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Report of the ICES Advisory Committee on Fishery Management, Advisory Committee on the Marine Environment and Advisory Committee on Ecosystems, 2006

Book 5
Celtic Sea and West of Scotland

International Council for the Exploration of the Sea

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5 CELTIC SEA AND WEST OF SCOTLAND

5.1 Ecosystem Overview

5.1.1 Ecosystem components

Bottom topography substrate and circulation

In the Celtic seas (ICES sub-areas VI and VII) the continental shelf is of variable width. The Celtic sea, south of Ireland is an extended shelf which most of the area is shallower than 100m. It is limited to the west by the slope of the Porcupine seabight and the Goban Spur. In this area the slope is rather gentle and sedimentary. To the west of Ireland the Porcupine bank forms a large extension of the shelf limited to the west by the Rockall Trough, the transition between the Porcupine bank and the trough is a steep and rocky slope along which reefs of deepwater corals occur. Further North, to West of Scotland the slope of the Rockall Trough is closer to the coast line, particularly off NW Ireland, and the Hebrides. West of the shelf break and the Rockall Trough is the Rockall Plateau with depths of less than 200m. The shelf area itself contains mixed substrates, generally with soft sediments (sand and mud) in the west and tending to more rocky, pinnacle areas to the east. The Irish Sea is shallow (less than 100m deep in most places) and largely sheltered from the winds and currents of the North Atlantic, although relatively high salinity indicates the influence of oceanic water from the south. In the Irish Sea, the inshore Coastal Current carries water from St. Georges's Channel northwards through the North Channel, mixing with water from the outer Clyde.

At these latitudes (55° to 58°N) the continental slope is mainly sedimentary and a trawl fishery for mid slope fish such as roundnose grenadier, Blackscabbard fish, deep sea squalids, blue ling and Orange roughy have been operating since the late 80s. The eco-region also contains several important seamounts; Anton Dohrn, Hebrides and Rosemary Bank, which have soft sediments on top and rocky slopes.

The water circulation in this area is dominated by the poleward flowing slope current. This persists throughout the year north of Porcupine Bank, and is stronger in the summer. South of the bank the current is present in the winter months, but breaks down in the summer, when flow becomes complex. There is also a weaker current flowing north from Brittany and splitting east and west along the Irish coast. (source; OSPAR QSR 2000) Porcupine Bank and the Rockall plateau tend to be retention zones.

The main oceanographic front in the Atlantic region is the Irish Shelf Front that occurs to the south and west of Ireland (at c. 11°W) around the 150m isobath, and exists year-round. This front marks the boundary between water over the Irish shelf (often mixed vertically by the tide) and offshore North Atlantic water. The turbulence caused by the front may bring nutrients from deeper water to the surface where they promote the growth of phytoplankton, especially diatoms in spring, but also dinoflagellates where there is increased stratification. These may in-turn be fed on by swarms of zooplankton and associated with these, aggregations of fish (Reid et al. 2003).

Seasonal fronts occur at several other locations immediately west of Britain, including the Ushant Front in the English Channel, the Celtic Sea front at the southern entrance to the Irish Sea, and the Islay Front between Islay and the coast of Northern Ireland. The Islay Front persists through the winter due to stratification of water masses of different salinity. Similarly, where tides are moderate, uneven bottom topography can have a considerable mixing effect, for example in the seas around the Hebrides.

Physical and chemical oceanography

Temperature/salinity

The slope current introduces warm saline water from further south into the whole area. The ICES Annual Ocean Climate Status Summary (IAOCSS) does not deal with this ICES Advisory Region as a bloc, but data are available for the Rockall Trough area in detail. The report suggests that the Rockall trough has been warming steadily over recent years. Similar trends appear for salinity (see Figure 5.1.1 below).

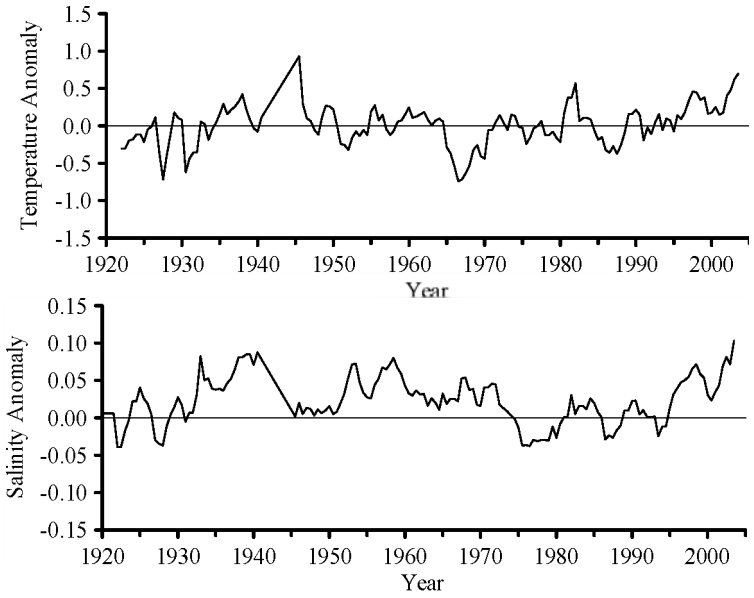

Figure 5.1.1 . Rockall Trough temperature and salinity anomalies for the upper ocean (0–800 m) of the northern Rockall Trough. Average across section, seasonal cycle removed.

Hydrographic observations for the area of the Northern Shelf (ICES area VI) were considered by *WGNSDS* in 2005 (ICES 2005a). Of particular note is the highlighted variability in local temperature observed in western waters (Figs 5.1.2and 5.1.3).

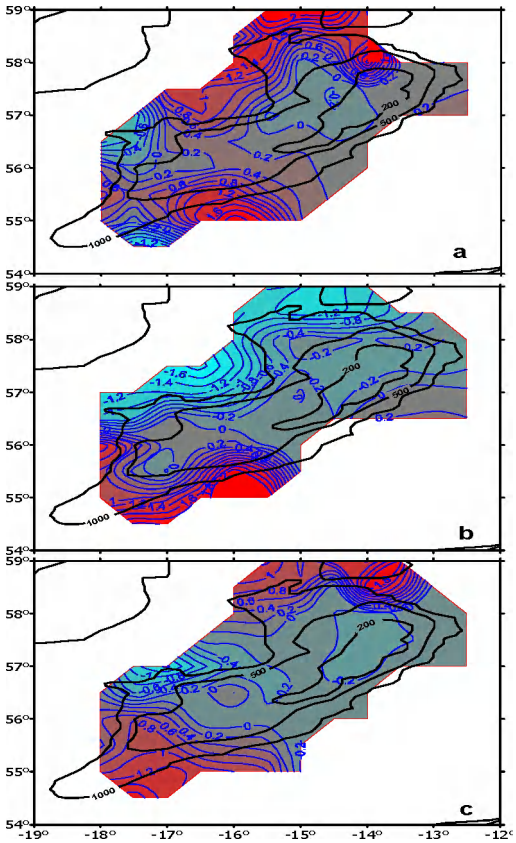

Figure 5.1.2 Difference of bottom temperature (°C) in the Rockall Bank area in spring 2005 from temperature in 2002 (a), 2003 (b) and 2004 (c).

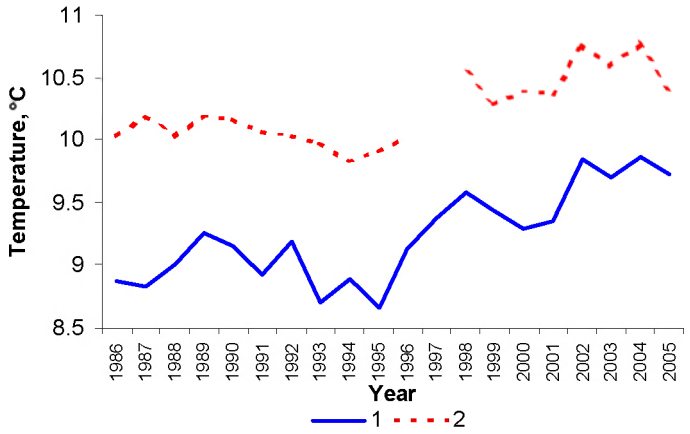

Figure 5.1.3 Yearly mean temperature in the areas west of the British Islands in 1986-2005: 1 - Rockall Bank area, 55-58°N 14-18°W (surface temperature in January-March), 2 - west of the Porcupine Bank, 52-54°N 14-16°W (temperature from 50-600 m in March-April).

No new temperature and salinity data were available for the Rockall area in 2005, although the positive temperature and salinity anomalies observed since the mid 1990s were expected to continue. Modified Atlantic waters in the Faroe-Shetland channel were warmer and saltier in 2003 than at any period in the last 50 years. Temperature and salinity decreased a little in 2004, but remained higher than the long-term average, suggesting that the general warming trend observed over the last 20 years was continuing. The North Atlantic Oscillation index (NAO) was near median in the winter of 2004. Early indications for the winter in 2005 are that the index will also be only slightly below median (ICES, 2005).

Inshore waters off the west of Scotland have also continued to warm, consistent with open ocean conditions. At Millport, where monitoring has been conducted since 1953, gradual warming is apparent, and the more rapid warming that has taken place since the mid 1990s continued until the time of the last reported data in 2003 (FRS, 2005).

Input of Freshwater

The major river inputs are into the Bristol channel, Irish Sea and The Malin Sea north of Ireland. These are locally important in reducing salinity in these areas. Because of the complex fjordic nature of west coast of Scotland there is also a substantial freshwater input from the numerous sea-lochs, notably the Firth of Lorne sealoch system.

Broad-scale climate & Oceanographic features

See general text on this topic in separate section on the NE Atlantic.

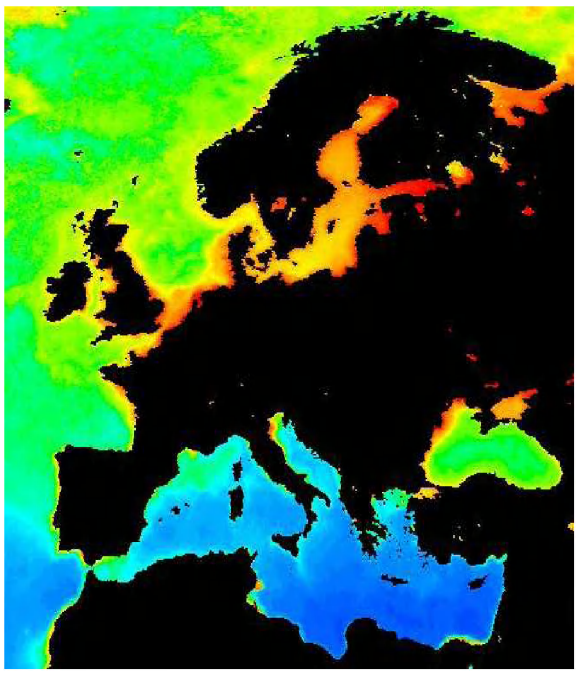

Figure 5.1.4 Spring chlorophyll (1998-2003).

Phytoplankton

For phytoplankton, the main feature is the strong primary productivity found along the shelf break – see Figure 5.1.4. This is stimulated by the warmer, nutrient rich waters found here. Productivity is reasonably strong on the shelf but drops rapidly west of the shelf break. Based on CPR greenness records for this area the spring bloom occurs around April and collapses by October, although in recent years has continued into December. CPR data also suggest that there has been a steady increase in phytoplankton colour index across the whole area over at least the last 20 years. Details on the taxa involved have not been located but are assumed to be dominated by diatoms (at least in the spring bloom), but will also include dinoflaggelates.

Zooplankton

Like the adjacent North Sea waters, the overall zooplankton abundance in this area has declined in recent years. CPR areas C5, D5 and E5 all show substantial drops in *Calanus* abundance and these are now below the long term mean. *Calanus finmarchicus* is known to overwinter in the Faroe-Shetland channel and the abundance of these is known to have been reduced in recent years. This species distribution in deep waters further south is unknown. More detailed information should be available from the CPR programme but this is not available at present.

Zooplankton monitoring data are available from one station in waters about 50 m deep in the English Channel. These data exhibited a decreasing trend from 1988 to 1995, but an increase thereafter until 1999. This increase was mainly due to two autumn developing small species of copepod, *Euterpina* sp. and *Oncaea* sp. In 1999 there was a decline in the zooplankton population, with the top ten species all below their typical average values (apart from *Temora* and *Corycaeus*, which exhibited very little variation). However, in 2000, 2001 and 2002 the abundance of zooplankton increased from a lower abundance level comparable to that of 1995-1998. (reported in ICES Zooplankton Monitoring Status Summary 2001/2002). Data for 2003, 2004 and 2005 are not yet available.

Benthos, larger invertebrates, biogenic habitat taxa

The major commercial invertebrate species is Nephrops. It is targeted by trawl fisheries on the shelf west of Scotland, the Rockall plateau and south and west of Ireland. Cuttlefish is also exploited in the Celtic Sea, and scallops in the Irish Sea and west of Scotland.

Major fisheries dredging for scallops and some smaller bivalves exist in the western Channel, Irish Sea and west of Scotland. Pot fisheries exploit the lobster *Homarus gamarus* and brown crab *Cancer pagurus* in the water around the Channel Islands, off France (French landing about 150 t/year), and the west of Scotland. Estimated landings of whelk (*Buccinum ondatum*) are as high as 12 000 t/year from at targeted pot fishery. Cuttlefish are also targeted by pot fishery but trawl catch are much higher and target juvenile in coastal water in some areas.

In addition to major aquaculture activity for oysters and mussels, some beds of oysters and buried bivalves such as cockles *Cardium edule* are exploited by professional and recreational fisheries.

The benthos of the Celtic seas (northern shelf, Irish Sea and Celtic Sea) is largely influenced by shelf sea dynamic processes that generate areas with high levels of seabed stress and erosion. Over 340 species of invertebrate and fish were captured in a survey of the epibenthos in ICES area VIIf-h (Ellis et al (2002), the most ubiquitous species being the hermit crab *Pagurus prideaux* and the spotted dragonet *Callionymus maculatus,* both of which are major prey items for commercial fish (Pinnegar et al.2003). Two epibenthic assemblages predominate in the Celtic Sea. The first is dominated by the anemone *Actinauge richardi* (41.8% of faunal biomass) and occurs along the shelf edge and slope in waters 132-350m deep. The second assemblage is more widely distributed on the continental shelf (depth range: 66-232m) and *P. prideaux* dominates along with other mobile invertebrates (shrimps and echinoderms), although there are some spatial differences in assemblage structure and relative abundance.

Biogenic reefs of horse mussels *Modiolus modiolus*, maerl and Serpulid worms occur in specific locations (Irish Sea, West coast of Scotland). The latter can support benthos of conservation interest such as sea fans and structurally complex bryozoans. Offshore areas on the shelf slope support reefs of deep water corals such as *Lophelia pertusa.*

Fish Community

This ICES Advisory Region includes two distinct types of ecosystem; shelf seas and deep water communities. In the northern part of the area, (Irish Sea, West of Ireland and western Scotland) there are important commercial fisheries for Nephrops, cod, haddock and whiting and a number of flatfish species. Hake and angler fish are also fished across the whole area. The Rockall plateau is subject to a haddock and small-scale Nephrops fishery. Commercial fisheries for, cod, plaice and sole are conducted in the Irish Sea. The whole area is also characterised as a spawning area for a number of key wide ranging, migratory species, notably mackerel, horse mackerel and blue whiting. These species are also commercially exploited within the area. Key pelagic species are herring, considered as consisting of a number of different stocks, as well as sardine, in the southern part of the area, and sprat, particularly in the Celtic Sea proper. The area also accommodates considerable stocks of argentines (two species) and large numbers of small mesopelagic myctophids along the shelf break.

The shelf slope (500-1800m) comprises a quite different species assemblage including roundnose grenadier, black scabbard fish, blue ling and orange roughy as well as deep sea squalids (sharks) and macrouridae. For the most part none of these species are subject to stock assessment, although some are likely to have been severely depleted by the deep water fisheries carried out in this area. A notable example would be orange roughy, which has probably been largely fished out. All these fish are characterised as being long lived, slow growing and having a low fecundity, making them very vulnerable to overfishing.

The Celtic sea groundfish community consists of over a hundred species and the most abundant 25 make up 99 percent of the total estimated biomass and around 93 percent of total estimated numbers (Trenkel and Rochet 2003). Population and community analyses have shown that fishing has impacted a number of commercial species, primarily because individuals of too small a size have been killed in the past (Trenkel and Rochet 2003). This can be considered as resulting partly from observed large discards (Rochet et al., 2002).

The size structure of the fish community has changed significantly over time, and that a decrease in the relative abundance of larger fish has been accompanied by an increase in smaller fish (4–25g) (Blanchard et al 2005; Trenkel et al 2004).. Temporal analyses of the effects of fishing and climate variation suggest that fishing generally has had a stronger effect on size-structure than changes in temperature. A marked decline in mean trophic level of the fish community over time has also been documented (Pinnegar et al 2003) and this resulted from a reduction in the abundance of large piscivorous fishes and an increase in smaller pelagic species which feed at a lower trophic level. Since 1990 the non-exploited species *Capros aper* has become particularly abundant in French and UK survey catches. This phenomenon has been reported as occurring elsewhere in the North Atlantic including the Bay of Biscay (Farina et al. 1997) and offshore seamounts (Fock et al. 2002).

Trophic web

For the Celtic Sea, two sources of fish stomach data have recently been collated and these are described in UK researchers collected stomachs for 66 species during routine annual groundfish surveys from 1986 to 1994. French researchers (du Buit and co-workers) sampled stomachs of seven species aboard commercial fishing vessels, throughout the years 1977 to 1992 (in all seasons).

Several studies for fish stomach contents and diets have concluded that the main predator species in the Celtic Sea (hake, megrim, monkfish, whiting, cod, saithe) are generalist feeders which exhibit size-dependent, temporal and spatial prey-switching behaviour (Pinnegar et al.2003, Trenkel et al. 2005). Overall, there was general agreement between

higher prey densities in the environment and higher occurrences of particular prey species in predator stomachs, which lead to distinct spatial and temporal feeding patterns (Trenkel, et al. 2005). Blue whiting was found more often in predator stomachs over the shelf edge during the summer months while mackerel and *Triopterus* spp were relatively more prevalent in stomachs sampled on the continental shelf during the winter half year. The general impression is one of a highly interlinked food web, where several predators feed on the same prey resources, i.e. their trophic niche overlaps substantially. These results derive from the Celtic sea sensus stricto (the southern part of region E, limited to the North by Ireland, and between longitudes of 4°E and 12°W). Less is known concerning trophic interactions among fish species in the Irish Sea and northwest Scotland (although see du Buit 1989; 1991a,b). No major studies of forage fish have been conducted in the north of the eco-region. Sand eel, sprat and Norway pout are known to be present, however their role and importance in the ecosystem is unclear.

Fish taken from the shelf edge areas of the Celtic Seas tend overall to be less planktivorous and from a higher trophic level than those in the North and Baltic Seas (2005a). For instance, the secondary production required per unit of landed fish from the southern part of the Celtic Seas is twice that for North Sea fish. In this area zooplankton production accounts for only a small fraction of the secondary production demands of the fisheries. In the Celtic Seas benthos production can be seen as a 'bottom-up' driver for fisheries production, which seems to be independent of variability in plankton production. As this situation is very different to the situation in the North Sea (see NS section), climate change and fishing pressures can be expected to influence these regional fisheries in very different ways. Overall, there appear to be strong spatial patterns in the fish food web structure and function, which should be important considerations in the establishment of regional management plans for fisheries (see Heath 2005b).

Heath (2005b) argues that, because the blue-whiting fishery is conducted mainly off the continental shelf, there is no rationale for a foodweb connection between the bulk of the blue whiting catch and the other landed species from the Celtic Sea and west of Scotland. By contrast, Pinnegar et al. (2003) and Trenkel et al. (2005) have both highlighted the importance of this species as a prey for fish on the shelf-edge, notably for hake and megrim.

For cod in the Irish Sea, the decapod *Nephrops norvegicus* is known to be an important prey item (Armstrong, 1982), whereas whiting, Norway-pout and *Nephrops* are known to be important for monkfish (Crozier 1985). In north-west of Scotland there have been additional studies focusing on inshore demersal assemblages (e.g. Gibson & Ezzi, 1987). Feeding relationships among deep-water species on the Wyville Thomson ridge have also been examined (du Buit 1978).

Vulnerable species

The blackspot (red) seabream (*Pagellus bogaraveo*) used to be an important target species of English fisheries in the 1930s (Desbrosses, 1932), catches in the Celtic seas declined well before the collapse of the fishery in region G (see this chapter for a longer account on this species). The species can be considered as eradicated from the Celtic seas.

The red lobster (*Palinurus elephas*) was exploited by pot fisheries prior to the late 1990s, and current catches and the stock of this species can be considered as residual.

Skates are arguably the most vulnerable of exploited marine fishes because of their large size, slow growth rate, late maturity and low fecundity. Dulvy *et al.* (2000) discussed the disappearance of skate species (*Dipturus oxyrhinchus, Rostoraja alba* and *D. batis*) in the Irish Sea, and the widespread decline in the abundance of smaller species.

As mentioned above, several species of deep water fish are considered as being severely depleted and meriting protection.

Birds, Mammals & Large Elasmobranches

Basking shark (*Cetorhinus maximus*), are seen throughout the Celtic Sea, Irish Sea and Northern Shelf region, from April through to October. Basking shark is protected within British territorial waters. Blue shark (*Prionace glauca*) are found in the summer in the southern part of the area. They are subject to a variety of fisheries, both recreational and directed (longlines and gillnet) as well as bycatch in offshore tuna fisheries. Porbeagle (*Lamna* nasus) and tope (*Galeorhinus* galeus) are also targeted in both recreational and commercial fishing.

Six species of cetacean are regularly observed in this Advisory Region (Reid et al 2003). SCANS line transect surveys in 1994 estimated numbers of some of these occurring in the Celtic Sea.

Minke whale *Balaenoptera acutorostrata* is found throughout the region, particularly off western Scotland and Ireland. SCANS estimate was 1195 animals. Bottlenosed dolphin *Tursiops truncatus* occur in large numbers off western and southwest Ireland and in smaller numbers throughout the region. No SCANS estimate. Common dolphin *Delphinus delphis* are widely distributed in shelf waters throughout the region, especially in the Celtic Sea and adjacent waters.

SCANS estimate was 75500 animals. White-beaked dolphin and White-sided dolphin (*Lagenorhynchus albirostris* and *L. acutus*) occur over much shelf area, but are less common in the southwest part of the area. Harbour porpoise *Phocoena phocoena* is the smallest but by far the most numerous of the cetaceans found in the shelf area, particularly south-west Ireland, the Irish Sea and west of Scotland. SCANS estimate was 36280 animals.

Grey seals (*Halichoerus grypus*) are common in many parts of the area, with population estimates ranging from approximately 50,000 to 110,000 animals (SCOS 2005), the majority in the Hebrides and in Orkney. Common seals (*Phoca vitulina*) are also widespread in the northern part of the area with around 15,000 animals estimated (SCOS 2005). Smaller numbers are seen in Ireland (c. 4,000) and very few further south.

In 2002, the ICES Working Group on Seabird Ecology reported seabird population estimates within all ICES areas. For ICES Area VIa west of Scotland a total of 1.2 million pairs of breeding seabirds were reported. Auks, predominantly the common guillemot (*Uria aalge*), razorbill (*Alca torda*) and the Atlantic puffin (*Fratercula arctica*) accounted for 51% of the total, while petrels (including fulmar, *Fulmarus glacialis*; storm petrel, *Hydrobates pelagicus*; and Manx shearwater, (*Puffinus puffinus*) accounted for 29%, Northern gannet accounted for 10%, and gulls (particularly kittiwake and herring gull) 9%(ICES 2002). In the Irish Sea, Bristol Channel and English Channel (ICES areas VIIa,d,e,f) gulls predominate (47%, 66%, 90%, 68% respectively), in particular black-headed, lesser black-backed and herring gulls as well as guillemots. Petrels (fulmar and storm-petrel) dominate in the west of Ireland and Celtic Sea region (area VIIb,g,j 48%, 60% and 79% respectively) but there also large breeding colonies of kittiwake, guillemot and gannet.

Climate change is likely to impact on seabird populations. The breeding success of some seabird populations in the Celtic Sea has already been linked to climatic fluctuations in the North Atlantic, such as the North Atlantic Oscillation (NAO). Projected consequences of global warming, such as sea level rises, increased storminess and rises in sea/air temperatures are likely to have a direct impact on seabird populations.

Knowledge gaps

In general this eco-region has attracted less attention than areas such as the North Sea. It is probably not that data do not exist, but that they have not been correlated and integrated. For example, the CPR programme has carried out sampling within the area , but detailed breakdown of these data has not been carried out. As noted above, the primary, and hence presumably secondary production change substantially from the shelf, to the shelf break to the open ocean. Therefore, data aggregated over all these systems is likely to be difficult to interpret. There is also no single assessment working group responsible for the fisheries in the area. These are covered by nine groups, including both northern and southern shelf demersal WGs,. This also makes the integration of data by eco-region more complex. There is currently no multi-species working group for this region, and hence there has been no coordinated effort towards exploring predator-prey relationships and inter-dependencies among commercial species.

5.1.2 Major environmental signals and implications

No obvious environmental signals were identified that should be considered in assessment or management in this area. The major trends in the ecosystem noted above are the steady warming of the area, particularly in the context of the slope current. The Rockall trough waters have been warming steadily for some years and are currently at an all time high. The general and continuing reduction of copepod abundance is also of major concern given the major role of these organisms in the food web.

Both these factors are likely to have an impact on the life histories of many species, but particularly on the migratory pelagic species; mackerel, horse mackerel and blue whiting. Both mackerel and horse mackerel migrations are closely associated with the slope current. Mackerel migration is known to be modulated by temperature (Reid et al 2001). Continued warming of the slope current is likely to affect the timing of this migration. The timing and location of spawning by all these species is also likely to be affected by warming. The impact on recruitment is difficult to assess, as mackerel generally recruits well, and the horse mackerel stock depends on very rare massive recruitments. No ecosystem link has been identified for either species.

The widespread and sudden increase in occurrence of non-commercial species such as *Capros aper,* particularly after 1990 (Pinnegar et al. 2003) might indicate some change in environmental conditions but mechanisms and consequences are poorly understood.

5.2 The human impacts on the ecosystem

5.2.1 Fishery effects on benthos and fish communities

This ICES Advisory Region is characterized by the presence of a number of benthic features which are considered important and vulnerable to fishing activity. These include cold water corals (particularly Darwin mounds) other biogenic reefs and natural reefs. Cold water corals structures have been identified in many areas including Porcupine Bank, Rockall, the slope areas west of Scotland & Ireland and on the seamounts. ICES has advised on the occurrence of cold-water corals in the North East Atlantic for the past two years. It has also advised that should managers wish to protect these habitats from the effects of fishing, the only effective way to do this is by closing them to all damaging fishing gear. In Subarea VI, one such area has been closed by fishery managers: the Darwin Mounds. This area lies to the south of the Wyville Thomson ridge (to the northeast in Figure 5.2.1). The Darwin Mounds have been impacted by towed bottom-fishing gear (ICES, 2002). There has been extensive use of bottom-set nets on shelf, slope and even deep-sea areas. Although documentation is hard to acquire, there is substantial concern about ecosystem effects due to ghost fishing by lost gear from these fisheries, and about unsustainable fishing practices.

Figure 5.2.1 Distribution of cold-water coral records within ICES Subarea VI (from ICES, 2005a).

Not all of the records of cold-water coral in Figure 5.2.1 are of reefs: some records are of individual fragments trawled or dredged up from the seabed. Accurate determination of the existence and location of reefs requires either remote sonar surveys or visual inspection, either using cameras or manned submersibles, coupled with accurate geo-referencing of the seafloor. In Subarea VI, reefs have been found in UK internal waters to the east of Mingualay in the Outer Hebrides of Scotland (ICES, 2004), on the Rockall Bank (Figure 5.2.2), particularly on the northwestern and southeastern parts of the Bank. On the southeast Rockall Bank, the coral reefs are associated with large carbonate mounds (the Logachev Mound province) and are particularly well developed. Tangle nets and trawl scar marks have been observed in these reefs (ICES, 2005a).

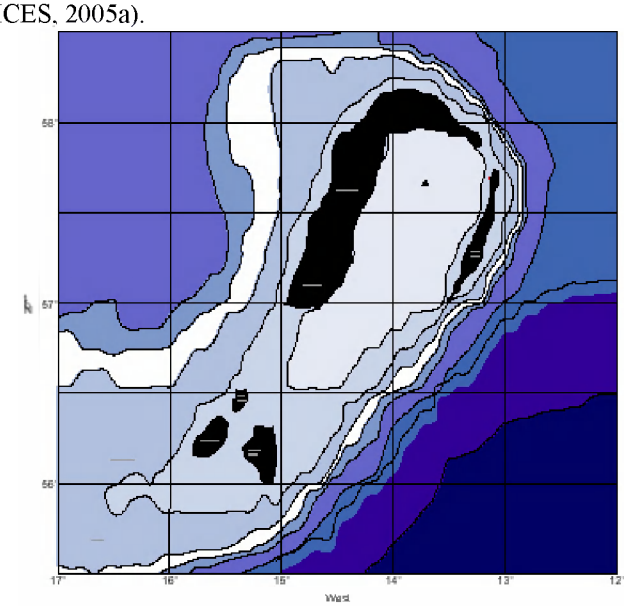

Figure 5.2.2. The distribution of coral reefs on Rockall Bank from fishermen's records (J. Hall-Spencer, pers comm.). The cross-hatched areas indicate the presence of *Lophelia* reefs (From ICES, 2003).

The fishing activities on the shelf areas is likely to have impacted the fish-communities and there are numbers of depleted stocks in that area (e.g. cod, whiting and plaice). Trawling in the deep waters has almost certainly caused substantial changes in the community structures of the deeper waters west of the shelf break. Initial studies of catch rates from surveys west of Scotland in the 1980s compared to the last 5-10 years suggest substantial reductions in large, slow growing species and a switch to smaller faster growing fish.

The shelf slope (500-1800m) comprises a quite diverse species assemblage including roundnose grenadier, black scabbard fish, blue ling and orange roughy as well as deep sea squalids (sharks) and macrouridae. For the most part these species are not subject to regular stock assessment. However, some of these species are likely to have been severely depleted by the deep water fisheries carried out in this area. All these fish species are characterised as being long lived, slow growing and having a low fecundity, making populations very vulnerable to overfishing.

Based on the above, the sustainability of deep water trawling should be reconsidered given the vulnerability of both the fish communities and the benthic habitats.

Cetacean bycatch in fisheries has been acknowledged to be a threat to the conservation of cetaceans in this eco-region (CEC 2002a, Ross & Isaacs 2004). As in other areas this mainly affects small cetaceans – i.e. dolphins, porpoises and the smaller toothed whales. Species caught in the region are primarily the harbour porpoise, common dolphin, striped dolphin, Atlantic white-sided dolphin, white-beaked dolphin, bottlenose dolphin and long-finned pilot whale (CEC 2002a). However, other larger cetaceans, such as the minke whale, can also be affected.

An extensive review of the bycatch of cetaceans in pelagic trawls was carried out for Greenpeace in 2004 (Ross & Isaacs 2004). This report considered published and anecdotal information. In the Celtic Seas the report identified a small number of fisheries where cetacean bycatch could be documented. These were;

- Bass fishing in the western channel
- Mackerel and horse mackerel trawling SW of Ireland
- Gill netting for hake in the Celtic Sea

In the last two cases, the number of animals caught was low, however, it is probably higher in the bass fishery and has attracted considerable public attention. The report identified that many countries had initiated cetacean bycatch monitoring programmes, and had generally found little or no evidence that serious bycatch had occurred.

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5.3 Assessments and advice

5.3.1 Assessment and advice regarding protection of biota and habitats

5.3.2 Assessments and advice regarding fisheries

Mixed fisheries and fisheries interactions (Celtic Sea and western Channel)

Demersal fisheries in the area are mixed fisheries, with many stocks exploited together in various combinations in different fisheries. In these cases management advice must consider both the state of individual stocks and their simultaneous exploitation in demersal fisheries. The stocks in poorest condition, particularly those outside precautionary limits, necessarily become the overriding concern for the management of mixed fisheries where these stocks are exploited either as a targeted species or as a bycatch.

Many of the fleets in the area operate on a mixture of demersal species. As trends in stocks of various species are generally not in synchrony, advice provided on the basis of the status of individual species may result in advised fishing mortalities for a group of co-harvested species that cannot be realized simultaneously within the context of mixed fisheries.

The main interactions between the stocks in the Celtic Sea, Southwest of Ireland, and Western Channel, are between:

- anglerfish, megrim, and hake in the otter board trawl fishery in medium to deep water;
- *Nephrops*, cod, and whiting in the *Nephrops* fishery in the Celtic Sea, and between *Nephrops* and hake in the Bay of Biscay;
- gadoids (cod, haddock, and whiting) within the trawl fishery for roundfish, mainly within Divisions VIIf,g;
- sole and plaice in the beam trawl fishery in Divisions VIIf,g and VIIe, and sole and anglerfish in VIIIa,b;
- haddock, whiting, cod, sole, plaice, hake, megrim, anglerfish, squid, elasmobranchs, and other species within the mixed demersal trawl fisheries.

The directed fisheries for hake (trawl, longlines, and gillnets) and have few interactions with other stocks:

Table 5.3.1 Stock interactions – Celtic Sea and Western Channel.

Technical interaction matrix - Interaction between fisheries	Anchovy VIII	Anglerfish budegassa VIIb-k, VIIIabd	Anglerfish piscatorius VIIb-k, VIIIabd	Cod VIIe-k	Haddock VIIb-k	Hake Northern	Herring Celtic Sea and Division VIIj	Herring VIa(S) and VIIbc	Horse Mackerel Southern	Horse Mackerel Western	Mackerel North East Atlantic	Megrim VII, VIIIabd	Nephrops Area L: VIIbcjk	Nephrops Area M: VIIfgh+VIIa	Nephrops VIIIa,b	Nephrops VIIIc	Plaice VIIbc	Plaice VIIe	Plaice VIIfg	Plaice VIIhjk	Sardine VIIIc, IXa	Sole VIIbc	Sole VIIe	Sole VIIfg	Sole VIIhjk	Sole VIIIab	Sprat VIIde	Whiting VIIe-k	Seabass	Rays
Anchovy VIII		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anglerfish budegassa VIIb-k, VIIIabd	N		H	L	L	M	0	0	0	0	0	M	M	L	M		L	L	L	L	0	L	L	L	L	M		L		M
Anglerfish piscatorius VIIb-k, VIIIabd	N	T		L	L	M	0	0	0	0	0	M	M	M	M		L	L	L	L	0	L	L	L	L	M		L		M
Cod VIIe-k	N	T	T		H	L	0	0	0	0	0	L	L	M	0	0	0	L	M	L	0	0	L	L	L	0	0	H/M		L
Haddock VIIb-k	N	T	T	T		L	0	0	0	0	0	L	M	M	0	0	L	L	L	L	0	L	L	L	L	0	0	H	0	L
Hake Northern	N	T	T	T			0	0	0	0	0	M	M	L	M		L		0	L	0	L		0	L	L		L		
Herring Celtic Sea and Division VIIj	N	N	N	N	N	N		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0
Herring VIa(S) and VIIbc	N	N	N	N	N	N	N		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0
Horse Mackerel Southern	N	N	N	N	N	N	N	N		0	H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Horse Mackerel Western	N	N	N	N	N	N	N	N	N		H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mackerel North East Atlantic	N	N	N	N	N	N	N	N				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Megrim VII, VIIIabd	N	T, BT	T, BT	T		T	N	N	N	N	N		H	M	M		L			L	0	L		L	L	0		L		
Nephrops Area L: VIIbcjk	N	NT	NT	NT	NT	NT	N	N	N	N	N	NT		0	0	0	L	0	0	L	0	L	0	0	L	0	0	M		
Nephrops Area M: VIIfgh+VIIa	N	NT	NT	NT	NT	NT	N	N	N	N	N	NT	N		0	0	0	0	0	L	0	0	0	L	L	0	0	M		
Nephrops VIIIa,b	N	NT	NT	N	N	NT	N	N	N	N	N	NT	N	N		0	0	0	0	0	0	0	0	0	0	M	0	0		
Nephrops VIIIc	N			N	N		N	N	N	N	N		N	N	N		L		0	0	0	L	0	0	0	0		0		
Plaice VIIbc	N			N			N	N	N	N	N		NT	N	N			0	0	0	0	L	0	0	0	0	0	L	0	L
Plaice VIIe	N	OT, BT	OT, BT	OT, BT	N		N	N	N	N	N		N	N	N		N		0	0	0	0	H	0	0	0	0	L		
Plaice VIIfg	N	OT, BT	OT, BT	OT, BT	OT, BT	N	N	N	N	N	N		N	N	N	N	N	N		0	0	0	0	H	0	0	0	L		M
Plaice VIIhjk	N			BT, OT			N	N	N	N	N		NT	N	N		N	N	N		0	0	0	0	L	0	0	L	0	L
Sardine VIIIc, IXa	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N		0	0	0	0	0	0	0	0	0
Sole VIIbc	N			N			N	N	N	N	N		N	N	N			N	N	N	N		0	0	0	0	0	L	0	L
Sole VIIe	N	BT, OT	BT, OT	BT, OT	N		N	N	N	N	N		N	N	N	N	N	BT, OT	N	N	N	N		0	0	0	0	L		
Sole VIIfg	N	BT, OT	BT, OT	BT, OT	BT, OT	N	N	N	N	N	N	BT	N	NT	N	N	N	N	BT, OT	N	N	N	N			0	0	0	L		M
Sole VIIhjk	N			BT, OT			N	N	N	N	N		N	N	N		N	N	N	T, BT	N	N	N	N		0	0	L	0	L
Sole VIIIab	N	BT	BT	N	N	BT	N	N	N	N	N	N	N	N	NT	N	N	N	N	N	N	N	N	N	N		0	0	0	M
Sprat VIIde	N	N	N	N	N				N	N	N		N	N	N		N	N	N	N	N	N	N	N	N	N		0		
Whiting VIIe-k	N	T	T	T	T		N	N	N	N	N		NT	NT	N		N	N	BT, OT		N	N	N	BT, OT		N			0	L
Seabass	N						N	N	N	N	N										N					N		0		
Rays	N	BT, OT	BT, OT	BT, OT			N	N	N	N	N										N			BT, OT		BT		T		

H; the stocks are taken together in most fisheries where they are taken and their fisheries linkage is therefore high; M: the stocks are taken together in some but not all important fisheries and their fisheries linkage is therefore medium; L: the stocks are taken together in some fisheries but are mainly caught independently of each other and their fisheries linkage is therefore low; 0: the stocks are never or only rarely caught together and they are thus not linked in the fisheries; na: information not available.

T: Trawl; BT: Beam trawl; OT: Otter trawl; NT: Nephrops trawl; N: none

Table 5.3.2 Single-stock exploitation boundaries and critical stocks in the Celtic Sea and Western Channel

The state and the limits to exploitation of the individual stocks are presented in the stock sections. The state of stocks and single-stock exploitation boundaries are summarised in the table below:

Stock	State of the stock			ICES considerations in relation to single-stock exploitation boundaries			Upper limit corresponding to single-stock exploitation boundary - Tonnes or effort in 2007 and % reduction in F.
	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 high long-term yield	in relation to precautionary limits	
Anglerfish in Divisions VIIb–k and VIIIa,b *(L. piscatorius* and *L. budegassa)*	Full reproductive capacity	Harvested sustainably	Overexploited	Not applicable	F is above $\mathbf{F_{0.1}} - \mathbf{F_{max}}$	Fishing at $\mathbf{F_{pa}}$ for *L. budegassa* is expected to result in landings of 7600 t. This corresponds to a fishing mortality of 0.21 for *L. piscatorius*, corresponding to landings of at most 28 400 t in 2007.	**TAC < 36 000 t**
Cod in Divisions VIIe-k	Reduced reproductive capacity	Harvested unsustainably	Overexploited	Not applicable	F is above $\mathbf{F_{max}}$	It is not possible to identify any non-zero catch which would be compatible with the Precautionary Approach.	**Zero TAC**
Haddock in Divisions VIIb-k	Unknown	Unknown	Unknown	Not applicable	Unknown	Effort not allowed to increase, rather than TAC management.	**No increase in effort**
Hake – Northern stock (Division IIIa, Subareas IV, VI and VII, and Divisions VIIIa, b, d)	Full reproductive capacity	Harvested sustainably	Overexploited	The TAC in accordance to the agreed management plan is 50 485 t	F is above $\mathbf{F_{0.1}} - \mathbf{F_{max}}$	A fishing mortality of $\mathbf{F_{pa}}$ = 0.25 is expected to lead to landings of 53 800 t in 2007.	**TAC < 50 485 t**
Megrim in Divisions VIIb,c,e-k and VIIIa,b,d (*L. whiffiagonis and L. boscii*)	Unknown	Unknown	Unknown	Not applicable	Unknown	Landings of *L. wiffiagonis* in 2007 should not exceed the average landings of 2003–2005. This corresponds to 14 200 tonnes.	**TAC < 14 200 t**
Nephrops in Divisions VIIb,c,j,k	Unknown	Unknown	Unknown	Not applicable	Unknown	*Nephrops* fisheries should be constrained to recent levels of effort at an appropriate geographical scale (FU).	**No increase in effort**
Nephrops in Divisions VIIf,g,h, FU20-22	Unknown	Unknown	Unknown	Not applicable	Unknown	*Nephrops* fisheries in this area should be constrained at recent levels of effort.	**No increase in effort**
Plaice in the Celtic Sea (Divisions VIIf and g)	Reduced reproductive capacity	Unknown	Overexploited	Not applicable	F is above $\mathbf{F_{0.1}} - \mathbf{F_{max}}$	A 50% reduction in F is needed to increase SSB to around $\mathbf{B_{pa}}$ in 2008. This corresponds to landings of less than 380 tonnes in 2007.	**TAC < 380 t or Recovery plan**

Stock	State of the stock			ICES considerations in relation to single-stock exploitation boundaries			Upper limit corresponding to single-stock exploitation boundary - Tonnes or effort in 2007 and % reduction in F.
	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 high long-term yield**	**in relation to precautionary limits**	
Plaice in Division VIIe (Western Channel)	Increased risk	Increased risk	Overexploited	Not applicable	F is above $\mathbf{F_{0.1}} - \mathbf{F_{max}}$	Substantial reduction in catch until the estimate of SSB is above $\mathbf{B_{pa}}$ or other strong evidence of rebuilding is observed.	**Substantial reduction in catch**
Plaice Southwest of Ireland (Division VIIh-k)	Unknown	Unknown	Unknown	Not applicable	Unknown	Catches in 2005 should be no more than the recent average (2003–2005) of around 196 t.	**TAC < 196 t**
Plaice West of Ireland (Division VIIb,c)	Unknown	Unknown	Unknown	Not applicable	Unknown	Catches in 2005 should be no more than the recent average (2003–2005) of around 55 t.	**TAC < 55 t**
Sole in the Celtic Sea (Divisions VIIf and g)	Full reproductive capacity	Increased risk	Overexploited	Not applicable	F is above $\mathbf{F_{0.1}} - \mathbf{F_{max}}$	A 24% reduction in F is needed to reduce F below $\mathbf{F_{pa}}$. This corresponds to landings of less than 840 tonnes in 2007.	**TAC < 840 t**
Sole in Division VIIe (Western Channel)	Increased risk	Harvested unsustainably	Overexploited			Landings of around 350 tonnes in 2007 to bring SSB above $\mathbf{B_{pa}}$; or recovery plan.	**TAC < 350 t or recovery plan**
Sole Southwest of Ireland (Division VIIh-k)	Unknown	Unknown	Unknown	Not applicable	Unknown	Catches in 2005 should be no more than the recent average (2003–2005) of around 287 t.	**TAC < 287 t**
Sole West of Ireland (Division VIIb,c)	Unknown	Unknown	Unknown	Not applicable	Unknown	Recent catches have been close to the TAC of 65 t. Catches should not be allowed to increase unless it can be shown that an expansion of the fishery is sustainable.	**TAC < 64 t**
Whiting in Divisions VIIe–k	Unknown	Unknown	Unknown	Not applicable	Although F is ucertain, F is above $\mathbf{F_{0.1}}$	The stock should be managed by ensuring that the effort is not allowed to increase.	**No increase in effort**
Celtic sea and Division VIIj herring	Uncertain	Unknown	Unknown	Not applicable	Unknown	No fishing should be allowed until a rebuilding plan is in place.	**Zero TAC**
Herring in VIa south and VIIb,c	Uncertain	Uncertain	Unknown	Not applicable	Unknown	No fishing should be allowed unless a rebuilding plan is in place.	**Zero TAC**

Table 5.3.2 (Cont'd)

Identification of critical stocks

The table above identifies the stocks outside precautionary reference points. Spurdog and cod in VIIe–k are in a critical state. Stocks for which a reduction in exploitation is required are sole and plaice in Divisions VIIfg; plaice and sole in Division VIIe; Celtic Sea herring; and VIa VIIbc herring.

These stocks are the overriding concerns in the management advice for all fisheries where the interactions between stocks taken in the same fisheries should be considered:

- For spurdog and cod in VIIe–k the advice is for a zero catch;
- For sole in Division VIIe; and plaice in Division VIIf,g: either catches in 2007 as indicated in the table above, or recovery plans to define the limits within which the fisheries can take place and which ensure a large reduction in F in 2006;
- Reduction in fishing mortality has been advised for sole in Divisions VIIfg; for plaice in Division VIIe; and for Celtic Sea herring and VIa VIIbc herring.

Advice on fisheries management

Fisheries in the Celtic Sea, Southwest of Ireland, Western Channel, and northern part of the Bay of Biscay should in 2006 be managed according to the following rules, which should be applied simultaneously:

They should fish:

- **With no catch or discard of spurdog and cod in VIIe–k;**
- **without jeopardizing the recommended reduction in fishing mortality of sole and plaice in Divisions VIIfg; plaice and sole in Division VIIe; and Celtic Sea herring and VIa VIIbc herring;**
- **concerning deepwater stocks fished in Subareas VII and VIII, see Volume 9;**
- **within the biological exploitation limits for all other stocks (see text table above).**

Furthermore, unless ways can be found to harvest species caught in mixed fisheries within precautionary limits for all those species individually, then fishing should not be permitted.

Celtic Sea and West of Scotland

Fisheries to the West of Scotland and Rockall

The main fleets operating in Division VIa include the mixed roundfish otter trawl fleet, the *Nephrops* otter trawl fleet, the otter trawl fleet targeting anglerfish, megrim, and hake, and the fleet targeting saithe and/or deep-sea species. To a large extent, the roundfish fishery in Division VIa is an extension of the similar fishery in the North Sea. The demersal fisheries in Division VIa are predominantly conducted by otter trawlers fishing for cod, haddock, anglerfish, and whiting, with bycatches of saithe, megrim, and lemon sole.

The majority of the vessels in the demersal fishery are locally-based Scottish trawlers using light-trawls, but trawlers from Ireland, Northern Ireland, England, France, and Germany also participate in this fishery. The importance of Scottish seiners mainly targeting haddock has been declining in recent years as many of these vessels have been converted to trawlers. Part of the fleet of light trawlers has diversified into a fishery for anglerfish that has been expanding into deeper water off the northern coast of Scotland. Bycatches in this fishery include megrim, ling, and tusk.

About 200 Scottish trawlers also take part in the fisheries for *Nephrops* on inshore grounds. In recent years Irish vessels have also been targeting *Nephrops* in Division VIa, mainly on offshore grounds. These *Nephrops* vessels also land smaller quantities of haddock, cod, whiting, and small saithe, but discard large amounts of whiting and haddock.

The development of a directed fishery for anglerfish has led to considerable changes in the way the Scottish fleet operates. Part of this is a change in the distribution of fishing effort; effort in the roundfish fisheries has shifted away from the traditional inshore areas to more offshore areas and deeper waters. The expansion in area and depth-range of the fishery has been accompanied by the development of specific trawls and vessels to exploit the stock. These vessels mainly use large twin-rig otter trawls with >100-mm mesh. A smaller Irish fleet also targets anglerfish, megrim, and hake on the Stanton bank with 90-mm to 100-mm mesh. This fleet declined in numbers in recent years although there was a fleet modernisation scheme in the early 2000s whereby several large new vessels joined the fleet. More recently there has also been an Irish decommissioning scheme, involving around 40 fishing vessels (~6000 GT, 18 000 kW) which have been permanently withdrawn from the Irish fishing fleet and removed from the Register of Sea Fishing Vessels in 2005 and 2006. Several of these vessels have a track record of fishing in VI.

The fishery for anglerfish has expanded into deeper waters with an associated increase in catches. The expansion of this fishery has been further accelerated by the diversion of fishing effort from other stocks subject to more restrictive quotas in recent years, and by market opportunities. A gillnet fishery has developed on the continental slopes to the West of the British Isles, North of Shetland, at Rockall, and on the Hatton Bank. A preliminary investigation of this fishery suggests high levels of gear loss, widespread dumping of netting, high catch and discarding levels (particularly of monkfish), and a lack of effective management. These fisheries are occurring in areas believed to have been a refuge for adult anglerfish, increasing the vulnerability of the stock to overexploitation. Immature fish are subjected to exploitation for a number of years prior to first maturity.

The larger Scottish and Irish trawlers fish for haddock at Rockall when opportunities arise for good catches from the Division VIb stock. Vessels from the Russian Federation have fished for haddock and other demersal species at Rockall since 1999 when part of the Bank was designated as being in international waters. Although young saithe are caught by coastal trawlers in Subarea VI, the fishery for saithe essentially takes place on the shelf edge to the west and northwest of Scotland. Traditionally, this fishery has largely been operated by the larger deep-sea French trawlers. However, the number of these vessels has declined in recent years. Since the late 1980s, some of these vessels diverted their activity toward deep-sea species, notably orange roughy, and some medium-sized trawlers also participate in the fishery for deep-sea species during summer in some years.

The pelagic fishery for herring is mainly operated by UK, Dutch, and German vessels in the north, and by Irish vessels in the south. Substantial misreporting of catches from the North Sea and between the northern and southern stocks occurred in the past, but UK licensing regulations are thought to have reduced misreporting since 1997. In recent years TACs for the northern stock have not been restrictive, presumably because of low effort and a weak market. The Clyde herring fishery has declined sharply in recent years as the stock has suffered from a series of low recruitments. Recent TACs have not been taken and the catches have been less than 1000 t since 1991.

There is a directed trawl fishery for mackerel and horse mackerel in the area. The mackerel fishery mainly takes place in the fourth and first quarter of the year, when the mackerel is returning from the feeding area to the spawning area. The horse mackerel is mainly fished in the second half of the year. In addition, there are fisheries for blue whiting in the area.

The industrial fisheries in Division VIa are much smaller than in the North Sea. The Scottish sandeel fishery started in the early 1980s, peaking in 1986 and 1988. It is irregular, depending on the availability of the resource and of

processing facilities at Shetland, Denmark, and the Faroes. Bycatches in this fishery are very small. The Norway pout fishery is conducted mainly by Danish vessels.

Recent fishing effort trends

Recent effort trends are available for the UK fleet in Subareas VI. Almost 50 000 records over the period 1998 to 2005 were grouped into a series of nine gear categories, as shown in Figures 5.3.1 and 5.3.2. Note that only vessels over 10 m are included here and that gears such as pots, etc. are excluded. No attempt was made to compile an international data set since effort information from countries potentially making a significant contribution (such as France and Spain) were not yet available to ICES. Despite the incomplete nature of the data, the trends recorded for UK vessels (one of the main countries fishing in the area) provide useful indications of recent effort patterns.

Figure 5.3.1 shows that larger-meshed whitefish demersal trawls were the most important gears in VIa prior to 2002, but that there has since then been a marked decline in KW days by this category. This is principally explained by the recent, significant decommissioning schemes in the UK. Single-rig *Nephrops* trawls in the 70- to 99-mm mesh category are the other major gears in use and effort by these seems to have been maintained at a fairly stable level throughout the time-series. Numerous other gears generally make small contributions to the overall effort and the pattern in most of these has either been a downward trend (e.g. seine nets and midwater trawls) or fluctuation without trend (e.g. fixed nets). Taken together the picture suggests that overall, effort has declined in recent years in Area VIa and that declines in particular categories have not been compensated for by rises in other categories.

Figure 5.3.2 shows the results for VIb, again only for UK vessels. The effort (KW-days) figures are smaller in this area (mostly reflecting fishing at Rockall) and fewer gears are used extensively. Most gears are only recorded sporadically and some (e.g. *Nephrops* trawls and *Nephrops* twin trawls) are essentially not used in this area at all. Whitefish demersal trawls are the most important gears in use, particularly larger-mesh ones and the pattern of these in recent years has been a slight rise followed by a decline since 2003. Fixed nets and longlines are the other significant category and the trend in these has been downward.

Fisheries interactions to the West of Scotland and Rockall

Demersal fisheries in the area are mixed fisheries, with many stocks exploited together in various combinations in different fisheries. Roundfish are caught in otter trawl and seine fisheries, with a 120-mm minimum mesh size that comprises mixed demersal fisheries with more specific targeting of individual species in some areas and/or seasons. Cod, haddock, and whiting form the predominant roundfish catch in the mixed fisheries, although there can be important bycatches of other species, notably saithe and anglerfish in the deeper water and of *Nephrops* on the more inshore *Nephrops* grounds. Static-gear fisheries with mesh sizes generally in excess of 140 mm are also used to target cod. Saithe are mainly taken in a directed trawl fishery in deeper water along the shelf in Subarea VI. There is thought to be little bycatch of other demersal species associated with the directed fishery.

Large *Nephrops* fisheries take place in discrete areas that comprise appropriate muddy seabed sediment. Targeted *Nephrops* fisheries on these grounds are taken predominantly in trawls with mesh sizes less than 100 mm (particularly in the more southerly regions) using single- or multiple-rig trawls. *Nephrops* fishing grounds are mainly inshore grounds, although there are smaller offshore fisheries at Stanton Bank and west of the Hebrides. The bycatch and discarding of other demersal species in the *Nephrops* fisheries is highly variable.

There are trawl and gillnet fisheries targeting hake and anglerfish and otter trawl fisheries targeting hake, megrim, and anglerfish in Subarea VI. The catch of other demersal species associated in these fisheries is uncertain.

There is an international fishery targeting haddock, grey gurnards, and other species at Rockall using small mesh. Successful application of TACs for this stock would require that there is a simple relationship between recorded landings and effort exerted. This assumption is unlikely to be true for Rockall haddock especially when coupled with ways of evading TACs including misreporting, high-grading, and discarding. In the case of Rockall haddock these may occur to a large extent due to the remote nature of the fishery and the processing of catches at sea by some fleets. Direct effort regulation is therefore suggested as a means of controlling fishing mortality on Rockall haddock.

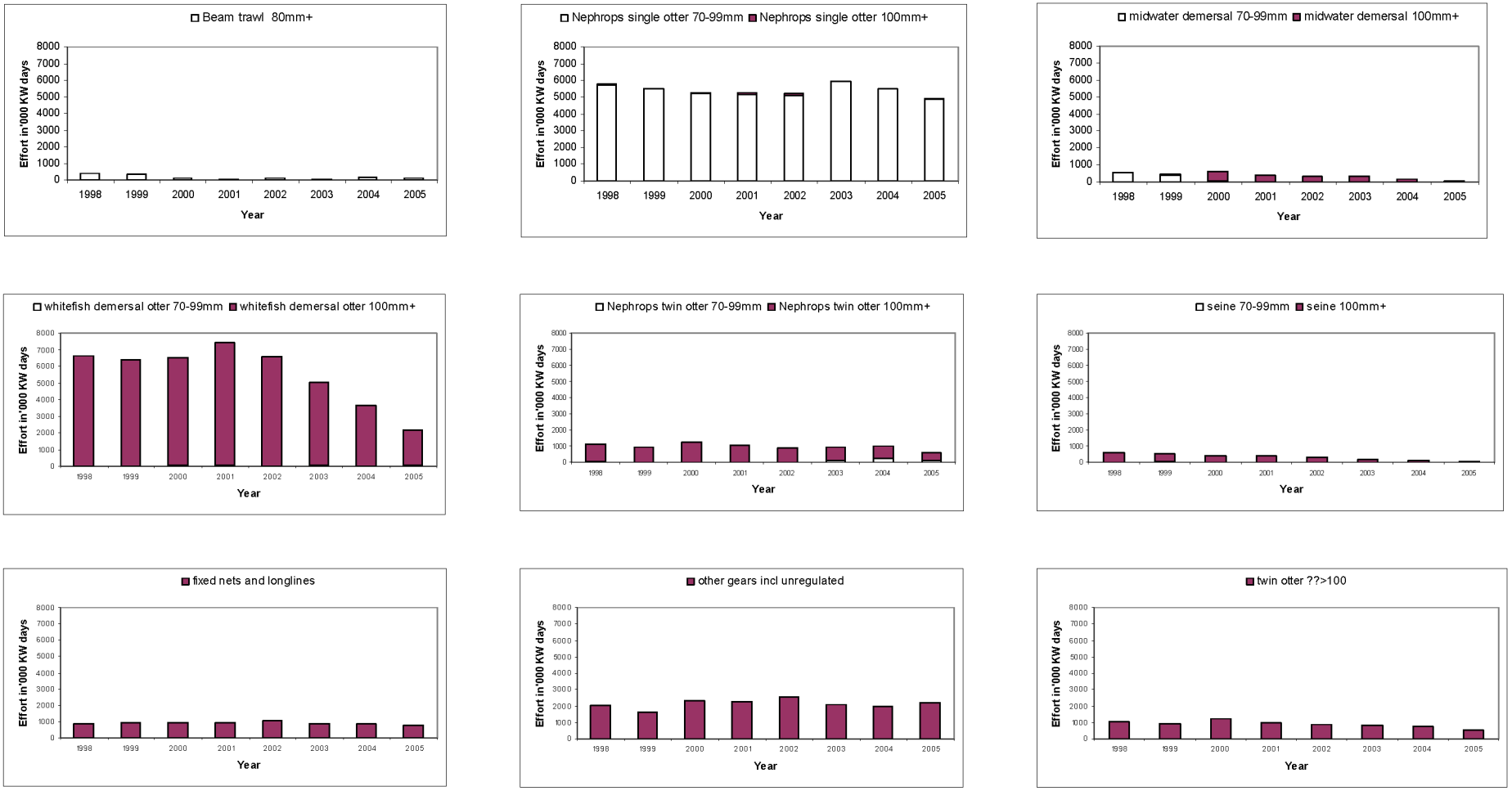


Figure 5.3.1 Fishing Effort (kW-days) by UK vessels from ICES Area VIa between 1998 and 2005 for various categories of fishing gear. All scaled to a maximum of 8000 kW-days. Open bars indicate 70- to 99-mm mesh gears, filled bars indicate 100+mm mesh gears.

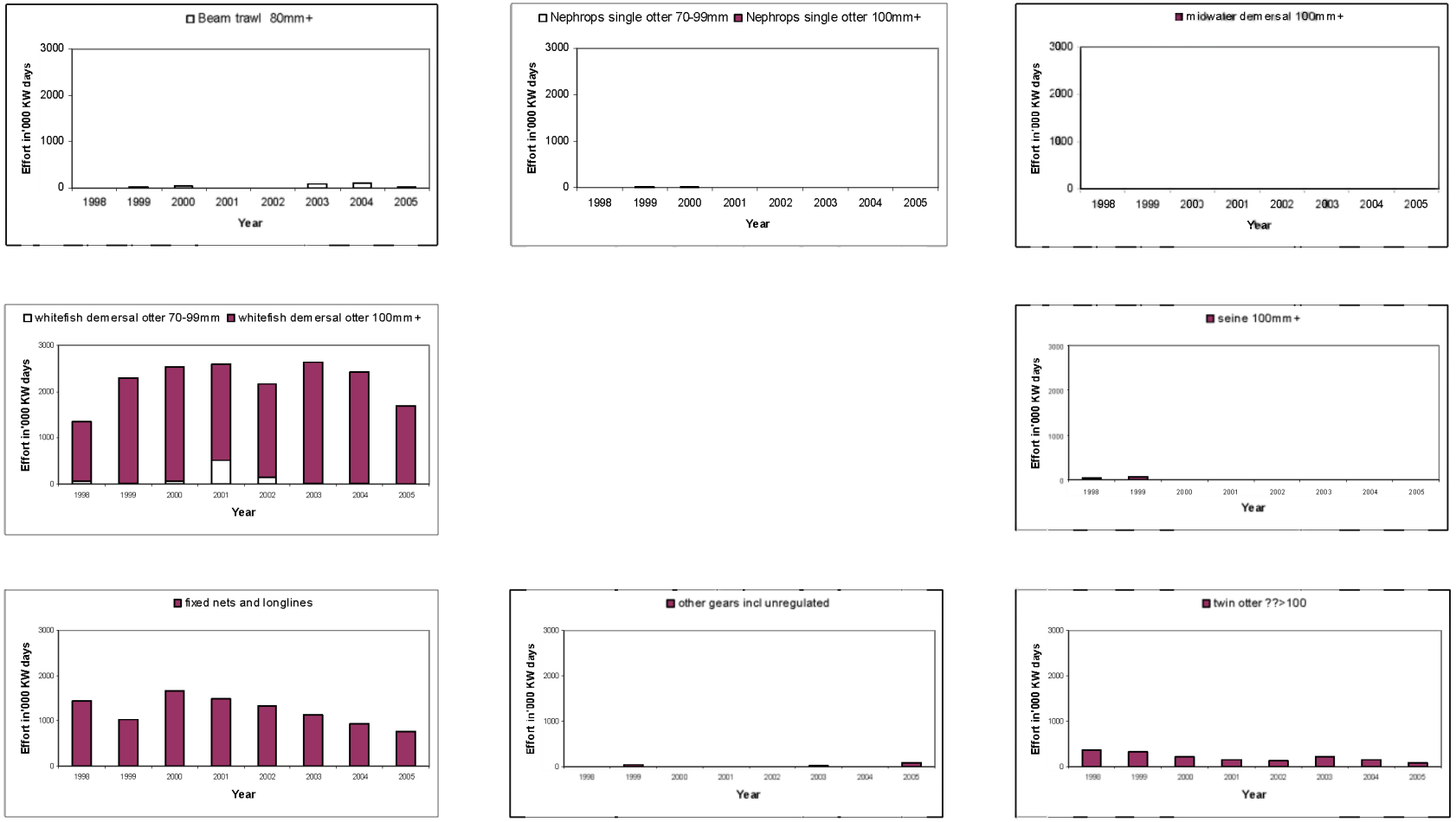


Figure 5.3.2 Fishing Effort (kW-days) by UK vessels from ICES Area VIb between 1998 and 2005 for various categories of fishing gear. All scaled to a maximum of 8000 kW-days. Open bars indicate 70- to 99-mm mesh gears, filled bars indicate 100+mm mesh gears.

Table 5.3.3 Stock interactions West of Scotland

	Anglerfish IV+VI	Megrim	Cod VIa	Haddock VIa	Whiting VIa	Nephrops VIa	Saithe IV+VIa	Herring VIa	NEA Mackerel	Deepwater fish
Anglerfish IV+VI		OTB, GND	OTB	OTB	OTB	NEP OTB	OTB	PTM	PTM	OTB Deep, GND
Megrim	Strong		OTB	OTB	OTB	NEP OTB	OTB	PTM	OTB Deep	OTB Deep
Cod VIa	Weak	Weak		OTB, PT	OTB, PT	OTB, NEP OTB	OTB, OTB Deep, PT	PTM	PTM	OTB Deep
Haddock VIa	Weak	Weak	Strong		OTB, PT	NEP OTB	OTB, PT	PTM	PTM	OTB Deep
Whiting VIa	Weak	Medium	Strong	Strong		NEP OTB	OTB	PTM	PTM	OTB Deep
Nephrops VIa	Medium	Medium	Medium	Strong	Strong		OTB	PTM	PTM	OTB Deep
Saithe IIIa+IV+VIa	Weak	Weak	Medium	Medium	Weak	Weak		PTM	PTM	OTB Deep
Herring VIa	0	0	0	0	0	0	0		PTM	OTB Deep
NEA Mackerel	0	0	0	0	0	0	Weak	Medium		OTB Deep
Deepwater fish	Strong	Medium	Weak	Weak	0	Weak	Weak	0	0	

Interaction	
Weak	Weak
Medium	medium
Strong	strong

OTB Deep	Otter Trawls in deepwater
OTB Nep	Otter Trawl *Nephrops* directed
GND	Gill nets demersal & deepwater
PTM	Pelagic Midwater Trawl
PT	Pair Trawl

Table 5.3.4 Single-stock exploitation boundaries and critical stocks (West of Scotland)

The state and the limits to exploitation of the individual stocks are presented in the stock sections. The state of the stocks and single-stock exploitation boundaries are summarised in the table below.

Stock	State of the stock			ICES considerations in relation to single-stock exploitation boundaries			Upper limit corresponding to single-stock exploitation boundary - Tonnes or effort in 2007 and % reduction in F.
	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 high long-term yield	in relation to precautionary limits	
Cod West of Scotland	Reduced reproductive capacity	Harvested unsustainably	Overexploited	ICES is not in a position to give quantitative forecasts. Simulations show that fishing should be closed for 3 years in order to bring SSB above B_{lim}.	F is above F_{max}	Given the very low SSB estimates, the high fishing mortalities and low recruitment in this stock, ICES advises zero catch of cod in 2007.	**Zero TAC**
Hake – Northern stock (Division IIIa, Subareas IV, VI and VII, and Divisions VIIIa, b, d)	Full reproductive capacity	Harvested sustainably	Overexploited	The TAC in accordance to the agreed management plan is 50 485 t.	F is above $F_{0.1}$ –F_{max}	A fishing mortality of F_{pa} = 0.25 is expected to lead to landings of 53 800 t in 2007.	**TAC < 50 485 t**
Cod in Division VIb (Rockall)	No assessment						
Haddock West of Scotland	Full reproductive capacity	Risk of being harvested unsustainably	Overexploited	Not applicable	F is above F_{max}	In order to maintain SSB above B_{pa} in 2008, ICES recommends a reduction in fishing mortality to less than 0.44. This corresponds to landings of less than 7200 t in 2007.	**TAC < 7200 t**
Haddock in Division VIb (Rockall)	Full reproductive capacity	Harvested sustainably	Overexploited	Not applicable	F is above F_{max}	Fishing mortality should be less than F_{pa}, corresponding to catches of less than 7100 t in 2007.	**TAC < 7100 t**
Whiting West of Scotland	Unknown	Unknown	Unknown	Not applicable	Unknown	Catches in 2007 should be reduced to the lowest possible level.	**Zero TAC**
Whiting in Division VIb (Rockall)	No assessment						
Megrim in Subarea VI (West of Scotland and Rockall)	Unknown	Unknown	Unknown	Not applicable	Unknown	Catches in 2007 should be no more than the recent (2002–2004) landings of about 2100 t. This includes landings in Division VIa and VIb and unallocated landings in Subarea IV.	**TAC < 2100 t**

Stock	State of the stock			ICES considerations in relation to single-stock exploitation boundaries			Upper limit corresponding to single-stock exploitation boundary - Tonnes or effort in 2007 and % reduction in F.
	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 high long-term yield**	**in relation to precautionary limits**	
Anglerfish in Division IIIa, Subarea IV, and Subarea VI	Unknown	Unknown	Unknown	Not applicable	Unknown	The effort in fisheries that catch anglerfish should not be allowed to increase and the fishery must be accompanied by mandatory programmes to collect catch and effort data.	**No increase in effort**
Norway pout West of Scotland	No assessment						
Sandeel in Division VIa	No assessment						
Nephrops in Division VIa (FUs11,12,13)	Unknown	Unknown	Unknown	Not applicable	Unknown	Effort should not be allowed to increase relative to the past three years. In addition the exploitation ratio in this stock should be no more than 15%. This corresponds to landings less than 3200 t for North Minch, 7200 t for the South Minch and 3800 t for the Firth of Clyde stock. Landings from other areas in Division VIa should be below the average of 2003–2005, corresponding to landings of 2100 t.	**No increase in effort and** **- for North Minch (FU11) TAC < 3200 t** **- for South Minch (FU12) TAC < 7200 t** **- for Firth of Clyde (FU13) TAC < 3800 t** **- for other VIa stocks TAC < 2100 t**
Herring West in Division Via North	Uncertain	Uncertain	Unknown	Not applicable	Unknown	Given that the perception of the stock is the same as last year, the 2006 TAC should be applicable in 2007 also.	**TAC < 34 000 t**

Table 5.3.4 (Cont'd)

Identification of critical stocks

The table above identifies the stocks outside precautionary reference points. Spurdog, cod in Division Via, and whiting in VIa are in a critical state. Stocks for which reduction in exploitation is required is haddock in Division Via.

The following stocks are the overriding concerns in the management advice of all demersal fisheries:

- for spurdog and cod in Division VIa ICES recommends a zero catch;
- for whiting in VIa ICES recommends the lowest possible catch;
- reduction in fishing mortality has been advised for haddock in Division VIa.

Advice on fisheries management

Demersal fisheries in Subarea VI should in 2006 be managed according to the following rules, which should be applied simultaneously:

They should fish:

- **without catch or discards of cod in Subarea VI;**
- **with the lowest possible catch for whiting in Via;**
- **without catch or discards of spurdog;**
- **without jeopardizing the recommended reduction in fishing mortality of haddock in Division Via;**
- **concerning deep water stocks fished in Subarea VI, see Volume 9;**
- **within the biological exploitation limits for all other stocks (see table above).**

Furthermore, unless ways can be found to harvest species caught in mixed fisheries within precautionary limits for all those species individually, then fishing should not be permitted.

Fisheries in the Irish Sea

The majority of vessels in the Irish Sea target *Nephrops* with either single- or twin-rig otter trawls. These vessels use either 70-mm diamond mesh with an 80-mm square mesh panel or an 80-mm diamond mesh in their codends, and (by regulation) their landings must consist of at least 35% *Nephrops* by live weight. These vessels have bycatches of whiting (most of which are discarded), and haddock, cod, and plaice. Twin-rig otter trawl were first introduced in the early 1990s. Recent studies show that the use of twin-rigs increases the proportion of roundfish bycatch in *Nephrops* fisheries compared with single-rig otter trawls. *Nephrops* catches are highly seasonal, with the highest *Nephrops* catches seen in the summer months. Catch rates are also dependent on tidal conditions, with higher catches during periods of weak tide.

The roundfish fisheries in the Irish Sea are conducted primarily by vessels from the UK and Ireland. A Northern Irish semi-pelagic trawling for cod and whiting developed in the early 1980s. As the availability of whiting declined this fleet switched to mainly targeting cod and haddock. Irish, Northern Irish, and English and Welsh otter trawlers target plaice, haddock, whiting, and cod, with smaller bycatches of anglerfish, hake, and sole. Some Irish vessels participate in a fishery for rays in the southern Irish Sea. Since 2001, these trawlers have adopted mesh sizes of 100–120 mm and other gear modifications, depending on the requirements of recent EU technical conservation regulations and national legislation.

There is also a beam trawl fishery which takes place mainly in the eastern Irish Sea with vessels from Belgium, Ireland, and the UK. This fishery mainly catches sole with important bycatches of plaice, rays, brill, turbot, anglerfish, and cod. The fishing effort of the Belgian beam-trawl fleet varies in response to the catch rates of sole in the Irish Sea relative to catch rates in other areas in which the fleet operates. Fishing effort peaked in the late 1980s following a series of strong year classes of sole, but is presently only about 60% of the peak value.

The other gears used to catch demersal species are gillnets and tangle nets, notably by inshore boats targeting cod, bass, grey mullet, sole, and plaice, and the bottom VHVO trawl targeting hake.

The main pelagic fishery in the Irish Sea is for herring. In recent years, it has been predominantly operated by one pair of trawlers from Northern Ireland. The size of this fleet has declined to a very low level in recent years.

There are also a number of inshore fisheries in the Irish Sea that target stocks not currently assessed by ICES. These include pot fisheries for crab, lobster, and whelk, hydraulic dredge fisheries for razor clams, and dredge fisheries for scallops.

Decommissioning at the end of 2003 permanently removed 19 out of 237 UK demersal vessels that operated in the Irish Sea, representing a loss of 8% of the fleet by number and 9.3% by tonnage. Of these vessels, 13 were vessels that had used demersal trawls with mesh size >=100 mm and had more than 5% cod in their reported landings. The previous round of decommissioning in 2001 removed 29 UK(NI) *Nephrops* and whitefish vessels and 4 UK(E&W) vessels registered in Irish Sea ports at the end of 2001. Of these, 13 were vessels that used demersal trawls with mesh size >=100 mm and had more than 5% cod in their reported landings.

The Irish fleet has also declined in numbers in recent years although there has been some modernisation particularly since 2000, whereby several large newer vessels joined the fleet. More recently there has also been an Irish decommissioning scheme, whereby around 40 fishing vessels (~6000 GT, 18 000 kW) have been permanently withdrawn from the Irish fishing fleet and removed from the Register of Sea Fishing Vessels in 2005 and 2006. Several of these vessels have a track record of fishing in VIIa.

Fishing effort in the semi-pelagic effort increased rapidly between the early 1980s and early 1990s before decreasing somewhat in the mid-1990s. Fishing effort in the England and Wales otter trawl vessels longer than 12 m declined rapidly after 1989, and from 1999 to 2004 was less than 25% of the effort reported in the 1980s. There has been a declining trend in fishing effort for Northern Irish otter trawlers also since the early 1990s. Fishing effort for Irish otter trawlers has declined in recent years as many vessels switched from targeting roundfish to *Nephrops*.

Recent fishing effort trends

Within the gear and mesh categories 4A (trawls, seines etc., $\geq$ 100 mm) and 4E (trawls, seines etc., 70- to 99-mm) gears in the Irish Sea, there is a range of fishing gears of a quite different design. Demersal trawls in the 4A category include a variety of single- and multiple-rig otter trawls used for gadoids, rays, and other demersal fish, and semi-pelagic (mid-water) trawls that have been used extensively in the deeper waters of the Irish Sea to target hake, whiting, cod, and haddock since the 1980s. Category 4E includes single-rig and multiple-rig *Nephrops* trawls, and whitefish trawls targeting species such as plaice and whiting where catch composition rules permit this mesh size. The change in mesh

size regulations in 2000, requiring the use of 100-mm mesh for vessels targeting species such as cod, resulted in a change in the distribution of effort between mesh bands.

The nominal effort trends in kW-days for VIIa given by STECF-SGRST and updated by ICES are given in Table 5.3.2. The data are split by more gear-types in Table 5.3.2 than were given by STECF. In the case of UK vessels, the figures for the gear types sum to the aggregated STECF figures for 2000–2004. Figures for Belgium have been revised slightly. Major revisions were supplied by Ireland. Specifically, effort data by mesh band for Ireland were not available for 2000–2002, and the figures given by STECF for these years may not be accurate or complete.

The majority of nominal effort is in the gear grouping for otter trawls with mesh sizes between 70 and 99 mm. Most of the effort in this mesh band is attributable to *Nephrops* trawlers, but it also includes vessels targeting plaice, whiting or other species where the catch-composition rules permit 70- to 99-mm trawls. These are included in the "whitefish otter trawl" category, although the distinction between *Nephrops* trawls and whitefish trawls using 70- to 99-mm mesh is blurred because many vessels use gears optimised to catch *Nephrops* with a whitefish bycatch. The more restricted days-at-sea allowances for 4A (100 mm+) otter trawls has resulted in some vessels returning to 70- to 99-mm trawls to obtain more days per month. A number of UK(NI) vessels switch between semi-pelagic trawls and twin-rig *Nephrops* trawls according to fishing opportunities, including access to the cod spawning closure where there is a derogation for *Nephrops* vessels. The effort of the two series tends to vary in opposite directions.

The fishing effort for UK 4A gear types has declined in the last few years in VIIa. Specifically, fishing effort of mid-water whitefish trawlers has declined by 50% between 2003 and 2005, and effort of Irish otter trawlers (100 mm+) has declined by over 80% in the same period (Figure. 5.3.1). Single-rig *Nephrops* effort has declined by 33% since 2001. The combined effort of towed gears and static gears (gillnets and longlines) has declined by 33% since 2001 (Figure 5.3.2).

Taking Irish and Belgian fleets into account, an almost threefold decline international effort of 100 mm+ demersal trawls is evident between 2003 and 2005, whilst otter trawls in the 70- to 99-mm mesh band have slightly increased their effort over this period (Figure 5.3.3). Beam trawl effort declined slightly between 2000 and 2002, and gillnet effort has halved over these three years.

Although the trends in kW-days are indicative of recent trends in fleet activities in recent years, the relationship with fishing mortality will be affected by changes in the amount of fishing per day at sea, technological improvements, and changes in species targeting and fishing practices resulting from management restrictions and changing fish availability. An analysis of catchability (F generated per unit of effort) will require more highly resolved data, (both spatially and temporally), accurate catch and effort data for suitably disaggregated fleet/gear combinations, and sufficiently accurate assessment estimates of F. Recent trends in F are very poorly determined for most of the stocks assessed by WGNSDS. However, very large apparent changes in mortality (e.g. the large decline in estimates of F in VIa haddock, mirroring a similar large decline in F estimates for North Sea haddock stock in recent years), should be reflected in recent trends in kW-days in fleets targeting the species.

Fisheries interactions in the Irish Sea

Demersal fisheries in the area are mixed fisheries, with many stocks exploited together in various combinations in different fisheries. In these cases management advice must consider both the state of individual stocks and their simultaneous exploitation in demersal fisheries. Stocks in the poorest condition, particularly the critical stocks, necessarily become the overriding concern for the management of mixed fisheries where these stocks are exploited either as a targeted species or as a bycatch.

Four main fishery units can be described in the Irish Sea: these are *Nephrops* otter trawlers, roundfish otter trawlers, semi-pelagic trawlers, and beam trawlers. As trends in stocks of various species are generally not in synchrony, advice provided on the basis of the status of individual species may result in advised fishing mortalities for a group of co-harvested species that cannot be realized simultaneously within the context of mixed fisheries. Stocks in need of special conservation efforts, such as those affected by recovery plans, present particularly difficult challenges. For instance, the reduction of fishing mortality (and effort) required for cod makes it very unlikely that TACs, which would be sustainable for healthier stocks in the mixed fisheries could be taken. The needs of the stock(s) under recovery plans could be met most directly by simply setting the TACs for all species in mixed fisheries to correspond to the fishing mortality intended for the species under recovery plans, which would result in large foregone yields in many healthier stocks. The foregone yield could be reduced somewhat if effort could be adjusted on a fleet-by-fleet basis to comply with the total fishing mortality in the proposed recovery plan, while allowing as much harvesting of other species as possible. However, such an approach requires reliable information on the catch-at-age for all species in all fisheries, and is still likely to leave substantial potential harvestable biomass of several species unavailable to any fishery.

Possibly the strongest mixed fishery interaction in the Irish Sea is between the *Nephrops* fishery and the whiting stock. Discard estimates for fleets targeting *Nephrops* are incomplete and considered imprecise, but demonstrate that the selectivity of *Nephrops* trawls for whiting remains relatively poor despite the obligatory use of square mesh panels for vessels targeting *Nephrops* with a 70-mm codend mesh since 1994. ICES points out that in addition to effort restrictions, further technical measures (e.g. increased codend and square mesh panel mesh sizes, separator panels, and fixed grids) should be investigated and this may substantially reduce bycatch and discarding of whiting in this *Nephrops* fishery.

The cod fishery was traditionally carried out by otter trawlers targeting spawning cod in spring and juvenile cod in autumn and winter. Activities of these vessels have decreased, whilst a fishery for cod and haddock using large pelagic trawls increased substantially during the 1990s. Cod are also taken as a bycatch in the *Nephrops*-directed fishery Although discard estimates for cod in the Irish Sea are not available discard rates are not thought to be substantial. However, misreporting and underreporting of cod is thought to occur in some VIIa fisheries. Estimates of misreporting for some nations are included in the assessment, but the scientific advice for zero catch of the cod stock requires that the practice be terminated.

The extent to which the stocks are taken in the same fisheries cannot be quantified on basis of the available data. The existing information suggests that the stocks are caught together to a high (H), medium (M), low (L) extent, or not at all (0), as indicated in the table below. The information in the table relates to catches and the linkage is thus indicated as high also in cases where the catches of most of one stock taken in a fishery with another stock is discarded.

Table 5.3.5 Fishing effort of national fleets by gear type and mesh band, in kW-days. Includes revisions to STECF-SGRST data for Ireland and Belgium in Table 5.3.1. UK data for different gear types in 2000–2004 sum to the aggregated figures in Table 5.3.1.

			1998	1999	2000	2001	2002	2003	2004	2005
Beam trawl	Beam>=80	BEL	n/a	n/a	982855	1484122	1759801	1541794	1140300	1251345
Beam trawl	Beam>=80	UK	283705	276217	127813	216216	138473	213234	110839	165015
Beam trawl	Beam (all meshes)	IRL	n/a	n/a	n/a	n/a	n/a	917379	661852	602439
Beam trawl	Beam>=80	NED	n/a	n/a	181060		1895			n/a
Dem Trawl >=100	whitefish otter trawls>=100	UK	239935	103007	251045	419976	366994	428708	177883	100117
Dem Trawl >=100	twin trawls >=100	UK	1265	34147	4065	5480	22323	77098	40091	5183
Dem Trawl >=100	seine nets >=100	UK	32108	24597	161552	97435	60073	126488	67594	27984
Dem Trawl >=100	Nephrops otter>=100	UK	0	0	0	0	1788	209	0	288
Dem Trawl >=100	otter trawl >=100	IRL	n/a	n/a	n/a	n/a	n/a	448335	161981	76845
Dem Trawl >=100	semi-pelagic >=100	UK	2952	885	1171304	1395746	1625759	1757119	1050681	827758
Dem Trawl	semi-pelagic 70-99	UK	1520802	1842037	81331	13621	5398	0	12983	0
Dem Trawl 70-99	whitefish otter 70-99	UK	922300	830738	627184	564833	382865	408090	684043	582907
Dem Trawl 70-99	twin otter 70-99	UK	0	0	6197	0	0	9204	78411	32922
Dem Trawl 70-99	Nephrops single 70-99	UK	2545381	2494306	2342478	2522752	1960901	2143790	1722762	1682888
Dem Trawl 70-99	Twin Nephrops 70-99	UK	859307	926249	1308012	1140422	830739	1064004	1052313	1226483
Dem Trawl 70-99	Seine nets 70-99	UK	41158	120545	18175	777	333	666	222	0
Dem Trawl 70-99	Nephrops trawl 70-99	IRL	n/a	n/a	n/a	n/a	n/a	1274785	1445775	1628742
Trawls unspecified	Trawls excl beam	IRL	n/a	n/a	n/a	n/a	n/a	27451	128981	615
Trawls unspecified	Trawls excl beam	BEL				4416			8107	17800
longlines	longlines	UK	147137	205998	163686	164490	83240	33340	23814	31605
static gears	gillnets	UK	25128	23128	23990	15157	16766	14873	12547	10012
static gears	gillnets	IRL	n/a	n/a	n/a	n/a	n/a	139841	82951	50841
static gears	static gears	NED	n/a	n/a						
Other gears	Other gears	BEL	n/a	n/a						5621
Other gears	Other gears	UK	186669	148658	71239	170880	158810	163603	72997	98954
Other gears	Other gears	NED	n/a	n/a	12485					
Other gears	Pelagic	IRL	n/a	n/a	n/a	n/a	n/a	447582	426370	217550

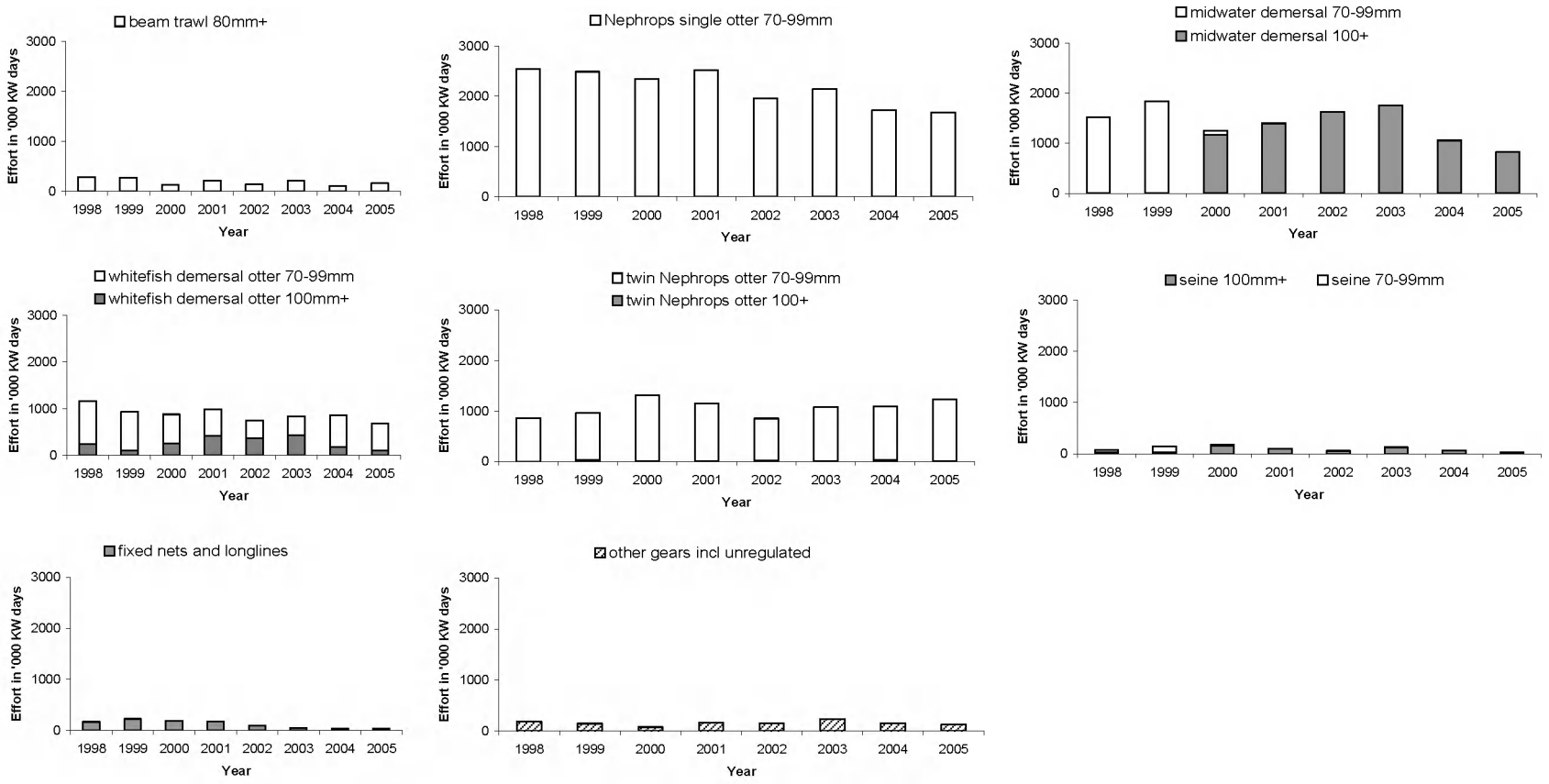


Figure 5.3.3 Trends in UK fishing effort (kW-days) for different gear types and mesh bands, from 1998–2005 in the Irish Sea.

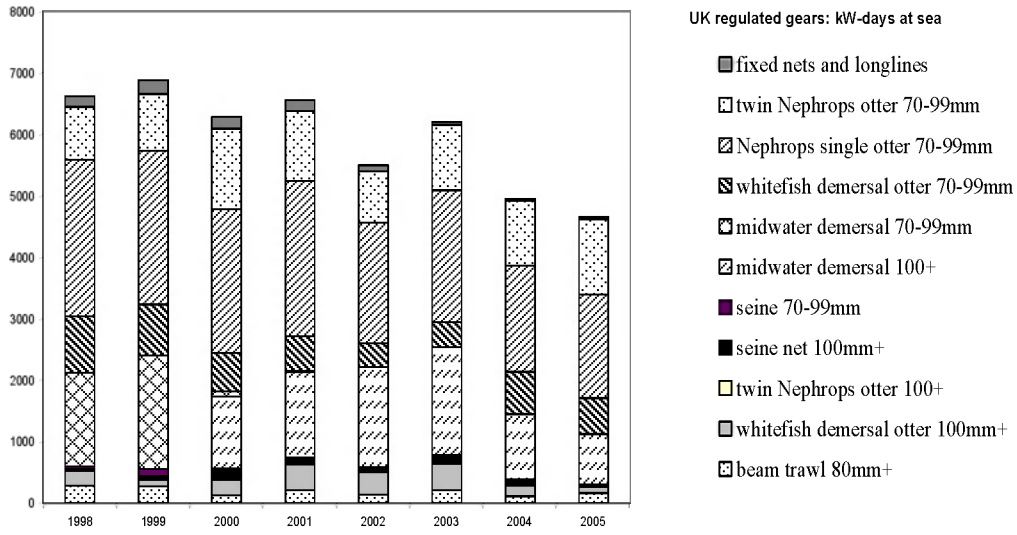


Figure 5.3.4 Trends in fishing effort (kW-days) for UK regulated gears, 1998–2005, in the Irish Sea.

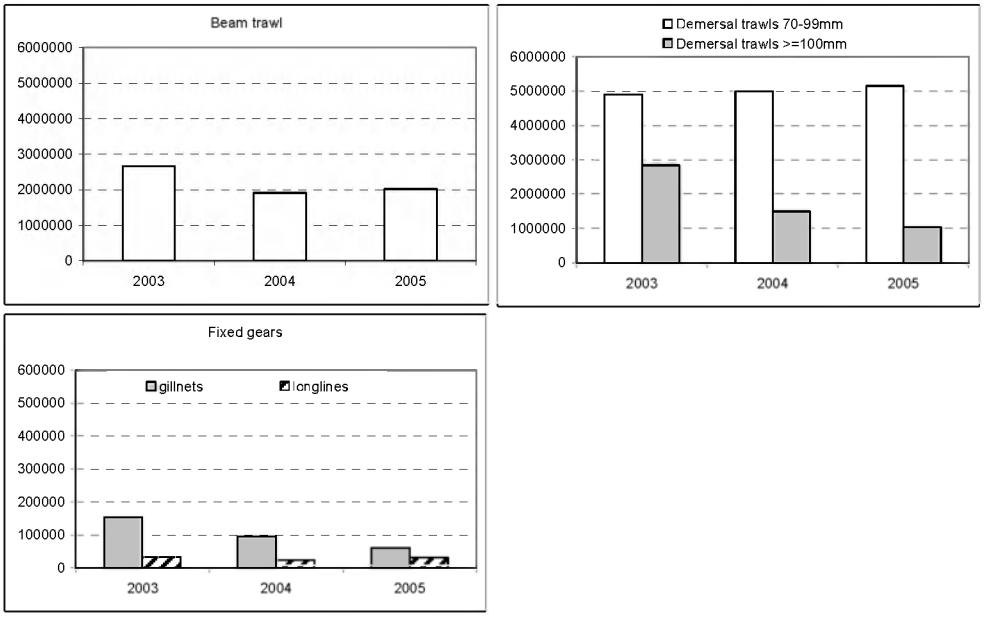


Figure 5.3.5 Trends in international fishing effort (kW-days) for different gear types and mesh bands, from 2003 to 2005, for UK, Ireland, Belgium, and the Netherlands. No data from France were provided in the Irish Sea.

Table 5.3.6 Technical interactions in the Irish Sea

Technical Interactions Matrix	Cod in Division VIIa	Haddock VIIa	*Nephrops* FU 15 & FU 14	Plaice VIIa	Sole VIIa	Whiting VIIa	Rays VIIa	Herring VIIaN	Scallops	Whelks	Razor Fish
Cod in Division VIIa		H	M	M	M	M	L	0	0	0	0
Haddock VIIa	White fish trawl, Semi-pelagic trawl, Seine-net		M	M	L	M	L	0	0	0	0
Nephrops FU 15 & FU 14	*Nephrops* trawl fishery	*Nephrops* trawl fishery		M	L	H	L	0	0	0	0
Plaice VIIa	Flat fish beam trawl, *Nephrops* trawl	*Nephrops* trawl	*Nephrops* trawl		H	L	M	0	0	0	0
Sole VIIa	Flat fish beam trawl, Nephrops trawl	Flat fish beam trawl	*Nephrops* trawl	Flat fish beam trawl		L	M	0	0	0	0
Whiting VIIa	Semi-pelagic trawl, *Nephrops* trawl, White fish trawl	White fish trawl, Semi-pelagic trawl, Seine-net	*Nephrops* trawl	*Nephrops* trawl	Beam trawl		L	0	0	0	0
Rays VIIa	Ray otter and beam trawl fishery	Ray otter and beam trawl fishery	*Nephrops* trawl	Beam trawl	Beam trawl	Ray otter and beam trawl fishery		0	0	0	0
Herring VIIaN	None	None	None	None	None	None	None		0	0	0
Scallops	None	None	None	None	None	None	None	None		0	0
Whelks	None	None	None	None	None	None	None	None	None		0
Razor Fish	None	None	None	None	None	None	None	None	None	None	

Table 5.3.7 Single-stock exploitation boundaries (Irish Sea)

The state and the limits to exploitation of the individual stocks are presented in the stock sections. The state of stocks and single-stock exploitation boundaries are summarised in the table below.

Stock	State of the stock			ICES considerations in relation to single-stock exploitation boundaries			Upper limit corresponding to single-stock exploitation boundary - Tonnes or effort in 2007 and % reduction in F.
	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 high long-term yield	In relation to precautionary limits	
Cod in Division VIIa	Reduced reproductive capacity	Harvested unsustainably	Overexploited	ICES is not in a position to give quantitative forecasts	F is above $F_{0.1}$–F_{max}	It is not possible to identify any non-zero catch which would be compatible with the precautionary approach.	**Zero TAC**
Haddock VIIa	Undefined	Unknown	Overexploited	Not applicable	F is above $F_{0.1}$–F_{max}	Fishing at F_{pa} requires a substantial reduction in effort and catches but ICES cannot quantify the reduction.	**Substantial reduction in F**
Nephrops FU 15 & FU 14	Unknown	Unknown	Unknown	Not applicable	Unknown	Effort in this fishery should not be allowed to increase from 2003–2005 levels.	**No increase in effort**
Whiting in Division VIIa	Unknown	Unknown	Unknown	Not applicable	Unknown	Catches of whiting in 2007 should be the lowest possible.	**Zero TAC**
Plaice VIIa	Intact reproductive capacity	Harvested sustainably	Harvested sustainably	Not applicable	F is below F_{max} and close to $F_{0.1}$	Fishing mortality should be kept below F_{pa} (0.45). This corresponds to catches of less than 6500 t in 2007.	**TAC < 6500 t**
Sole VIIa	Reduced Reproductive Capacity	Overexploited	Overexploited	Not applicable	F is above $F_{0.1}$–F_{max}	It is not possible to identify any non-zero catch compatible with the precautionary approach; or a Recovery Plan.	**Zero TAC or Recovery Plan**
Herring VIIa	Uncertain	Uncertain	Unknown	Not applicable	Unknown	The TAC of 4800 t which has been implemented in recent years is not expected to be detrimental to the stock.	**TAC < 4800 t**

Identification of critical stocks

The table above identifies the stocks outside precautionary reference points. The critical stocks are spurdog, cod, whiting, and sole. For haddock a reduction in exploitation is required.

These stocks are the overriding concerns in the management advice for all fisheries where the interactions between stocks taken in the same fisheries should be considered:

- for cod the advice is for zero catch;
- for spurdog the advice is for zero catch;
- for sole the advice is a zero catch or recovery plan that ensures safe and rapid rebuilding of SSB to levels above $\mathbf{B}_{pa}$;
- for whiting the advice is to reduce catch to the lowest possible levels;
- for haddock a reduction in exploitation is required.

Advice on fisheries management

Fisheries in the Irish Sea should in 2006 be managed according to the following rules, which should be applied simultaneously:

They should fish:

- **without bycatch or discards of cod, sole, and spurdog, and with minimal catch of whiting;**
- **without jeopardizing the recommended reduction in fishing mortality of haddock;**
- **within the biological exploitation limits for all other stocks (see text table above).**

Furthermore, unless ways can be found to harvest species caught in mixed fisheries within precautionary limits for all those species individually, then fishing should not be permitted.

5.3.3 Special requests

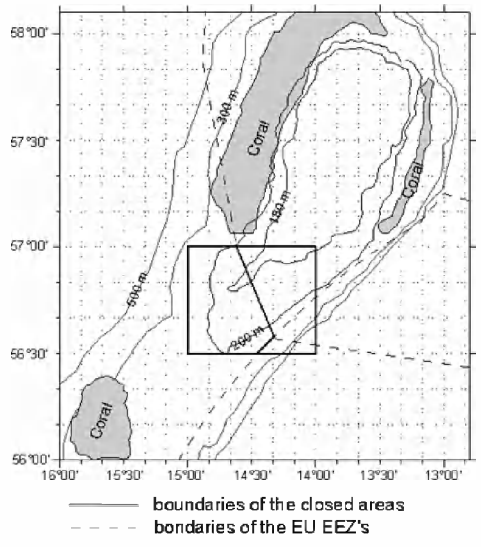
5.3.3.1 NEAFC Special Request on Rockall box

Request

The NEAFC Commission requests ICES to provide information on the effect of the Rockall Box in protecting juvenile haddock and possible revisions of the boundary of the Box.

Background

The Rockall box is one ICES rectangle and is partly in the NEAFC area and partly in the EU waters. The NEAFC closed area was effective from 2001 and the closed area in the EU waters came into effect in 2002. The objective of the Rockall box was to protect juvenile haddock and to improve the selection pattern.



Introduction

ICES dealt with the Rockall haddock box in 2001 (ICES 2002) and in 2002 (ICES 2003). In 2001 ICES reported on the spatial and seasonal patterns in fishing activity and in the haddock stock and carried out analysis of short and medium-term effects of changes in mesh size on haddock catches and SSB but did not make any specific conclusions on seasonal or area closures (ICES 2001, section 3.7.3.c, p. 361-398). In 2002 ICES specifically considered the newly introduced area closure for Rockall haddock but concluded that *"[it] is too early to quantify the effect this closure has had on the haddock stock. It is difficult to predict actual fishing mortality as fleet behaviour will depend on fishing opportunities elsewhere."* (ICES 2000, section 3.7.3.c, p. 358)

ICES' response

Apart from the comparison in relative fishing mortality and the trends in UK fishing effort, there is no additional data to evaluate the effects of the Rockall box. With this limited information, ICES has not been able to quantify the effects of the closed area. ICES' previous advice remains unchanged but the need for access to future data has been highlighted. For details see the Annex below.

Annex to the ICES' response

ICES has attempted to evaluate the effect of the Rockall Box and possible revision of the boundary of the Box. The Rockall box is a relatively small area where very detailed data will be needed to evaluate the effects of the closure of the box.

There is some survey information available from Scottish and Russian surveys but they do not cover the full period before and after the closure of the Rockall box.

Preliminary analysis suggests that the exploitation pattern has changed since the Rockall Box has been in force. Relative exploitation rate has decreased on age groups 1 and 2 (Figure 5.3.3.1.1) in the period after the closure compared to the period before the closure. However, discarding practices vary greatly between EU and international fleets and the poor estimation of discards means that estimates of fishing mortality at the younger age groups are very uncertain.

A detailed analysis of the UK effort data for all gears (except long-lines) shows that there has been a decline in UK effort across the Rockall Bank as a whole but an increase across the remaining VIb rectangles (figure 5.3.3.1.2). It is unknown what proportion of effort was applied directly to the haddock fishery.

Preliminary data from satellite tracking of all fishing vessels >24m in length over the northern Rockall Bank for 2002 are presented in figure 5.3.3.1.3 (Marrs and Hall-Spencer 2002; J. Hall-Spencer, unpublished, ICES 2005 vol 10, pp. 21-26). The VMS data show where the fishing vessels have been. The data do not show what types of gear were used by those vessels and does not discriminate between fishing and steaming.

In August 2006, NEAFC made the VMS data 2002-2005 available to ICES so that ICES could address the request on deepwater fisheries and deepwater corals. In section 1.5.4.1 ICES already concluded that the 2002 data could not be used because there was no gear information supplied and that the 2003 – 2005 could only be partially used because the majority of the records had no gear information. It was thus unclear what fishing gear was used in about half of the observations. From the records that were presented as OTB (Otter trawling), ICES was able to develop maps of effort allocation over the NEAFC area which were separated into fishing and steaming. This information could be used to plot effort distributions on the Rockall closed area. However, given the deficiencies noted above and the fact that the information was not available when the relevant expert group met, ICES has not generated these maps.

ICES did not have access to VMS data for the European waters.

Apart from the comparison in relative fishing mortality and the trends in UK fishing effort, there is no additional data to evaluate the effects of the Rockall box. With this limited information, ICES has not been able to evaluate the effects of the closed area.

In order to be able to evaluate the closed area in the future, ICES would need to have access to the following sets of information:

- VMS data for the NEAFC and EU area, preferably for as long time period as possible. These data should include the gear characteristics of the vessels.
- Logbook data for the same vessels and period, in order to be able to analyse the target species
- Survey data with catch rates by age group from before and during the closed period

Sources of information

ICES (2002). Report of the ICES advisory committee on fishery management 2001, ICES. Cooperative Research Report no. 246.
ICES (2003). Report of the ICES advisory committee on fishery management 2002, ICES. Cooperative Research Report no. 255.
ICES (2005). Report of the ICES Advisory Committee on fishery management, Advisory Committee on the Marine Environment and Advisory Committee on Ecosystems, 2005, ICES. December 2005.
ICES (2006). Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks. ICES C.M. 2006 / ACFM: 30.
Marrs, S. and Hall-Spencer, J. M. 2002. UK coral reefs. Ecologist, 32(4): 36-37.

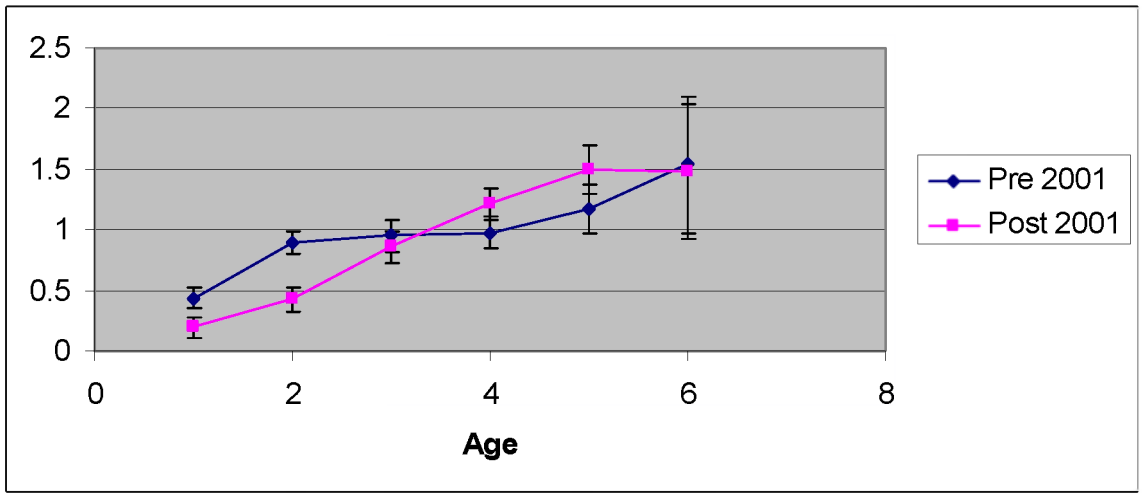


Figure 5.3.3.1.1 Rockall haddock. Exploitation pattern before and after (including) 2001. The bars indicate error bounds.

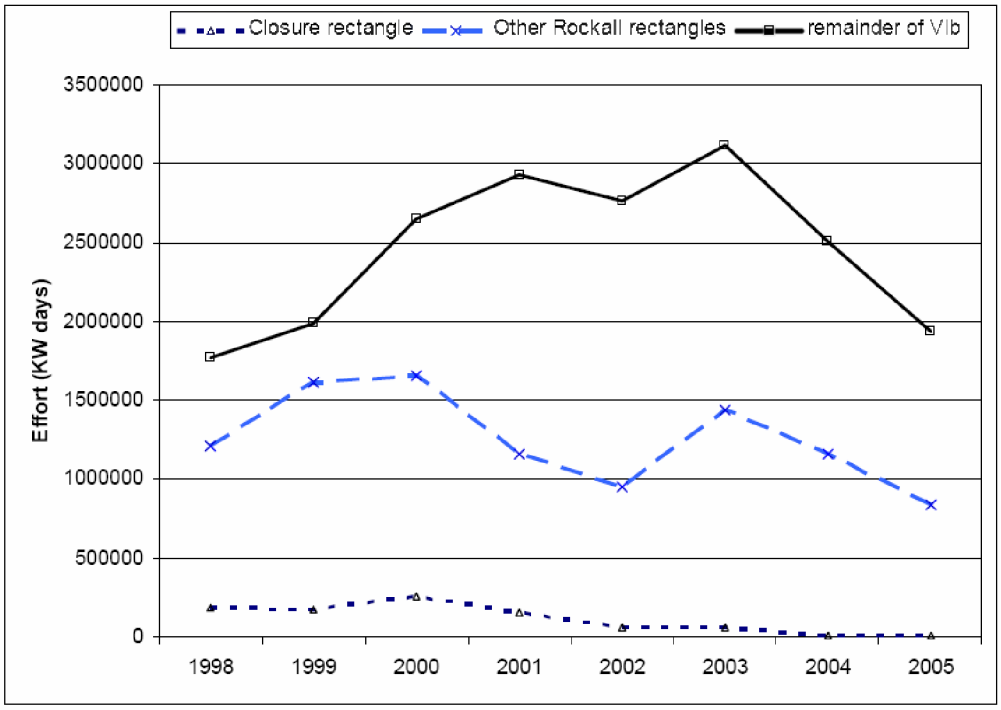


Figure 5.3.3.1.2 UK effort (KW days) for all gears except long lines. Separate lines show three subsets of the UK VIb data as follows i) the statistical rectangle (42D5) in which the closure area is located; ii) other statistical rectangles (43-44, D5-D6) covering the remainder of the shallow Rockall bank area and iii) the remainder of statistical rectangles in VIb.

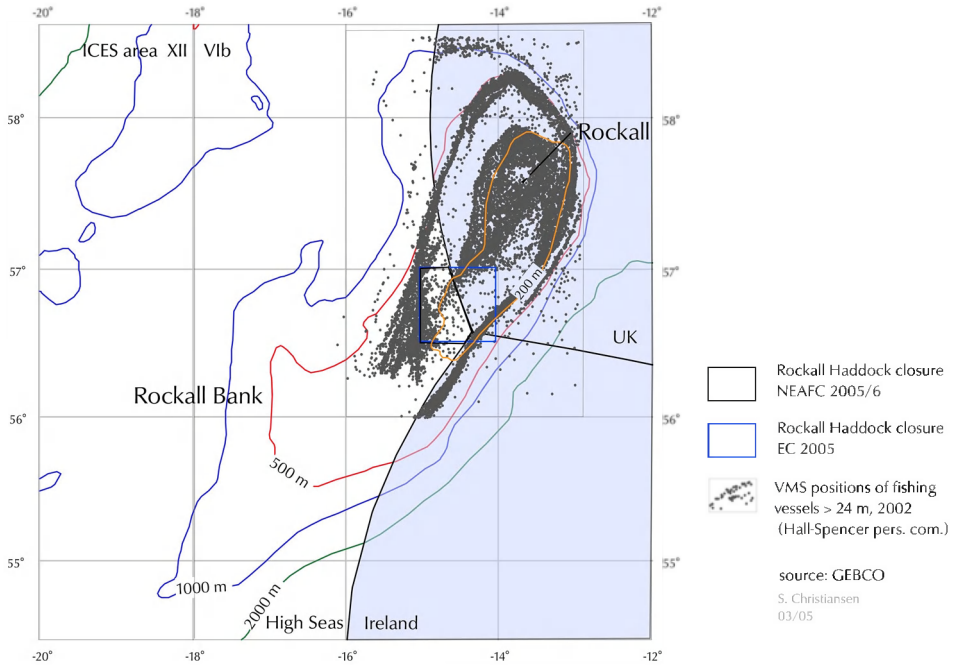


Figure 5.3.3.1.3 VMS data showing fishing vessel positions (all types of fishing vessels of all nationalities >24 m in length) every 2 hours in 2002 in the northern Rockall Bank area. Source: Marrs and Hall Spencer 2002, ICES 2005)

5.4 Stock Summaries (Celtic Sea and West of Scotland)

5.4.1 Cod in Division VIIa (Irish Sea)

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
Reduced reproductive capacity	Harvested unsustainably	Overexploited	Not defined	

Based on the most recent estimates of SSB and fishing mortality, ICES classifies the stock as having reduced reproductive capacity and as being harvested unsustainably. Fishing mortality had been around $\mathbf{F}_{pa}$ until the mid-1980s. It has increased close to or above $\mathbf{F}_{lim}$ since the late 1980s. SSB has been below $\mathbf{B}_{lim}$ since the mid-1990s. Recruitment has been below average for the past sixteen years, and the four most recent year classes are amongst the smallest on record. At the average rate of exploitation estimated for recent years, SSB will remain at sizes where the risk of continued poor recruitment is high.

Management objectives

The European Commission has enacted a Council Regulation ((EC) No. 423/2004) which establishes measures for the recovery of cod stocks.

For stocks above $\boldsymbol{B}_{lim}$, the harvest control rule (HCR) requires:

1. *setting a TAC that achieves a 30% increase in the SSB from one year to the next,*
2. *limiting annual changes in TAC to ± 15% (except in the first year of application), and,*
3. *a rate of fishing mortality that does not exceed $\boldsymbol{F}_{pa}$.*

For stocks below $\boldsymbol{B}_{lim}$ the Regulation specifies that:

4. *conditions 1-3 will apply when they are expected to result in an increase in SSB above $\boldsymbol{B}_{lim}$ in the year of application,*
5. *a TAC will be set lower than that calculated under conditions 1-3 when the application of conditions 1-3 is not expected to result in an increase in SSB above $\boldsymbol{B}_{lim}$ in the year of application.*

ICES has previously concluded that a precautionary recovery plan must include an adaptive element implying that fisheries for cod remain closed until an initial recovery of the cod SSB has been proven. Such an element of zero catch is not included in the existing plan. ICES therefore considers the recovery plan not to be consistent with the precautionary approach.

Reference points

	ICES considers that:	ICES proposed that:
Limit reference points	$\mathbf{B}_{lim}$ is 6 000 t.	$\mathbf{B}_{pa}$ be set at 10 000 t.
	$\mathbf{F}_{lim}$ is 1.0.	$\mathbf{F}_{pa}$ be set at 0.72.
Target reference points		$\mathbf{F}_{y}$ not defined.

Yield and spawning biomass per Recruit (from 2004 Assessment)
F-reference points

Fish Mort Yield/R SSB/R

	Fish Mort Ages 2–6	Yield/R	SSB/R
Average age 2–4 (2002–2004)	1.03	1.677	1.869
$\mathbf{F}_{max}$	0.31	2.153	7.999
$\mathbf{F}_{0.1}$	0.18	2.009	12.746

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:

$\mathbf{B}_{lim}$: $\mathbf{B}_{loss}$	$\mathbf{B}_{pa}$: This is the previously agreed MBAL with signs of reduced recruitment. It affords a high probability of maintaining the SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty of assessments. Below this value the probability of below-average recruitment increases.
$\mathbf{F}_{lim}$: $\mathbf{F}_{med}$	$\mathbf{F}_{pa}$: $\mathbf{F}_{med}$* 0.72. This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$. Fishing mortalities above $\mathbf{F}_{pa}$ have been associated with the observed stock decline.

Single-stock exploitation boundaries

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

Fishing mortalities between $F_{0.1}$ and F_{max} can be considered as candidate target reference points, which are consistent with taking high long-term yields and achieving a low risk of depleting the productive potential. The present fishing mortality is well above the candidate reference point.

Exploitation boundaries in relation to existing management plans

The most plausible forecast assumes a total removal in 2006 that is 55% greater than the agreed TAC. The forecast indicates that a zero catch in 2007 provides only 30% probability of rebuilding SSB to Blim in 2008. The simulations indicate that a 30% increase in SSB during 2007 could be achieved with a reduction in fishing mortality to below 75% of the 2005 level.

Exploitation boundaries in relation to precautionary limits

Given the low stock size, recent poor recruitment, continued substantial catch well above the TAC, the uncertainty in the assessment, and the inability to reliably forecast catch, it is not possible to identify any non-zero catch which would be compatible to the precautionary approach.

Conclusion on exploitation boundaries

Because the existing recovery plan does not include the elements or measures necessary for rebuilding the stock at the current SSB (well below B_{lim}), ICES continues to advise on exploitation boundaries in relation to precautionary limits and recommends that the fisheries for cod be closed until an initial recovery of the cod SSB has been proven. Any catches that are taken in 2007 will prolong the recovery to B_{pa}.

Management considerations

Various emergency measures have been introduced for cod since 2000, effort control has been in place since 2003, and there have been various decommissioning schemes. These may translate into some reductions in fishing mortality of cod, but the current assessment does not provide sufficiently robust estimates of fishing to allow the possible reductions to be determined. It is clear that fishing mortality remains extremely high in this stock, and very few cod survive to age 4 in this stock. This is because:

- There are strong indications that the TAC management control is not effective in limiting the catch as landings are underreported;
- The effort reductions have not been sufficient although considerable effort reductions have been observed in some fleets (particularly vessels using >100-mm mesh);
- Cod is taken in mixed demersal fisheries (particularly haddock, sole, and *Nephrops*). Unless these fisheries can demonstrate zero bycatches of cod the effort in these fisheries also needs to be reduced substantially;
- Time and area closures have not been sufficient to lead to rebuilding of this stock.

Reducing fishing mortality to close to zero is required if the cod stock is to reach a level where it can regain historic productivity.

A resumption of sampling took place in 2005 at ports inaccessible for port sampling in 2003 and with only limited access in 2004. However, there will continue to be large uncertainties in the stock status and further deterioration in the ability to provide advice unless catches are accurately recorded.

Management plan evaluations

The management plan was evaluated and recovery to levels above $\mathbf{B}_{pa}$ is expected to occur by about 2011. The result of the evaluation depends on a large number of assumptions, most importantly that fishing mortality can be reduced to zero in 2007 to allow the stock to increase above $\mathbf{B}_{lim}$.

However, there are reports of significant non-reported landings, and as a consequence the current TAC system is not able to regulate fishing mortality. Unless recovery measures are effective in restricting the fishery they cannot be considered precautionary. The management plan was tested with an implementation error of less than 25% (which means no implementation error for F = 0), but a larger and more realistic implementation error has not been investigated.

The plan depends primarily on annual estimates of SSB in relation to $\mathbf{B}_{pa}$ but also on estimates of fishing mortality relative to $\mathbf{F}_{pa}$. While SSB appears to be estimated well by this assessment, the level of fishing mortality is less well known and aspects of the management plan relating to maximum fishing mortality levels may be difficult to implement.

Factors affecting the fisheries and the stock

The effects of regulations

The fishery is managed by TACs that do not restrict landings.

Several regulations have been introduced in the Irish Sea in recent years. These regulations and their impact on the fisheries have been discussed in detail in the overview. To rebuild the SSB, a closure was introduced in 2000 for ten weeks from mid-February (EU Regulations 304/2000 and 2549/2000). This closure was intended to maximize the reproductive output of the stock. The measures were revised in 2001, 2002, and 2003, involving a continued, but smaller spawning-ground closure, coupled with changes in net design to improve selectivity. Various derogations were introduced for gears not targeting cod.

These recovery measures have since been complemented by a system of fishing effort limitation. This is done by adjustment of the number of fishing days allowed for various vessel categories deploying gears with various mesh sizes. The introduction of effort regulation has effectively encouraged vessel operators to reduce mesh size and shift to other fisheries, particularly *Nephrops* trawling, in order to gain more days at sea.

It is not possible to evaluate whether the mesh size changes and effort limitations may have benefited cod without information on the level of adherence to catch composition regulations required when using smaller mesh sizes. Trends in nominal effort in this area are presented in section 17 of the 2006 WG report. STECF (2005) indicate an overall decrease in effort of 19% between 2000 and 2004.

The continued decline in the stock indicates that these measures alone have not proven sufficient to rebuild the stock to precautionary levels. Detailed analysis of the impact of the regulations will not be possible until data of sufficient quality become available.

Scientific basis

Data and methods

The assessment model is based on a catch-at-age analysis of reported landings, calibrated with several series of survey indices. In addition, the model estimates missing removals as a bias in landings, assuming that they have the same age composition as reported landings.

The assessment is indicative of stock trends, but cannot be used for precise forecasts.

Recent discard estimates available for some fleets indicate a variable, but very high discard rate of ages 0 and 1. These estimates are not used in the assessment due to the short time-series available.

Information from the fishing industry

The UK Fisheries Science Partnership (FSP) survey of the western Irish Sea cod spawning grounds in spring 2004–2006, carried out using a commercial pelagic trawler, indicated similar abundance and age structure of adult cod in both years, although catch rates were generally poor on the spawning grounds. The equivalent FSP survey of the eastern Irish Sea in spring 2005 and 2006 indicated low catch rates of 3-year-old and older cod.

Uncertainties in assessment and forecast

The present stock estimates are highly uncertain. The quality of the commercial landings and catch-at-age data for this stock deteriorated in the 1990s following reductions in the TAC without associated control of fishing effort. Limited access to some ports in recent years has also resulted in reduced sampling coverage for estimating length and age compositions.

ICES previously attempted to overcome this problem by incorporating sample-based estimates of landings from three major ports in the WG landings figures from 1991 onwards. The sources of this information became more limited in 2003 and 2004. The large TAC reduction for cod from 2000 onwards, with only the spring cod closure as a means of restricting effort until days-at-sea restrictions came into force, may have caused more widespread problems with misreporting or over-quota discarding. Hence ICES considers the international landings figures from 2000 onwards to have potentially large inaccuracies that could lead to retrospective bias and other problems with an analytical assessment.

Comparison with previous assessment and advice

Traditionally, ICES has included estimates of misreported landings within the unallocated landings figures reported for this stock. These unallocated landings have made adjustments to nominal landings figures, correcting either for misreporting or for differences between official statistics and data obtained by national scientists. As the misreporting estimates are for one country only, and there is evidence that the practice is more widespread, ICES is no longer able to provide catch estimates that are partially corrected for misreporting for the recent years 2003 and 2004. This is the reason for the change in assessment model, used since last year.

The overall trends in biomass and recruitment appear well-estimated and the perception of the stock from this year's assessment does not differ qualitatively from that obtained last year. The basis of the advice this year is the same as last year.

Sources of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 9–18 May 2006 (ICES CM 2006/ACFM:30).

Report of the STECF for 2005. Evaluation of the Irish Sea Cod recovery plan.

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. To advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	Official landings	ACFM Landings
1987	No increase in F; interaction with *Nephrops*		10.3		15.0	13.2	12.9
1988	No increase in F; interaction with *Nephrops*		10.1		15.0	15.8	14.2
1989	No increase in F		13.4		15.0	11.3[1]	12.8
1990	F at $\mathbf{F}_{med}$; TAC		15.3		15.3	9.9[1]	7.4
1991	Stop SSB decline; TAC		6.0		10.0	7.0[1]	7.1[2]
1992	20% of F(90) ~ 10 000 t		10.0		10.0	7.4	7.7[2]
1993	$\mathbf{F}_{med}$ ~ 10 200 t		10.2		11.0	5.9	7.6[2]
1994	60% reduction in F		3.7		6.2	4.5	5.4[2]
1995	50% reduction in F		3.9		5.8	4.5	4.6[2]
1996	30% reduction in F		5.4		6.2	5.30	4.96[2]
1997	30% reduction in F		5.9		6.2	4.44	5.86[2]
1998	No increase in F		6.2		7.1	4.96	5.31[2]
1999	Reduce F below $\mathbf{F}_{pa}$		4.9		5.5	2.96	4.78[2]
2000	Lowest possible F		0		2.1	1.42	2.18[2]
2001	Lowest possible F		0		2.1	2.03	3.60[2]
2002	Establish recovery plan		-		3.2	2.7	4.42[2]
2003	Closure of all fisheries for cod		-		1.95	1.5	n/a
2004		Zero catch		0	2.15	1.1	n/a
2005		Zero catch		0	2.15	n/a	
2006		Zero catch		0			
2007		Zero catch					

Weights in '000 t.
[1]Preliminary.
[2]Incomplete data.
n/a = not available.

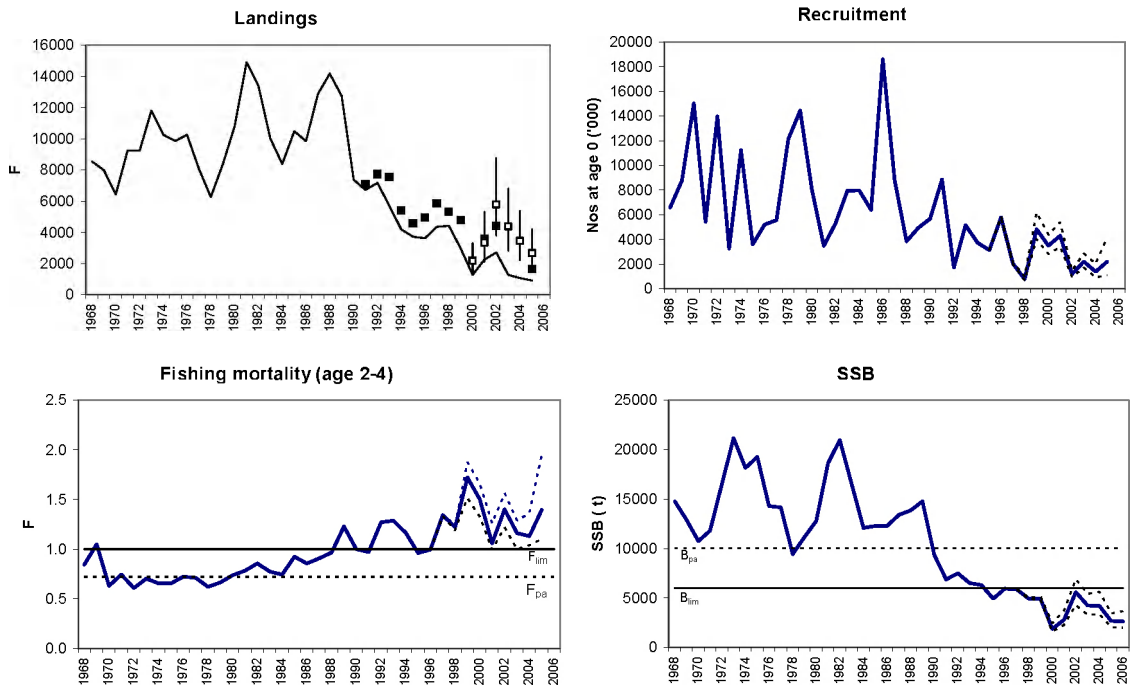


Figure 5.4.1.1. Cod in VIIa: landings and stock trends from final B-ADAPT run. Continuous line on landings plot is the reported landings; filled squares are landings in 1991–2002 and 2005 including sample-based estimates at three ports; open squares (± 2SE) are total removals estimates from B-ADAPT and may include unallocated discards and landings and any additional natural mortality in excess of the value for M assumed in the assessment. Dotted lines on plots are 5th and 95th bootstrap percentiles.

Table 5.4.1.1 Nominal landings (t) of COD in Division VIIa as officially reported to ICES, and figures used by ICES.

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005[1]
Belgium	169	129	187	142	183	316	150	60	283	318	183	104	115
France	686	208	166	148	268	269	n/a[2]	53	74	116	151[2]	29	29
Ireland	1,328	1,506	1,414	2,476	1,492	1,739	966	455	751	1,111	594	380	n/a
Netherlands	-	-	-	25	29	20	5	1	-	-	-		
Spain	-	-	-	-	-	-	-	-	-	-	14	-	-
UK (England, Wales & NI)	3,244	2,274	2,330	2,359	2,370	2,517	1,665	799	885	1,134	505	646	598[3]
UK (Isle of Man)	57	26	22	27	19	34	9	11	1	7	7	5	n/a
UK (Scotland)	453	326	414	126	80	67	80	38	32	29	23	15	
Total	5,937	4,469	4,533	5,303	4,441	4,962	2,875	1,417	2,026	2,715	1,477	1,179	742
Unallocated	1,618	933	54	-339	1,418	348	1,909	-144	225	-11	-201	-108	167
Total as used by WG	7555[4]	5402[4]	4587[4]	4964[4]	5859[4]	5310[4]	4784[4]	1273[5]	2251[5]	2704[5]	1276[5]	1071[5]	909[5]

[1] Preliminary.
[2] Revised.
[3] Includes Scotland.
[4] Includes sample-based estimates of landings into three ports.
[5] Based on official data only.
n/a = not available.

5.4.2 Cod in Divisions VIIe-k (Celtic Sea Cod)

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
Reduced reproductive capacity	Harvested unsustainably	Overexploited	

The current assessment indicates that the stock was well below $\mathbf{B}_{lim}$ since 2004 and is still declining. Fishing mortality has been very high since the mid-1980s, although it has declined slightly in recent years while remaining above $\mathbf{F}_{pa}$. Recruitment since 2001 has been well below average.

Management objectives

There are no specific management objectives or a management plan for this stock.

Reference points

$\mathbf{B}_{lim}$ and $\mathbf{B}_{pa}$ were revised in 2004.

	ICES considers that:	ICES proposed that:
Precautionary Approach reference points	$\mathbf{B}_{lim}$ is 6 300 t, the lowest observed spawning stock biomass.	$\mathbf{B}_{pa}$ be set at 8800 t. Biomass above this value affords a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the variability in the stock dynamics and the uncertainty in assessments.
	$\mathbf{F}_{lim}$ is 0.90, the fishing mortality estimated to lead to potential collapse.	$\mathbf{F}_{pa}$ be set at 0.68. This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$ and maintaining SSB above $\mathbf{B}_{pa}$ in the medium term (assuming normal recruitment), taking into account the uncertainty assessments.

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 2–5	Yield/R	SSB/R
Average last 3 years	0.807	1.864	2.142
$\mathbf{F}_{max}$	0.333	2.229	7.722
$\mathbf{F}_{0.1}$	0.207	2.100	12.618
$\mathbf{F}_{med}$	0.638	2.012	3.120

Technical basis

$\mathbf{B}_{lim} = \mathbf{B}_{loss}$.(B76).	$\mathbf{B}_{pa} = \mathbf{B}_{lim} * 1.4$
$\mathbf{F}_{lim}$ = based on historical response of the stock.	$\mathbf{F}_{pa} = 5^{th}$ percentile of $\mathbf{F}_{loss}$.

Single-stock exploitation boundaries

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

Fishing mortalities close to $\mathbf{F}_{max}$= 0.33 can be considered as candidate target reference points, which are consistent with taking high long-term yields and achieving a low risk of depleting the productive potential. The present fishing mortality (0.81) is above the candidate reference point.

Exploitation boundaries in relation to precautionary limits

Given the low stock size, high fishing mortalities and recent poor recruitment, it is not possible to identify any non-zero catch which will be compatible with the Precautionary Approach. The forecast indicates that a zero catch in 2007 allows SSB to achieve $\mathbf{B}_{lim}$, but not $\mathbf{B}_{pa}$ in 2008.

Short-term implications

Basis: F(2006) = F_{sq} = mean F(age 3–5) = 0.81; R = GM2002–05 = 1.6 million; SSB(2006) = 4.48 kt; SSB(2007) = 4.01 kt; landings (2006) = 3.54 kt.
The maximum fishing mortality which would be in accordance with precautionary limits (F (precautionary limits)) is 0.68.
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 0.33.

Rationale	TAC(2007) [1]	Basis	F(2007)	SSB(2008)	%SSB change
Zero catch	0.00	F=0	0.00	7.67	92%
Status quo	3.23	F_{sq}	0.81	3.69	-8%
High long-term yield	1.62	F(long-term yield)	0.33	5.65	41%
Status quo	1.59	F_{sq} *0.4	0.32	5.69	42%
	1.91	F_{sq} *0.5	0.41	5.29	32%
	2.22	F_{sq} *0.6	0.49	4.91	23%
	2.50	F_{sq} *0.7	0.57	4.57	14%
	2.76	F_{sq} *0.8	0.65	4.26	6%
	3.00	F_{sq} *0.9	0.73	3.96	-1%
	3.23	F_{sq}	0.81	3.69	-8%
	3.44	F_{sq} *1.1	0.89	3.45	-14%
Precautionary limits	0.37	TAC(F_{pa}) *0.1	0.07	7.20	80%
	0.89	TAC(F_{pa}) *0.25	0.17	6.55	64%
	1.66	TAC(F_{pa}) *0.5	0.34	5.60	40%
	2.52	TAC(F_{pa}) *0.842	0.57	4.54	13%
	2.65	TAC(F_{pa}) *0.9	0.61	4.39	10%
	2.86	$F_{pa} = F_{sq}$ *0.84	0.68	4.13	3%
	3.06	TAC(F_{pa}) *1.1	0.75	3.89	-3%
	3.34	TAC(F_{pa}) *1.25	0.85	3.56	-11%
	3.75	TAC(F_{pa}) *1.5	1.02	3.08	-23%
	4.10	TAC(F_{pa}) *1.75	1.19	2.67	-33%
	4.41	TAC(F_{pa}) *2	1.36	2.32	-42%
	4.67	TAC(F_{pa}) *2.25	1.53	2.03	-49%
Mixed Fisheries					

All weights in thousand tonnes.
[1] It is assumed that the TAC will be implemented and that the landings in 2007 therefore correspond to the TAC.
Shaded scenarios are not considered consistent with the precautionary approach.

Management considerations

Since the majority of the landings consist of 1- and 2-year-old fish, the catch forecast relies heavily on the incoming recruitment. Since 2001 the year classes of Celtic Sea cod have been very weak. At present there is no knowledge on the strength of the incoming year-class strength. Consequently ICES used the average of the recent weak year classes as input for the short-term forecast.

Long-term projections have been carried out to demonstrate the impact of a sustained period of poor recruitment. These projections indicate that the long-term yield is halved if the current low recruitment persists. The projections also show that the stock cannot sustain the current exploitation rate.

To assure that the current box closure in the Celtic Sea provides a reduction in fishing mortality, this regulation should be accompanied by measures to ensure that fishing effort and catches do not increase in other areas or in other periods.

Effort in the main fleet targeting cod has declined since 1999. There is some indication of recent reductions on fishing mortality, but not to sustainable levels. Further reductions of effective effort are needed to improve yields and reduce risks to the stock in the longer term.
There are also some indications of substantial underreporting of landings in some fleets.

The assessment area covers Divisions VIIe–k and the ICES advice applies to these areas only; however, the TAC is set for Divisions VIIb–k, Subareas VIII, IX, X, and CECAF 34.1.1. Within this larger area there is no control over where

the catches are taken. Current management measures for Divisions VIIe–k include cod in Divisions VIIbc and cod in Division VIId. Cod in Division VIId is assessed together with cod in the North Sea.

Cod in VIIe–k is caught in a range of fisheries including gadoid trawlers, *Nephrops* trawlers, otter trawlers, beam trawlers, and gillnetters. Other commercial species that are caught by these fisheries are haddock, whiting, *Nephrops*, plaice, sole, anglerfish, hake, megrim, and elasmobranchs.

Ecosystem considerations

Cod in the Celtic Sea are at the southern limit of the range of the species in the Northeast Atlantic. It is known that at the southern limits of their range, recruitment tends to decrease in warmer waters (above 8.5°C) and that cod are not found in waters warmer than 12°C. It is at present unclear to what extent the recent poor recruitments are linked to increased water temperatures. The growth rates in the Celtic Sea are among the fastest observed for cod. Fishing mortality remains an important factor in the productivity of this stock.

Most cod spawning in the Celtic Sea occurs off northern Cornwall in mid- to late March. There is also some spawning off southeast Ireland and a little in the Western Channel.

Tagging studies have given no evidence of cod movement out of Division VIIe and into VIIfg, where there appears to be a simple inshore-offshore migration between deepwater wrecks and reefs in the summer and inshore spawning areas in the winter. Recent tagging work in the Irish Sea suggests that only a small component of cod landings from the Celtic Sea are fish which spawn in the Irish Sea. Furthermore, no cod tagged in the Celtic Sea were recaptured in the Irish Sea.

Factors affecting the fisheries and the stock

Cod in Divisions VIIe–k are taken in mixed trawl fisheries. Landings are made mainly by French gadoid trawlers, which prior to 1980 were mainly fishing for hake in the Celtic Sea. Landings of cod by French *Nephrops* trawlers have fluctuated between 10% and 20% of the total French cod landings from this stock in recent years. Since 1988, Irish landings have accounted for on average 14% of the total, but in 2005 accounted for 28%. UK and Belgium have contributed on average to 9% and 4%, respectively. Landings occur throughout the year, but mainly in the winter months during November to April, with a peak in February–March.

The effects of regulations

Council Regulation (EC) No. 27/2005, Annex III, part A 12 (b) and Council Regulation (EC) No. 51/2006, Annex III, part A 4.2 prohibited fishing in ICES rectangles 30E4, 31E4, and 32E3 during January–March 2005 and during February and March 2006. The direct impact of this closure on the status of cod is difficult to quantify. However, the effort of the main fleet fishing on cod, i.e. the French gadoid fleet, has decreased considerably since 1999(-37%). This fleet changed to other, mainly benthic metiers. Although the fleet still operates in the Celtic Sea and on other fishing grounds outside the Celtic Sea (mainly VIIe) this has resulted in a decreased fishing mortality on cod in most recent years. The impact on the fishing pressure on other species (including sensitive species such as elasmobranchs) is unclear.

VMS data for French, Belgian, and UK (E+W) vessels has showed that overall the box closure has been respected by the fleets of these nations both in 2005 and in 2006. There has been some evidence of reduced LPUE for UK otter trawlers, but little evidence of a reduction of LPUE for UK beam trawlers and netters which together account for a substantial component of the UK cod catch.

Technical measures applied to this stock are: a minimum mesh size for beam and otter trawlers in Subarea VII and a minimum landing size (MLS) of 35 cm. For Belgian trawlers that land in Belgium the MLS is 40 cm. Minimum landing sizes do not prevent cod from being caught (and thrown back dead), but might prevent targeting juvenile cod. Recent sampling programmes in countries exploiting this stock indicate that discards account for between 40% and 60% by number of all fish caught. These discards are mainly under the MLS. Qualitative analysis of observations at sea in 2005 have shown that discarding practice is more important in Divisions VIIe and VII f,g than in VII h–k, where small fish are less abundant.

Management regulations, particularly effort control regimes in other areas (Division VIIa, Subareas VI & IV), became increasingly restrictive since 2004 and should not be allowed to result in a displacement of effort into the Celtic Sea.

Changes in fishing technology and fishing patterns

In 2003 and 2004 there has been a substantial behavioural change in the main fisheries with regard to discarding. Discarding occurred in the last quarter of 2002 as the French fishery was closed when the cod quota was exhausted. In 2003 and 2004 there was substantial high-grading of marketable cod in order to prevent a new early closure of the fishery. This high-grading practise was not continued in 2005.

Scientific basis

Data and methods

Analytical assessment has been carried out. The landings-at-age data which formerly were the basis of the assessment have been improved since 2003 to include estimates of misallocated landings and French high grading.

Information from the fishing industry

Meetings with representatives of the fishing industry were held prior to this year's assessment in France and the UK. There was no major disagreement about the state of the stock or its assessment.

The industry has been cooperative in a number of scientific endeavours with regards to this stock. The fisheries science partnership conducted cooperatively between CEFAS and the UK industry has provided information on the relative age compositions, suggesting that the main year-class signals are captured by the assessment.

Uncertainties in assessment and forecast

Although the change in high-grading practices has been partially corrected for in the current assessment data there are still some uncertainties about this. There is also substantial discarding of small fish by all fleets, which is not included in the assessment and forecast.

Although there are some small corrections for area misreporting in the current assessment there are still concerns about the accuracy of the reported landings statistics for some fleets exploiting this stock.

Most of the abundance estimates come from commercial fleets operating on different components of the stock (VIIe, VIIfgh, VII j). Only two fishery-independent surveys are available. Because of the low cod abundance, the calculated abundance indices for the UK and French surveys are based on very few cod. Nevertheless, both surveys give some indication of year-class strength, especially when a large year class comes through.

The forecast is highly dependent on the recruitment assumption used. In this case a reduced recruitment has been used in line with recent observations from the stock. This is considered the most likely scenario. If recruitment were to be at average levels then SSB could be rebuilt above $\mathbf{B}_{pa}$ in one year if the fishing mortality is reduced by 50%, corresponding to landings less than 2300 tonnes. Given the recent sustained weak recruitment this is an unlikely scenario.

Comparison with previous assessment and advice

In the past the assessment was only used to indicate trends, but this year the advice is based on a full analytical assessment and forecast. The assessment has been improved compared to last year's because estimates of misreporting and high grading have been included and the input data have been corrected. The changes in stock development in the new assessment are reasonably robust despite the assessment uncertainty discussed above. The advice this year is more restrictive than last year due to the now available estimates of low recruitment, lowest observed SSB, and high fishing mortality.

Source of information

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 27 June–6 July 2006 (ICES CM 2006/ACFM:33).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	ACFM Landings[6]
1987	Reduce F	< 6.4[2]		10.2
1988	No increase in F; TAC	7.0[2]		17.2
1989	No increase in F; TAC	8.6[2]		19.8
1990	No increase in F; TAC	9.2[2]		12.7
1991	TAC; SSB = mean	4.5[2]		9.3
1992	Appropriate to reduce F	-		9.7
1993	20% reduction in F	6.5[2]	19.0	10.4
1994	20% reduction in F	5.6[2]	17.0	10.6
1995	20% reduction in F	4.7[3]	17.0	11.7
1996	20% reduction in F	4.7[3]	20.0	12.6
1997	20% reduction in F	7.4[4]	20.0	12.0
1998	10% reduction in F	8.8[4]	20.0	11.4
1999	Reduce F below $\mathbf{F}_{pa}$	9.2[4]	19.0	9.9
2000	Reduce F below $\mathbf{F}_{pa}$	< 7.6[5]	16.0	6.9
2001	40% reduction in F	< 4.3[5]	10.5	8.2
2002	45% reduction in F	< 5.3[5]	8.7	8.7
2003	60% reduction in F	< 3.8[5]	6.7	6.0
2004	90% reduction in F or management plan	<0.7	5.7	3.4
2005	17% reduction in F	<5.2	6.2	3.1
2006	No increase in effort [should have been reduce effort]	Cannot be estimated	5.6	
2007	Zero catch	0		

Weights in '000 t.
[1]TAC covers Subareas VII (except Division VIIa) and VIII. [2] For the VIIf+g stock component. [3] For the VIIf–h stock component. [4] For the VIIe–h stock component. [5] For the VIIe–k stock component. [6]ACFM landings for the period 1988–2002 revised.

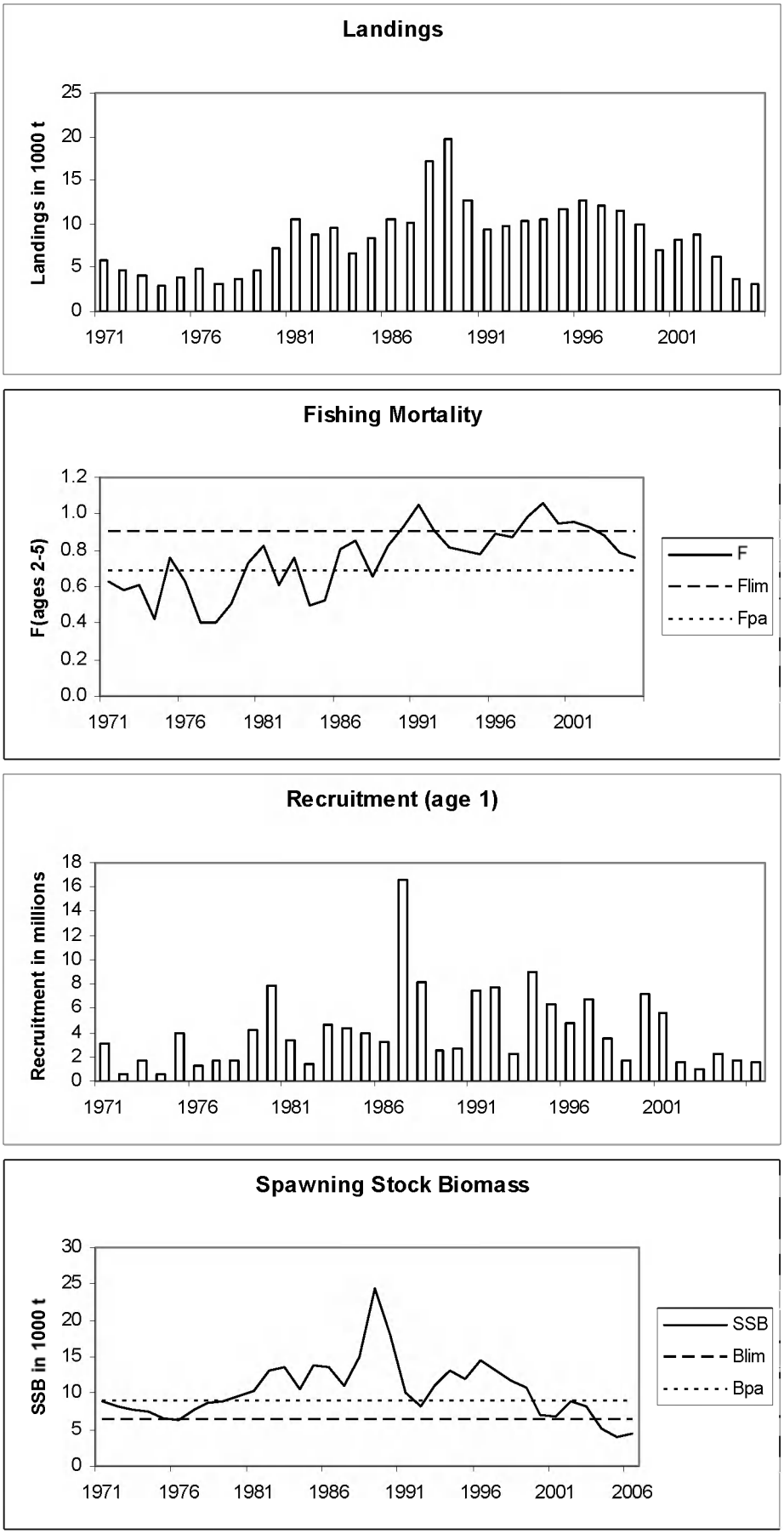
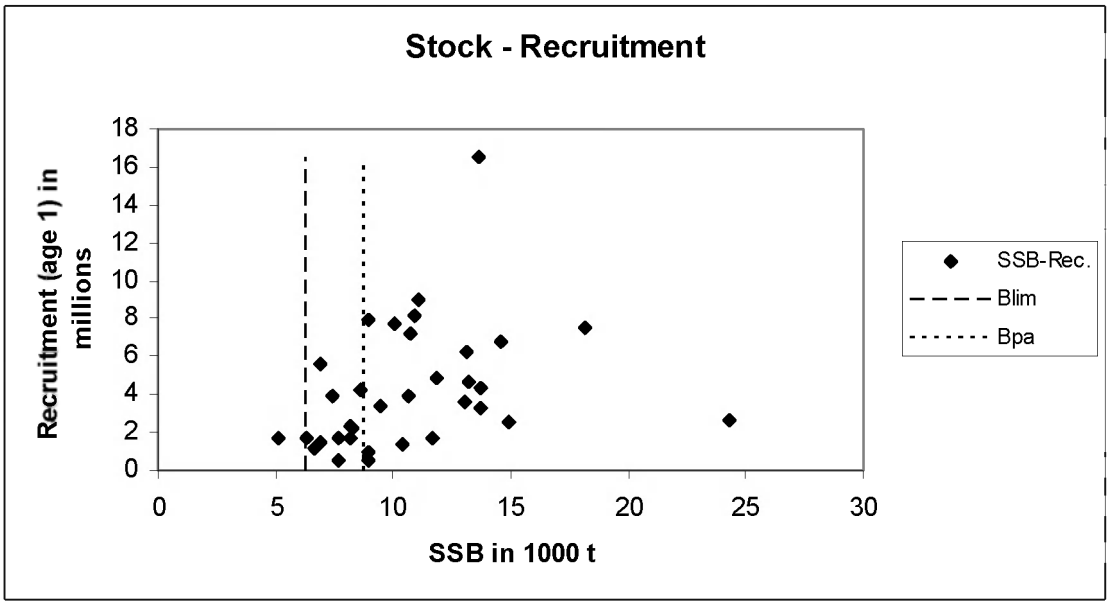
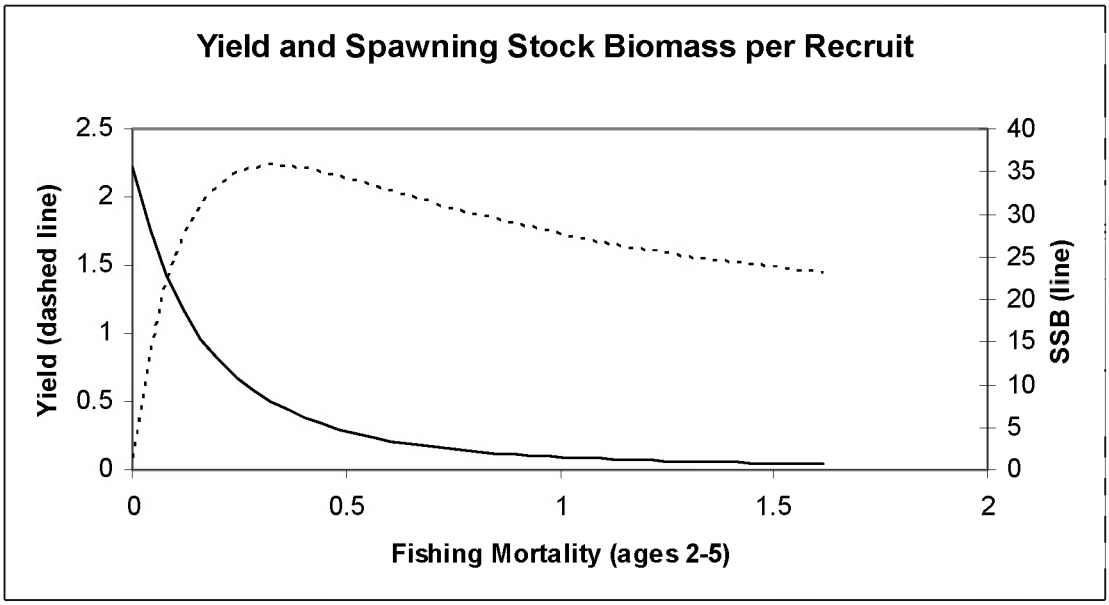


Figure 5.4.2.1 Cod in Divisions VIIe–k . Landings, fishing mortality, recruitment and SSB.





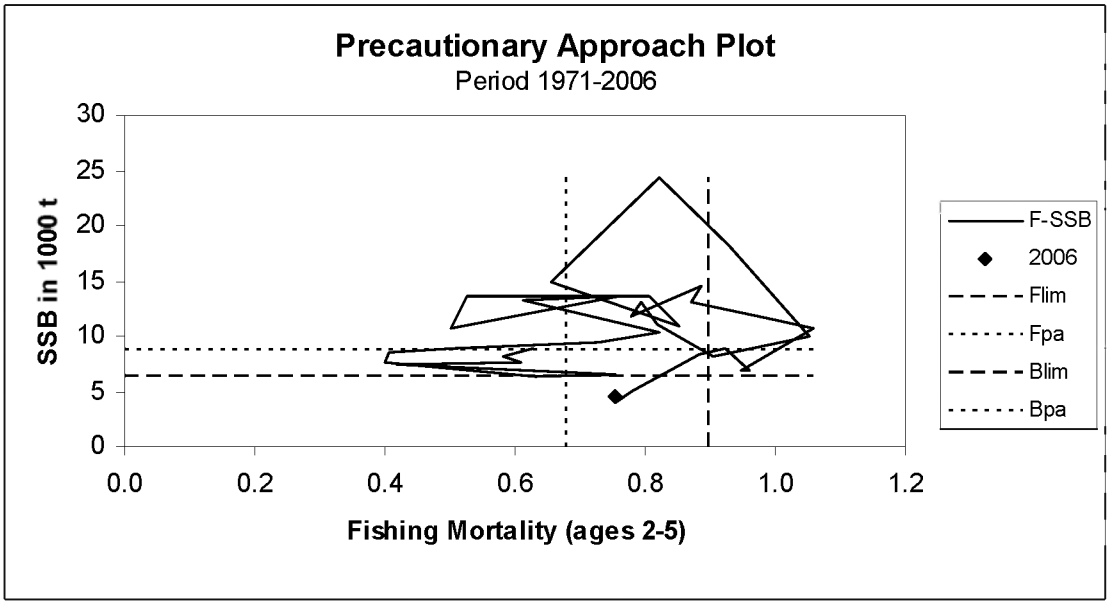


Figure 5.4.2.2 Cod in Divisions VIIe–k. Stock and recruitment; Yield and SSB per recruit.

- VIIfg cod - CS5 results 2006 RG (Average R assumed).

Results for different values of target F, assuming Fsq in 2006, and target F 2007 onwards.

Run	Fmult	Target F	F value	Yield: mean 2021-2024			Prob. (B<1600t,%) at equilibrium		
				Yield-25%	Yield-50%	Yield-75%	Risk	F-reduction	Yield prop.
1	0.10		0.08	3367	4112	5033	0.000	0.90	0.61
2	0.20		0.16	4771	5913	7300	0.000	0.80	0.88
3	0.30		0.24	5282	6585	8270	0.000	0.70	0.98
4	0.40		0.32	5342	6740	8582	0.000	0.60	1.00
5	0.50		0.41	5192	6622	8546	0.000	0.50	0.98
6	0.60		0.49	4926	6382	8382	1.300	0.40	0.95
7	0.70		0.57	4516	5965	8101	8.450	0.30	0.89
8	0.80		0.65	3742	5315	7429	29.425	0.20	0.79
9	0.90		0.73	2588	4204	6340	57.875	0.10	0.62
10	1.00	Fsq	0.81	1469	2832	4924	79.500	0.00	0.42

Boxed scenarios represent possible target fishing mortalities.

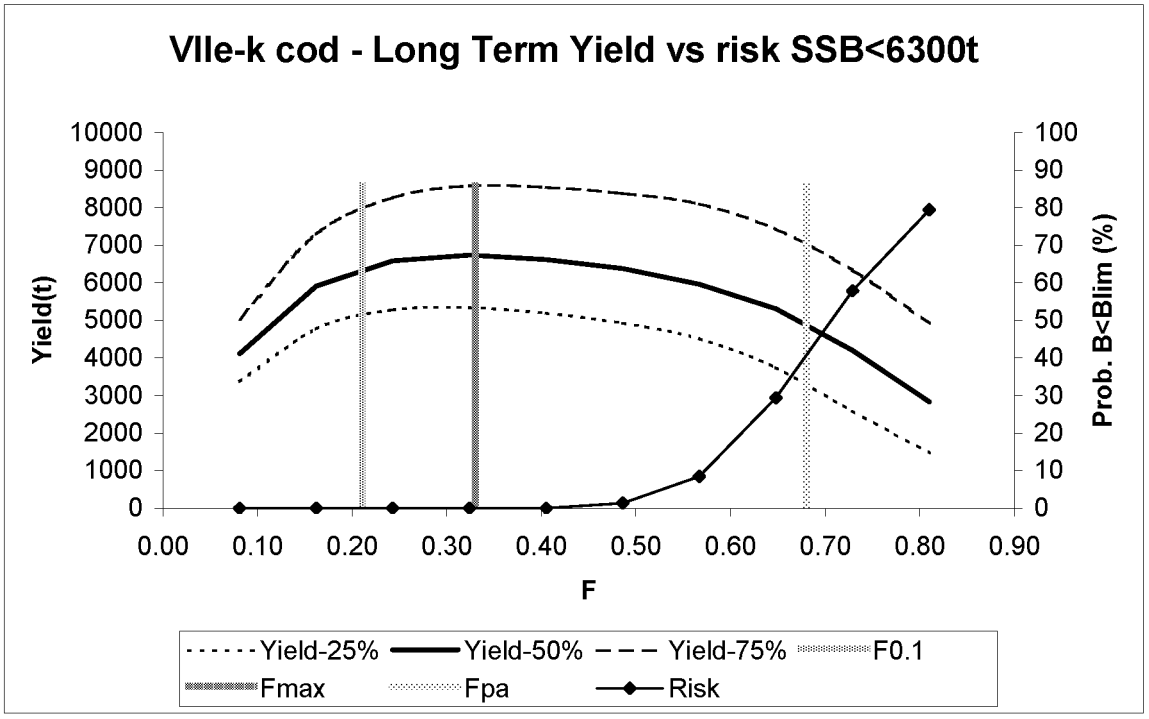


Figure 5.4.2.3

- VIIfg cod - CS5 results 2006 RG (Low R assumed).

Results for different values of target F, assuming Fsq in 2006, and target F 2007 onwards.

Run	Fmult	Target F	F value	Yield: mean 2021-2024			Prob. (B<1600t,%) at equilibrium		
				Yield-25%	Yield-50%	Yield-75%	Risk	F-reduction	Yield prop.
1	0.10		0.08	1702	2063	2514	0.000	0.90	0.62
2	0.20		0.16	2404	2960	3632	0.000	0.80	0.89
3	0.30		0.24	2654	3285	4103	0.000	0.70	0.98
4	0.40		0.32	2660	3341	4238	2.375	0.60	1.00
5	0.50		0.41	2397	3135	4090	19.275	0.50	0.94
6	0.60		0.49	1717	2559	3591	58.300	0.40	0.77
7	0.70		0.57	939	1623	2622	87.650	0.30	0.49
8	0.80		0.65	477	875	1536	98.000	0.20	0.26
9	0.90		0.73	235	447	821	99.600	0.10	0.13
10	1.00	Fsq	0.81	116	226	429	99.975	0.00	0.07

Boxed scenarios represent possible target fishing mortalities.

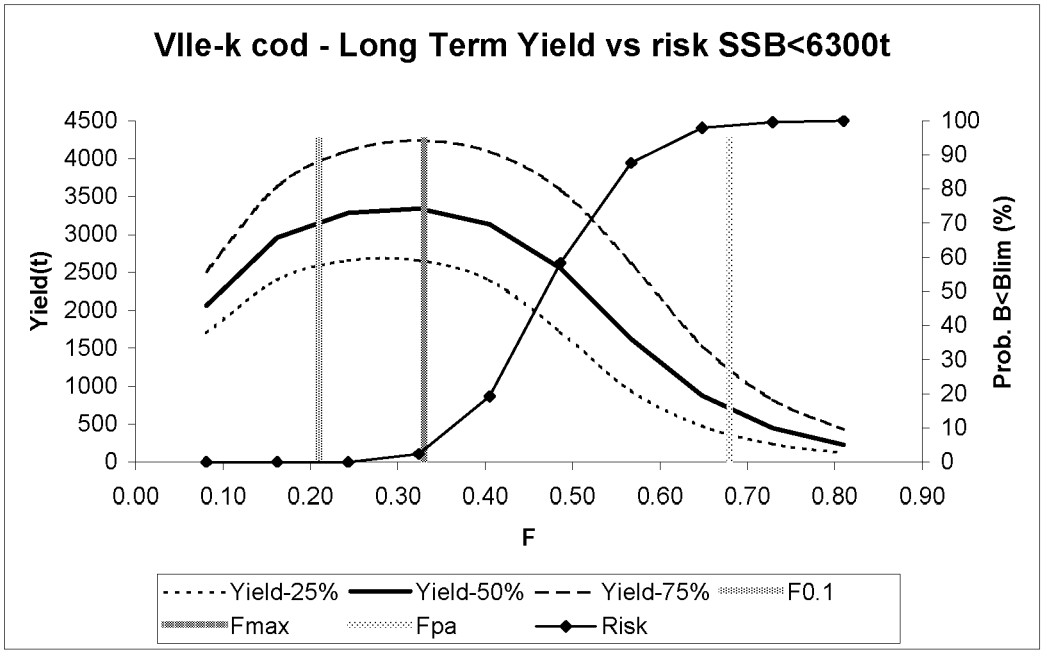


Figure 5.4.2.4

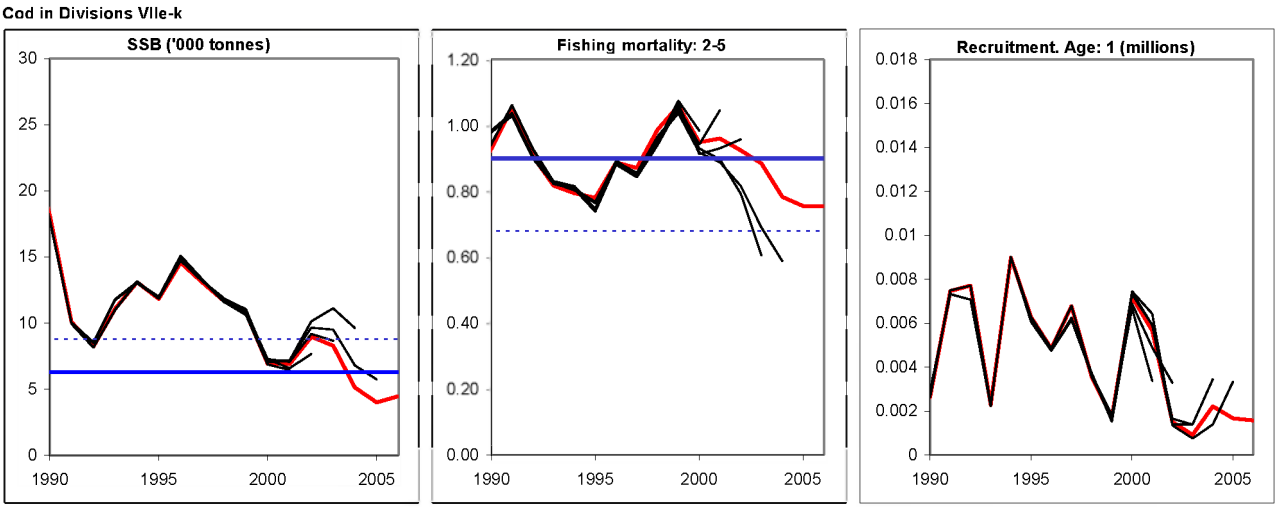


Figure 5.4.2.5 Cod in Divisions VIIe–k. Historical performance of the assessment (SSB, Fishing mortality, and recruitment).

Table 5.4.2.1 **Nominal landings of Cod in Divisions VII e-k used by the Working Group**

Year	Belgium	France	Ireland	UK	Others	Total
1971						**5782**
1972						**4737**
1973						**4015**
1974						**2898**
1975						**3993**
1976						**4818**
1977						**3058**
1978						**3647**
1979						**4650**
1980						**7243**
1981						**10596**
1982						**8766**
1983						**9641**
1984						**6631**
1985						**8317**
1986						**10475**
1987						**10228**
1988	554	13863	1480	1292	2	17191
1989	910	15801	1860	1223	15	19809
1990	621	9383	1241	1346	158	12749
1991	303	6260	1659	1094	20	9336
1992	195	7120	1212	1207	13	9747
1993	391	8317	766	945	6	10425
1994	398	7692	1616	906	8	10620
1995	400	8321	1946	1034	8	11709
1996	552	8981	1982	1166	0	12681
1997	694	8662	1513	1166	0	12035
1998	528	8096	1718	1089	0	11431
1999	326	6820	1883	897	0	9926
2000	208	4690	1302	744	0	6944
2001	347	5914	1091	838	0	8190
2002	555	6897	694	618	0	8764
2003	136	5018	517	346	0	6017
2004	153	2425	663	282	0	3523
2005*	186	1674	835	309	0	3004

*** provisional**
Scaled landings 1971-1987 (SSDS WG 1999)

Table 5.4.2.2 Nominal landings (t) of cod in Division VIIb,c for 1995–2005.

COUNTRY	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
France	91	115	71	44	…[1]	44	38	54	33	13	5
Germany	-	-	3	-	-	-	-	-			
Ireland	282	353	177	234	154	141	107	59	59	60	NA
Netherlands	-	-	-	-	-	-	+	-	1		
Norway	3	1	6		11	+*	1	5			
Spain	6	3		6	2	3	1	1			
UK(E/W/NI)	25	35	37	25	4	4	2	1	8		0.3
UK(Scotland)	66	12	7	9	1	-		1	1	10	
TOTAL	**473**	**519**	**301**	**318**	**172**	**192**	**150**	**122**	**102**	**83**	**5.3**

[1]See VIIg-k.

Table 5.4.2.3 Cod in Divisions VIIe–k.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-5
1971	3076	8939	5782	0.628
1972	565	8221	4737	0.582
1973	1665	7673	4015	0.610
1974	500	7410	2898	0.419
1975	3890	6627	3993	0.755
1976	1203	6302	4818	0.631
1977	1716	7695	3059	0.399
1978	1694	8630	3647	0.405
1979	4262	8966	4650	0.506
1980	7936	9496	7243	0.730
1981	3368	10414	10597	0.823
1982	1343	13186	8766	0.611
1983	4625	13688	9641	0.761
1984	4332	10641	6631	0.501
1985	3912	13712	8317	0.526
1986	3237	13594	10475	0.807
1987	16563	10932	10228	0.853
1988	8194	14891	17191	0.654
1989	2489	24275	19809	0.823
1990	2649	18155	12749	0.929
1991	7469	10088	9336	1.052
1992	7714	8218	9747	0.906
1993	2288	11098	10425	0.817
1994	8978	13100	10620	0.794
1995	6272	11840	11709	0.780
1996	4843	14566	12681	0.887
1997	6777	13069	12035	0.871
1998	3559	11647	11431	0.987
1999	1726	10776	9926	1.059
2000	7186	6919	6944	0.949
2001	5657	6902	8190	0.960
2002	1503	8962	8764	0.924
2003	919	8290	6219	0.884
2004	2219	5132	3701	0.783
2005	1666	3997	3094	0.755
2006	1577*	4477		
Average	4099	10348	8255	0.753

* Average 2002–05.

5.4.3 Haddock in Division VIIa (Irish Sea)

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
Undefined	Unknown	Overexploited	Not defined	

The assessment is indicative of trends in SSB and recruitment and is based on survey results. Mortality remains at a high level. SSB has been sustained by recent high recruitment. The SSB has increased since 2001 as a result of the stronger 1999 and 2001 year classes. Recruitment levels in the last 3 years appear to be above average and should result in increased SSB in the next years.

Management objectives

There are no explicit management objectives for this stock.

Reference points

	ICES considers that:	ICES proposed that:
Limit reference points	$\mathbf{B}_{lim}$ is not defined.	$\mathbf{B}_{pa}$ is not defined.
	$\mathbf{F}_{lim}$ is not defined.	$\mathbf{F}_{pa}$ be set at 0.5.
Target reference points		Not defined.

Yield and spawning biomass per Recruit (from 2004 Assessment)
F-reference points

	Fish Mort Ages 2–6	Yield/R	SSB/R
$\mathbf{F}_{max}$	0.35	0.511	1.232
$\mathbf{F}_{0.1}$	0.19	0.469	2.009

Candidate 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:

There is currently no biological basis for defining appropriate reference points, in view of the rapid expansion of the stock size over a short period and the inability to conduct a full analytical assessment. ICES proposed that $\mathbf{F}_{pa}$ be set at 0.5 by association with other haddock stocks.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary limits

Although uncertain, recent estimates of total mortality are in excess of 1.0 which implies that F is above the $\mathbf{F}_{pa}$ of 0.5. Fishing at $\mathbf{F}_{pa}$ requires a substantial reduction in effort and catches, but ICES cannot quantify the reduction.

Management considerations

The EU Cod Recovery Plan implemented in the Irish Sea from 2004 will impinge upon the management measures for species caught in related fisheries, including haddock. The current directed fishery for haddock in the Irish Sea is likely to generate bycatches of cod in the same area.

Limited sampling schemes since the 1990s have shown high rates of discarding of haddock less than 3 years old, and variable discarding of 3-year-olds in fisheries using 70- to 80-mm mesh nets. Data for whitefish vessels since the introduction of 100+ mm mesh and other recent technical measures are too few to form a basis for evaluation of discards in that fleet. However, any measures to reduce discards will result in increased future yield.

There are strong indications that management control is not effective in limiting the catch, and that it has resulted in very uncertain data on the quantities of fish caught by the fleet.

Factors affecting the fisheries and the stock

The effects of regulations

Due to the bycatch of cod in the haddock fishery, the regulations affecting Division VIIa haddock remain linked to those implemented under the Irish Sea cod recovery plan. The regulations implemented for cod are detailed in the overview for the Irish Sea. The extent to which fishing mortality may have been reduced in 2005 by management measures such as effort limitation and decommissioning of vessels in 2003 could not be reliably evaluated.

Scientific basis

Data and methods

Landings data for this stock are uncertain because of species misreporting, which has been estimated from quayside observations in one country only. Restrictive quotas for some countries caused extensive misreporting during the 1990s prior to the introduction of a separate TAC allocation for the Irish Sea. Estimates of misreporting prior to 2003 have been included in the estimates of landings.

The present stock estimates are relatively uncertain due to a lack of access to port sampling in 2003 **at several major ports** and only limited access in 2004. **A resumption of sampling took place in 2005 at these ports**. There will continue to be uncertainties in the estimated stock status unless full sampling is **maintained** at all major ports.

The assessment of recent stock trends is based on survey data only, using the March survey data up to 2006.

Uncertainties in assessment and forecast

Some discarding information is available, which indicates that discarding is substantial for younger age classes. Comparisons were made of relative trends in recruitment and SSB from this year's and last year's survey-based assessment. The methods indicate similar trends in SSB and recruitment estimates.

The survey-based assessment provides only relative trends in stock parameters.

Comparison with previous assessment and advice

The perception of the stock from this year's assessment does not differ qualitatively from that obtained last year, and the basis of the advice is the same as last year.

Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 9–18 May 2006 (ICES CM 2006/ACFM:30).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. To advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	Official landings	ACFM Landings
1987	Not dealt with					1.287	1.287
1988	Not dealt with					0.747	0.747
1989	Not dealt with					0.560	0.560
1990	Not dealt with					0.582	0.582
1991	Not dealt with					0.616	0.616
1992	Not dealt with					0.656	0.703
1993	Not dealt with					0.730	0.813
1994	Not dealt with					0.681	1.043
1995	Not dealt with				6[1]	0.841	1.753
1996	No advice				7[1]	1.453	3.023
1997	Means of setting catch limits req'd				14[1]	1.925	3.391
1998	Catch limit for VIIa		3.0		20[1]	3.015	4.902
1999	No increase in F; Catch limit for VIIa		7.0		4.99[2]	2.370	4.139
2000	Reduce F below $\mathbf{F}_{pa}$		<2.8		3.4[2]	2.447	1.430
2001	Reduce F below $\mathbf{F}_{pa}$		<1.71		2.7[2]	2.238[3]	2.50
2002	Reduce F below $\mathbf{F}_{pa}$		<1.20		1.3[2]	1.115	1.972
2003	No cod catches		-		0.6[2]	0.674	n/a
2004	[4]	F<$\mathbf{F}_{pa}$	[4]	<1.5	1.5	0.761	n/a
2005	[4]	F<$\mathbf{F}_{pa}$	[4]	<1.37	1.5	n/a	n/a
2006	[4]	Substantial reduction in fishing mortality	[4]	-	??		
2007		Substantial reduction in fishing mortality	[4]	-			

Weights in '000 t.
[1] Precautionary TAC for VII, VIII, IX, and X.
[2] VIIa allocation of precautionary TAC.
[3] Incomplete data.
[4] Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.
n/a = not available.

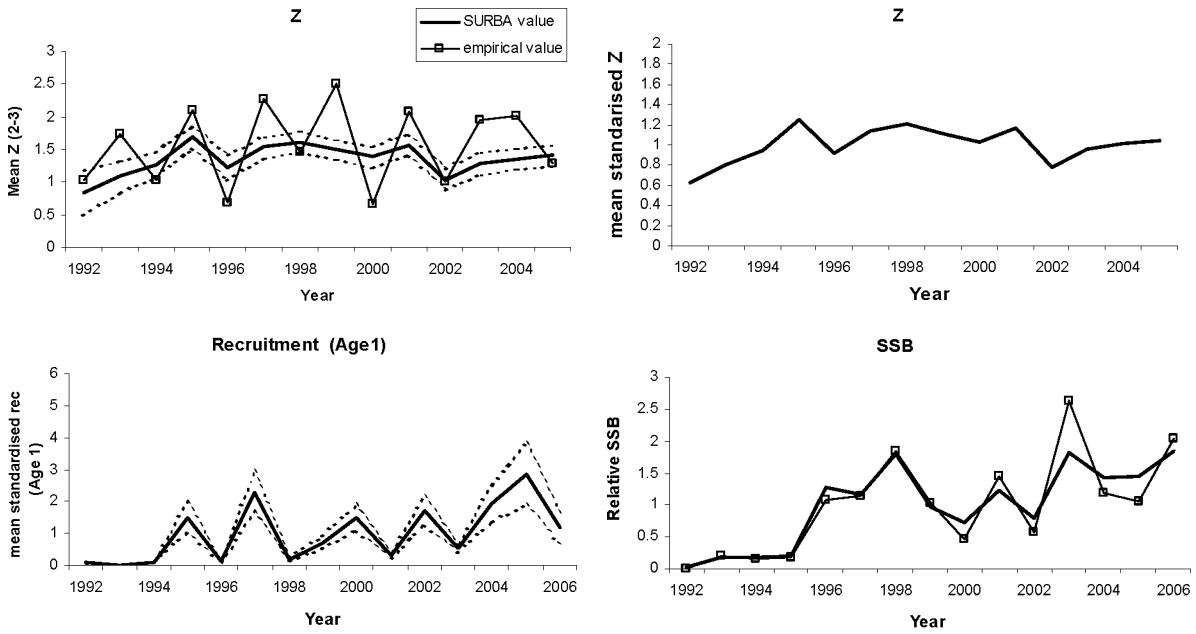


Figure 5.4.3.1 Haddock VIIa: Results of final SURBA 3.0 run using NIGFS-Mar survey data. Dotted lines are +/- 1SE. Z estimates given as absolute and relative. Empirical estimates of SSB and Z given by SURBA from the raw survey data are also shown.

Table 5.4.3.1 Nominal landings (t) of HADDOCK in Division VIIa, 1984–2005, as officially reported to ICES.

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Total (Official Landings used in assessment)	2204	2169	683	276	345	188	131	146	418	445	303	299

Country	1984	1985	1986	1987	1988	1989	1990	1991	1992
Belgium	3	4	5	10	12	4	4	1	8
France	38	31	39	50	47	n/a	n/a	n/a	73
Ireland	199	341	275	797	363	215	80	254	251
Netherlands	-	-	-	-	-	-	-	-	-
UK (England & Wales)[1]	29	28	22	41	74	252	177	204	244
UK (Isle of Man)	2	5	4	3	3	3	5	14	13
UK (N. Ireland)	38	215	358	230	196	…	…	…	…
UK (Scotland)	78	104	23	156	52	86	316	143	114
United Kingdom									
Total (Official)	387	728	726	1,287	747	560	582	616	703
Unallocated									-47
Total used for assessment	387	728	726	1287	747	560	582	616	656

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	18	22	32	34	55	104	53	22	68
France	41	22	58	105	74	86	n/a	49	184
Ireland	252	246	320	798	1,005	1,699	759	1,238	652
Netherlands	-	-	-	1	14	10	5	2	-
UK (England & Wales)[1]	260	301	294	463	717	1,023	1,479	1,061	1,238
UK (Isle of Man)	19	24	27	38	9	13	7	19	1
UK (N. Ireland)	…	…	…	…	…	…	…	…	…
UK (Scotland)	140	66	110	14	51	80	67	56	86
United Kingdom									
Total (Official)	730	681	841	1,453	1,925	3,015	2,370	2,447	2,229
Unallocated	83	362	912	1570	1466	1887	1759	-1067	270
Total used for assessment	813	1043	1753	3023	3391	4902	4129	1380	2498

Country	2002	2003	2004	2005*)
Belgium	44	20	15	22
France	72	146	20	19
Ireland	401	229	296	139
Netherlands	-	-	-	
UK (England & Wales)[1]	551	248	421	
UK (Isle of Man)	-	-	-	
UK (N. Ireland)	…	…	…	…
UK (Scotland)	47	31	9	
United Kingdom				350*
Total (Official)	1,115	674	761	530*)
Unallocated	857	n/a	517	169
Total used for assessment	1972	n/a	1278	699

*Preliminary.
[1]1989–2004 Northern Ireland included with England and Wales.
n/a = not available.

5.4.4 Haddock in Divisions VIIb-k (Irish Sea)

State of the stock

The state of the stock is unknown in relation to precautionary reference points. Fishing mortality appears to be relatively stable on a high level. Recruitment is highly variable and there were strong 1995, 2001, and 2002 year classes. This has lead to an increase in spawning-stock biomass.

Management objectives

There are no explicit management objectives for this stock.

Reference points

No precautionary reference points have been established.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary considerations

Because of the strong 2001 and 2002 year class SSB has increased, but ICES is unable to provide a reliable estimate of the current stock size. Future catches and SSB will be highly dependent on the strength of incoming year classes and their discard mortality. In this context the stock should be managed by ensuring that the effort is not allowed to increase, rather than by TAC management.

Management considerations

Most of the haddock caught are discarded. Discards include both fish under the minimum landing size (MLS) and larger fish. Haddock are caught in mixed demersal fisheries in the Celtic Sea and management should take this into account. An increase in mesh size or other technical measures to reduce discarding would be of huge benefit to this stock and have a substantial impact on medium-term yield. Haddock is a relatively low value species and targeting practices in the fishery are highly dependent on availability and market demand.

Factors affecting the fisheries and the stock

Haddock in Divisions VIIb–k are mainly taken in mixed trawl fisheries. These are mainly otter trawlers, including gadoid trawlers and *Nephrops* trawlers and to a lesser extent beam trawlers.

The effects of regulations

The TAC for haddock is set for all of Subareas VII, VIII, IX, and X. Quotas in recent years have been based on average landings and as the strong 2002 year class recruited to the fishery underreporting, species misspecification in landings, and high grading are know to have increased. Technical measures applied to this stock include a minimum landing size (≥ 30 cm) and the minimum mesh sizes applicable to the mixed demersal fisheries. Given the observed discarding rates in some towed gears there is a mismatch between minimum mesh sizes in these mixed demersal fisheries and the MLS.

Within the large management area there is no control over where the catches are taken. Current management measures for Divisions VIIb–k include haddock in Division VIIa. Whatever management measures are implemented, they must be consistent with the assessment area.

Council Regulation (EC) No. 1954/2003 established measures for the management of fishing effort in a 'biologically sensitive area' in Divisions 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 national annual effort (calculated over the period 1998–2002).

Council Regulation (EC) No. 27/2005, Annex III, part A 12 (b) prohibited fishing in ICES rectangles 30E4, 31E4, and 32E3 during January–March 2005. The impact of this on the haddock stock is not yet known.

Ecosystem considerations

Recruitment of haddock in this area has been increasing in recent years but as yet it has not been possible to link this to specific environmental drivers. The distribution of haddock varies with age; young haddock from Division VIIb move to deeper waters and possibly into Division VIaS as they grow, while migration patterns of haddock in Division VIIgj

are more variable. The spatial distribution of haddock and their length-at-age data suggest that Divisions VIIb and VIaS might be the same stock, and other biological parameters also do not show obvious spatial patterns.

Scientific basis

Data and methods

An exploratory assessment was carried out, but the available data were not considered sufficient to provide a reliable assessment. Work is in progress to include discards in the assessment. French survey information was available but requires further analysis, and the time-series of the Irish survey is still too short.

Information from the fishing industry

Meetings with representatives of the fishing industry were held prior to the assessment group in Ireland and the UK. No specific issues were raised about the state of this stock or its assessment.

Uncertainties in assessment and forecast

Only exploratory analyses of the data could be carried out for this stock.

The stock structure is uncertain. Stocks of haddock in Divisions VIa, VIIa, and VIIb–k have shown different growth rates and patterns of recruitment variation during the 1990s. This may reflect latitudinal variations in environmental conditions. Catches of haddock along the Atlantic seaboard of the British Isles are recorded more or less continuously between the west coast of Scotland and the Celtic Sea. Significant genetic differences have been found between samples collected at much smaller spatial scales than the entire west coast of the British Isles. The implications of this when evaluating the present stock management units remain unclear. Further investigation is needed to better define the biological stock units.

There are some concerns about the accuracy of the landings statistics in some fleets.

Comparison with previous assessment and advice

There have been some improvements in the data available to assess this stock, but as last year no reliable analytical assessment could be achieved.

The advice is consistent with last year's advice.

Sources of information

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks (ICES CM 1999/ACFM:04).
Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 27 June–6 July 2006 (ICES CM 2006/ACFM:33).

Year	ICES Advice	Predicted catch corresp. To advice	Agreed TAC[1]	Official Landings[2]	ACFM landings	Discards	ACFM Catch
1987	Not dealt with			3.0	2.6	na	2.6
1988	Not dealt with			4.0	3.6	na	3.6
1989	Not dealt with			4.2	3.2	na	3.2
1990	Not dealt with			2.9	2.0	na	2.0
1991	Not dealt with			2.6	2.3	na	2.3
1992	Not dealt with			2.9	2.7	na	2.7
1993	Not dealt with			3.4	3.3	1.6	5.0
1994	Not dealt with			4.1	4.1	2.0	6.1
1995	Not dealt with		6	4.5	4.5	4.3	8.8
1996	Not dealt with		7[3]	6.7	6.8	2.7	9.4
1997	Not dealt with		14	10.3	10.8	6.0	16.8
1998	Not dealt with		20	7.4	7.7	1.2	8.9
1999	Not dealt with		22[5]	5.2	5.0	1.2	6.2
2000	No expansion of catches		16.6[5]	6.7	7.6	2.1	9.7
2001	No expansion of catches		12[5]	9.7	8.7	7.1	15.8
2002	No expansion of catches	8.0	9.3[5]	7.0	6.8	10.8	17.6
2003	No expansion of catches	7.2	8.185[5]	6.9	8.4	64.7	73.0
2004	No increase in F	-	9.600[5]	8.4	8.6	23.9	32.5
2005	No increase in effort	-	11.520[5]	4.0[4]	6.6	11.0	17.5
2006	No increase in effort	-	11.520[5]				
2007	No increase in effort	-					

Weights in '000 t.
[1]Applies to Subareas VII, VIII, IX, and X.
[2]Possible underestimates due to misreporting.
[3]Increased in-year to 14 000 t.
[4]Incomplete official statistics.
[5]Includes separate Division VIIa allocation.

Table 5.4.4.1

Haddock in VIIb–k (Celtic Sea & West of Ireland)

Nominal landings (t) of Haddock in Divisions VIIb,c,e–k, 1984–2005, as officially reported to ICES, and total landings as used by the Working Group.

Country		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005*	2005*
Belgium		-	4	6	12	64	117	22	18	21	51	123	189	133	246	142	51	90	165	132	118	136	167	167
France		3328	2438	2279	2380	3275	3412	2110	1247	1461	1839	2788	2964	4527	6581	3674	2725	3088	4842	4348	5781	6130	3579	3579
Ireland		646	794	317	314	275	323	461	1020	1073	1262	908	966	1468	2789	2788	2034	3066	3608	2188	1867	1715		
Netherlands									-	-	-	-	-	-	-	3	-	-						
Norway		17	4	86	-	-	27	31	38	26	-	17	64	38	31	49	71	13*	19	21*				
Spain		532	561	-	-	-	-	-	-	-	-	-	19	48	54	260	88	110	646	85	82	143		
UK (Channel Islands)		-	-	-	-	-	-	-		-	-	1	-	-	-	-	-	-						
UK (England & Wales)		340	168	188	194	405	278	123	137	220	189	193	228	432	554	410	273	287	409	313	385			
UK (Scotland)		63	7	57	79	4	17	195	113	86	67	47	38	7	15	35	5	2	13	2	8	6		
United Kingdom																						307	291	291
Total		4926	3976	2933	2979	4023	4174	2942	2573	2887	3408	4077	4468	6653	10270	7361	5247	6656	9702	7030	6885	8437	4036	4036
Unallocated											-60	54	2	103	557	307	-220	970	-956	-217	1486	131	2517	2517
Totals as used by the Working Group	Landings										3348	4131	4470	6756	10827	7668	5027	7626	8746	6813	8371	8568	6553	6553
	Discards										1620	1988	4288	2659	6013	1238	1203	2061	7126	10828	64658	23898	10976	10976
	Catch										4968	6119	8758	9415	16840	8906		6230	9687	15872	17641	73029	32466	17529

*Preliminary

5.4.5 Whiting in Division VIIa (Irish Sea)

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
Unknown, low SSB	Unknown	Unknown	Unknown	

Long-term information on the historical yield and catch composition all indicate that the present stock size is low. The assessment carried out in 2003 indicated a decrease in SSB by a factor 10 from the 1980s to the 1990s. Survey information indicates that the stock has remained at the low level.

Management objectives

No explicit management objectives have been set for this stock.

Reference points

	ICES considers that:	ICES proposed that:
Limit reference points	$\mathbf{B}_{lim}$ is 5000 t.	$\mathbf{B}_{pa}$ be set at 7000 t.
	$\mathbf{F}_{lim}$ is 0.95.	$\mathbf{F}_{pa}$ be set at 0.65.
Target reference points		$\mathbf{F}_{y}$ not determined.

Technical basis:

$\mathbf{B}_{lim}$: $\mathbf{B}_{loss}$. The lowest observed spawning stock biomass as estimated in previous assessment. There is no clear evidence of reduced recruitment at the lowest observed SSBs.	$\mathbf{B}_{pa} = \mathbf{B}_{loss} * 1.4$: This is considered to be the minimum SSB required to ensure a high probability of maintaining SSB above its lowest observed value, taking into account the uncertainty of assessments.
$\mathbf{F}_{lim}$: This is the fishing mortality estimated to lead to a potential stock collapse.	$\mathbf{F}_{pa}$: This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$ and is consistent with a high probability of remaining above $\mathbf{B}_{pa}$ in the long run. It implies an equilibrium SSB of 10.6 kt, and a relatively low probability of SSB < $\mathbf{B}_{pa}$ (= 7 kt), and is within the range of historic Fs.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary limits

On the basis of the stock status, ICES advises that catches of whiting in 2007 should be the lowest possible.

Management considerations

Landings of whiting by all vessels as well as discards of whiting estimated for *Nephrops* fisheries have declined substantially since the 1990s, and whiting is now a relatively minor bycatch in the demersal fisheries. Due to the small catches and low value of the catch, a high proportion of whiting are discarded. Age profiles observed on these surveys are very steep, indicating either a continuing high mortality or some emigration effect. Fishing mortality cannot be managed by a TAC on whiting, and measures restricting landings alone will not be sufficient to allow recovery of the stock.

There are reports of significant non-reported landings and therefore the current implementation of the TAC system is not able to restrict fishing. Unless management measures are able to restrict the fishery within TAC limits they are not precautionary.

Factors affecting the fisheries and the stock

The effects of regulations

Various technical measures have been introduced in the past to mitigate bycatch of whiting in the *Nephrops* fishery, which operates on the whiting nursery grounds. It has proved difficult to evaluate the success of measures such as the mandatory use of square mesh panels in *Nephrops* trawls since 1994, as there have been very few direct observations of

size and age compositions of catches prior to discarding (much of the discards data are from fisher self-sampling schemes that do not record total catch). Experimentally these measures reduce substantially whiting discarding; however, monitoring programmes are needed to evaluate if these experimental benefits have been realised in the commercial fishery.

Due to the bycatch of cod in fisheries taking whiting, the regulations affecting Division VIIa whiting remain linked to those implemented under the Irish Sea cod recovery plan. The closure of the western Irish Sea to whitefish fishing from mid-February to the end of April, designed to protect cod, has been continued, though it is not clear to what extent these measures will protect whiting.

Similarly the extension of days-at-sea limitations into the Irish Sea in 2005 is not expected to result in a significant reduction in fishing mortality for whiting since the *Nephrops* fleet is still permitted to fish up to 21 days/month.

The minimum landing size (MLS) for whiting is 27 cm; however, discard data shows that individuals in excess of that size are also discarded.

Other factors

The stock structure of whiting in the Irish Sea is uncertain with differences in the population structure observed between the eastern and western components. However, individual whiting move between the western Irish Sea and other areas within the Irish Sea and this precludes treating different areas within the Irish Sea as containing functionally separate stocks.

It is not known if the severe decline of the population of adult whiting in the western Irish Sea represents a localised depletion of a more broadly distributed stock, or the depletion of a local sub-population. Survey catch-rates of whiting above the MLS of 27 cm have declined continuously in the western region since 1992, reflecting the rapid decline in commercial landings. Survey catch-rates in the eastern region above the MLS are much higher and the spring survey showed little or no trend over time up to 2003, but declined substantially in 2004–2006. The commercial fishery has become more concentrated in the western region in recent years as the English and Welsh fleets, which operate mainly in the east, have declined over time.

Scientific basis

Data and methods

Historically, the sampling of catch for length and age has been relatively poor for this stock. The unreliability of the catch numbers was also seen in 2004, due to a combination of low sampling levels and small landings (reported landings in 2004 were only 96.3 t, down from ~11 000 t in the late 1980s). The issues with misreporting meant that a catch-based assessment would have been unreliable.

Information from the fishing industry

Some information was available from the fishing industry. Ireland has established a trial self-sampling scheme (ECONEPH) in cooperation with the *Nephrops* fleet to augment discard sampling in the *Nephrops* fishery. The UK(NI) industry participated in an *ad hoc* workshop on Irish Sea whiting in the spring of 2005 where their information on the fishery was used to inform on the perception of the stock structure.

Uncertainties in assessment and forecast

The major deficiency is poor quality of the input data. An examination of the survey data indicates poor internal and external consistency at tracking year classes. In addition, the most recent estimates from different surveys give conflicting signals. Discard estimation and raising procedures are problematic and discard estimates may be imprecise.

Comparison with previous assessment and advice

The last analytical assessment was undertaken in 2003 based on a catch-at-age analysis, using catch estimates and the western Irish Sea survey. There was no analytical assessment carried out for this stock in 2004 and again, no analytical assessment was possible this year. The advice this year is the same as last year.

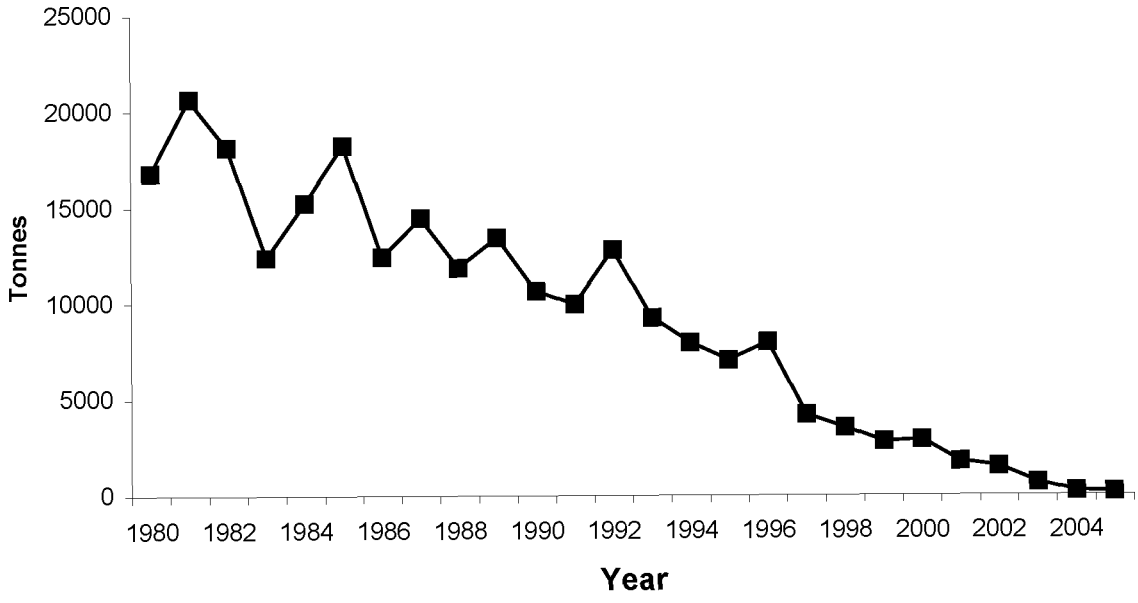
Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 9–18 May 2006 (ICES CM 2006/ACFM:30).

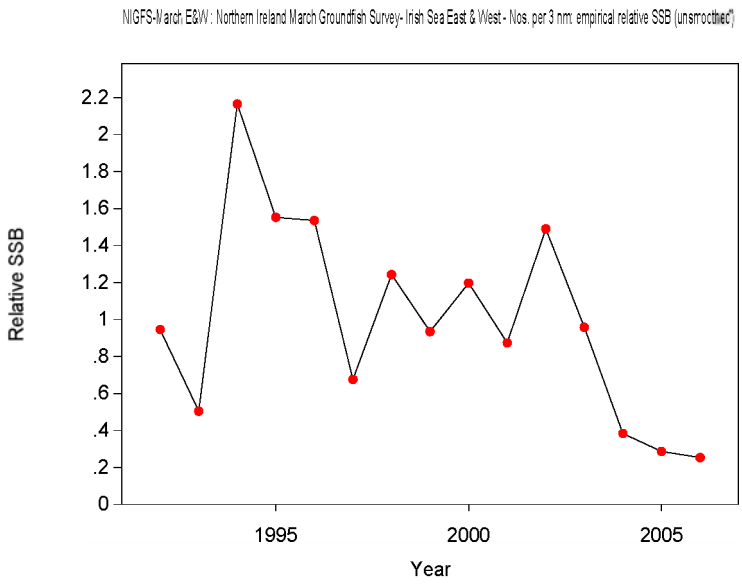
Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. To advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	Official Landings	Disc.[2]	ACFM Catch
1987	Reduce F		16.0		18.2	11.7	3.8	14.4
1988	No increase in F; enforce mesh regulations		12.0		18.2	11.5	1.9	11.9
1989	F = $\mathbf{F}_{high}$; enforce mesh regulations		11.0		18.2	11.3	2.0	13.4
1990	No increase in F; TAC		8.3[1]		15.0	8.2	2.7	10.7
1991	Increase SSB to SSB(89); TAC		6.4[1]		10.0	7.4	2.7	9.9
1992	80% of F(90)		9.7[1]		10.0	7.1	4.3	12.8[3]
1993	70% of F(91) ~ 6 500 t		6.5		8.5	6.0	2.7	9.2[3]
1994	Within safe biological limits		-		9.9	5.6	1.2	7.9[3]
1995	No increase in F		8.3[1]		8.0	5.5	2.2	7.0[3]
1996	No increase in F		9.8[1]		9.0	5.6	3.5	8.0[3]
1997	No advice given		-		7.5	4.5	1.9	4.2[3]
1998	20% reduction in F		3.8[4]		5.0	3.4	1.3	3.5[3]
1999	Reduce F below $\mathbf{F}_{pa}$		3.5[4]		4.41	2.0	1.1	2.8[3]
2000	Reduce F below $\mathbf{F}_{pa}$		<1.6[4]		2.64	1.1	2.1	2.9[3]
2001	Lowest possible F		~0		1.39	1.1	1.0	1.7[3]
2002	Lowest possible F		~0		1.00	0.7	0.7	1.5[3]
2003	Lowest possible F		~0		0.50	0.5	n/a	n/a
2004	Lowest possible F			0	0.514	0.1	n/a	n/a
2005	Lowest possible F			0	0.514			
2006		Lowest possible catch		-				
2007		Lowest possible catch		-				

Weights in '000 t.
[1]Not including discards from the *Nephrops* fishery.
[2]From the *Nephrops* fishery.
[3]Including estimates of misreporting.
[4]Landings only, no discards included.
n/a = not available.

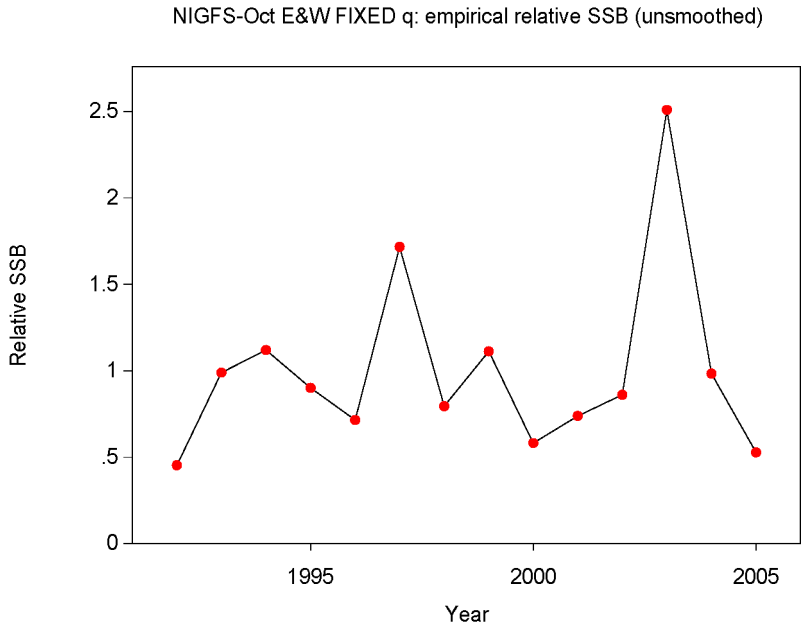
Figure 5.4.5.1 Whiting VIIa. Working group estimates of landings 1980-2005. Note landings data has prior to 2003 has been adjusted for misreporting and includes estimates of discards.



a)


NIGFS-March E&W : Northern Ireland March Groundfish Survey- Irish Sea East & West - Nos. per 3 nm: empirical relative SSB (unsmoothed)
Relative SSB
2.2
2
1.8
1.6
1.4
1.2
1
.8
.6
.4
.2
0
1995
2000
2005
Year

b)


NIGFS-Oct E&W FIXED q: empirical relative SSB (unsmoothed)
Relative SSB
2.5
2
1.5
1
.5
0
1995
2000
2005
Year

c)

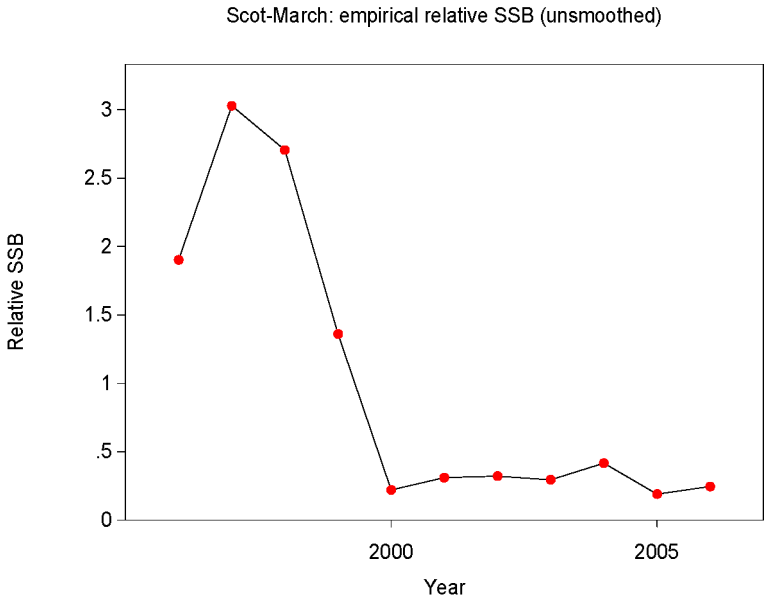


Figure 5.4.5.2 Empirical Estimates of SSB for NIGFS-March (a), NIGFS-Oct (b), and ScoGFS (c).

Table 5.4.5.1 Nominal catch (t) of WHITING in Division VIIa, 1988-2005, as officially reported to ICES and Working Group estimates of discards.

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005*
Belgium	90	92	142	53	78	50	80	92	80	47	52	46	30	27	22	13	11	9.5
France	1,063	533	528	611	509	255	163	169	78	86	81	150	59	25	33	29	8	5.61
Ireland	4,394	3,871	2,000	2,200	2,100	1,440	1,418	1,840	1,773	1,119	1,260	509	353	482	347	265	96	n/a
Netherlands									17	14	7	6	1					
UK(Engl. & Wales)[a]	1,202	6,652	5,202	4,250	4,089	3,859	3,724	3,125	3,557	3,152	1,900	1,229	670	506	284	130	82	
Spain																85		
UK (Isle of Man)	15	26	75	74	44	55	44	41	28	24	33	5	2	1	1	1	1	
UK (N.Ireland)	4,621																	
UK (Scotland)	107	154	236	223	274	318	208	198	48	30	22	44	15	25	27	31	6	
UK																		47.1
Total human consumption	11,492	11,328	8,183	7,411	7,094	5,977	5,637	5,465	5,581	4,472	3,355	1,989	1,130	1,066	714	554	204	62.21
Estimated Nephrops fishery discards used by the WG[b]	1,611	2,103	2,444	2,598	4,203	2,707	1,173	2,151	3,631	1,928	1,304	1,092	2,118	1,012	740	n/a	n/a	n/a
Working Group Estimates	11,856	13,408	10,656	9,946	12,791	9,230	7,936	7,044	7,966	4,205	3,533	2,762	2,880	1,745	1,487	676	184	158

[a] 1989-2002 Northern Ireland included with England and Wales.
[b] Based on UK(N. Ireland) and Ireland data.
* Preliminary.

5.4.6 Whiting in Divisions VIIe–k

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	Overexploited	

The available information is inadequate to evaluate the spawning stock in relation to precautionary approach reference points. The assessment is indicative of trends only. The stock is estimated to have declined in recent years as the strong 1999 year class passed through the fishery. There are some indications that recent recruitment has been low and stable. Fishing mortality was very high during the 1980s and decreased in the early 1990s; the estimates of recent fishing mortality are variable.

Management objectives

There are no specific management objectives for this stock.

Reference points

	ICES considers that:	ICES proposed that:
Limit reference points	$\mathbf{B}_{lim}$ is 15 000 t, the lowest observed spawning stock biomass.	$\mathbf{B}_{pa}$ be set at 21 000 t. Biomass above this affords a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty of the assessment.
	$\mathbf{F}_{lim}$ is not defined.	$\mathbf{F}_{pa}$ not proposed.

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 2–5	Yield/R	SSB/R
Average last 3 years	0.533	0.185	0.538
$\mathbf{F}_{max}$	1.360	0.188	0.338
$\mathbf{F}_{0.1}$	0.160	0.157	1.001
$\mathbf{F}_{med}$	0.734	0.187	0.456

Technical basis

$\mathbf{B}_{lim} = \mathbf{B}_{loss}$.	$\mathbf{B}_{pa} = \mathbf{B}_{lim} * 1.4$.
$\mathbf{F}_{lim}$ not proposed.	$\mathbf{F}_{pa}$ not proposed.

Single-stock exploitation boundaries

Exploitation boundaries in relation to management plan

There is no management plan for this stock.

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

Although uncertain it is likely that the current fishing mortality is above a fishing mortality that would lead to high long-term yields ($\mathbf{F}_{0.1}$). Fishing at a lower mortality would lead to higher SSB and therefore lower the risk of bringing the stock outside precautionary limits.

Exploitation boundaries in relation to precautionary limits

Although the current estimates of F and SSB are uncertain, F in recent years has been reduced and SSB is probably above $\mathbf{B}_{pa}$. In this context the stock should be managed by ensuring that the effort is not allowed to increase.

Management considerations

The assessment area covers Divisions VIIe–k and the ICES advice applies to these areas; however, this does not correspond to the TAC area. The TAC is set for Divisions VIIb–k. Within this larger area there is no control over where the catches are taken. Current management measures for Division VIIe–k include whiting in Division VIIbc and whiting in Division VIId. Whiting in Division VIId is assessed together with whiting in the North Sea (Subarea IV). Landings for VIIbc are given in Table 5.4.6.2.

A considerable part of the whiting catch is discarded. Any measure to reduce discarding and to improve the fishing pattern should be encouraged. Such measures might include increased cod-end mesh size, square mesh panels, separator trawls, and increased top sheet mesh in towed gears.

Whiting are taken in a mixed demersal trawl fishery with cod, haddock, plaice, and *Nephrops*, and management advice needs to be considered in that context.

Whiting are a relatively low-value species and targeting practices in the fishery are highly dependent on availability and market demand. In the past the TAC has been substantially higher than the realized catches and has not been restricting the fishery. There is some evidence that other species have been misreported as whiting in 2004 in some fleets.

Ecosystem considerations

The main spawning areas of whiting in the Western Channel and Celtic Sea are off Start Point (VIIe), off Trevose Head (VIIf), and southeast of Ireland (VIIg).

Returns of adult whiting tagged in the Western Channel indicated more movement into the Celtic Sea than between the Western and Eastern Channel. Whiting released in the Bristol Channel moved south and west towards the two spawning grounds off Trevose Head and southeast of Ireland. There was no evidence of emigration out of the Celtic Sea area. Tagging experiments have indicated movement of whiting from the Irish Sea VIIa into the Celtic Sea.

Factors affecting the fisheries and the stock

Celtic Sea whiting are taken in mixed species (cod, whiting, hake, *Nephrops*) fisheries. French trawlers account for about 60% of the total landings, Ireland takes about 30%, and the UK (England and Wales) 7%, while Belgian vessels take less than 1%. The French *Nephrops* trawlers have for several years adopted a larger mesh, following bycatch restrictions and market demand for larger *Nephrops*.

The main Irish fleets in Divisions VIIf,g,h are inshore and offshore otter trawlers and seiners based in Dunmore East and Kilmore Quay. However, in recent years there has been an increase in the number of Irish beamers (+6 vessels) offshore in Division VIIg, targeting anglerfish and megrim with whiting as bycatch. Irish landings of whiting from Division VIIj–k are taken in both a mixed fisheries (cod/whiting/anglerfish/megrim and *Nephrop*s) and in a directed fishery in the first quarter.

The main UK fisheries in Divisions VIIe–h are inshore between Newlyn and Salcombe and off the north Cornish coast, the bulk of the landings (> 60%) being made in the winter months between November and March. UK landings in the 1950s were 4–5 times higher than at present. The main gears used in the Western Channel are otter trawls targeting a wide range of species, and beam trawls targeting sole, anglerfish, and plaice.

The effects of regulations

The stock is managed by a TAC and technical measures. Technical measures applied to this stock are a minimum landing size (≥ 27 cm) and the area-specific minimum mesh sizes applicable to the mixed demersal fisheries. There is substantial discarding above the minimum landing size due to economic or other factors.

Management regulations, particularly effort control regimes in other areas (VIIa, VI, & IV), became increasingly restrictive in 2004 and 2005 and have resulted in a displacement of effort into the Celtic Sea.

Council Regulation (EC) No. 27/2005, Annex III, part A 12 (b) prohibited fishing in ICES rectangles 30E4, 31E4, and 32E3 during January–March 2005. This restriction did not apply to beam trawlers during March. The effect of the closure of the three rectangles during the fist quarter of 2005 cannot yet be quantified.

Council Regulation (EC) No. 51/2006, Annex III, part A 4.2 prohibited fishing in ICES rectangles 30E4, 31E4 and 32E3 during February–March 2006 for all vessels and gears (except within 6 nautical miles of the baseline).

Changes in fishing technology and fishing patterns

Fishing effort for the French fleets operating in the three closed rectangles was mainly displaced to other fishing grounds outside the Celtic Sea and to areas within the Celtic Sea. The impact on whiting has not been evaluated. Some vessels have also switched to another métier, targeting anglerfish and megrim in the rest of the Celtic Sea.

The 2006 WGFTFB report identifies a number of issues in relation to the fleets fishing in the Celtic sea. Due to elevated fuel costs a number of fleets have changed their fishing practices, with some skippers steaming to and from fishing grounds at reduced speed as well as experimenting with gear designs to improve fuel efficiency. There has also been an Irish decommissioning scheme, whereby around 40 fishing vessels (~6000 GT, 18 000 kW) have been permanently withdrawn from the Irish fishing fleet and removed from the Register of Sea Fishing Vessels in 2005 and 2006.

Scientific basis

Data and methods

Analytical assessment based on catch-at-age (landings only) data, commercial CPUE, and survey data.

Information from the fishing industry

Meetings with representatives of the fishing industry were held prior to WGSSDS2006 in Ireland and the UK. No specific concerns were raised about the state of this stock or its assessment. It has been noted by the FSP surveys that a relatively broad range of age classes of whiting has been present in both the eastern and western region of the Celtic Sea with fish up to six years of age being relatively abundant.

Uncertainties in assessment and forecast

Discarding is considered to be significant and the assessment does not include discard information. Not including discards biases the recruit estimates. There are conflicting signals and considerable noise in the survey data as well as some concerns about the accuracy of the landings statistics in some fleets. These factors mean that no reliable assessment and forecast could be provided. The assessment can only be considered indicative of gross trends in stock productivity and exploitation.

Comparison with previous assessment and advice

The current assessment was only indicative for stock trends and was rejected for current estimates because of conflicting signals in different tuning fleets. No reliable forecast could be presented this year.

The advice last year was based on $\mathbf{F}_{sq}$ from a short-term forecast. The advice this year is based on no increase in effort, which is consistent with last year's advice.

Source of information

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, July 2006 (ICES CM 2007/ACFM:01).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC[1]	ACFM Landings
1987	*Status quo* F; TAC	7.1[2]		12.7
1988	Precautionary TAC	7.0[2]		13.6
1989	Precautionary TAC	7.9[2]		16.5
1990	No increase in F; TAC	8.4[2]		14.1
1991	Precautionary TAC	8.0[2]		13.5
1992	If required, precautionary TAC	8.0[2]		12.4
1993	Within safe biological limits	6.6[2]	22.0	16.3
1994	Within safe biological limits	< 9.4[2]	22.0	20.0
1995	20% reduction in F	8.2[3]	25.0	22.7
1996	20% reduction in F	8.6[3]	26.0	18.3
1997	At least 20% reduction in F	< 7.3[4]	27.0	20.5
1998	At least 20% reduction in F	< 8.2[4]	27.0	19.2
1999	No increase in F	12.4[4]	25.0	19.9
2000	17% reduction in F	< 13.1[4]	22.2	14.9
2001	No increase in F	13.5[4]	21.0	12.9
2002	No increase in F	27.7[4]	31.7	13.1
2003	No increase in F	20.2[4]	31.7	10.4
2004	No increase in F	14.0	27.0	9.6
2005	No increase in F	10.6	21.6	12.6
2006	No increase in F	10.8	19.9	
2007	No increase in F	-		

Weights in t.
[1] TAC covers Subarea VII (except Division VIIa).
[2] For the VIIf+g stock component.
[3] For the VIIf–h stock component.
[4] For the VIIe–k stock component.

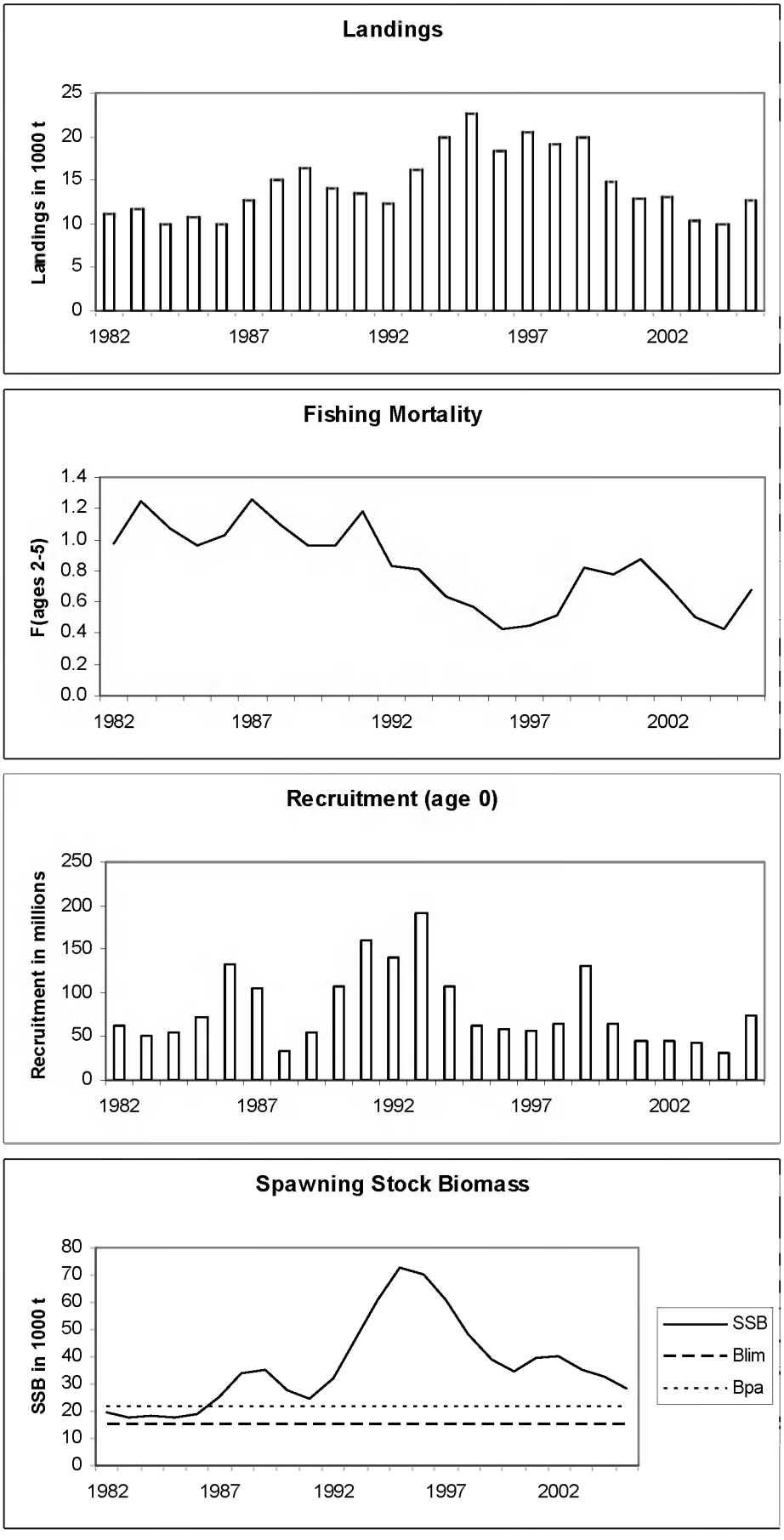
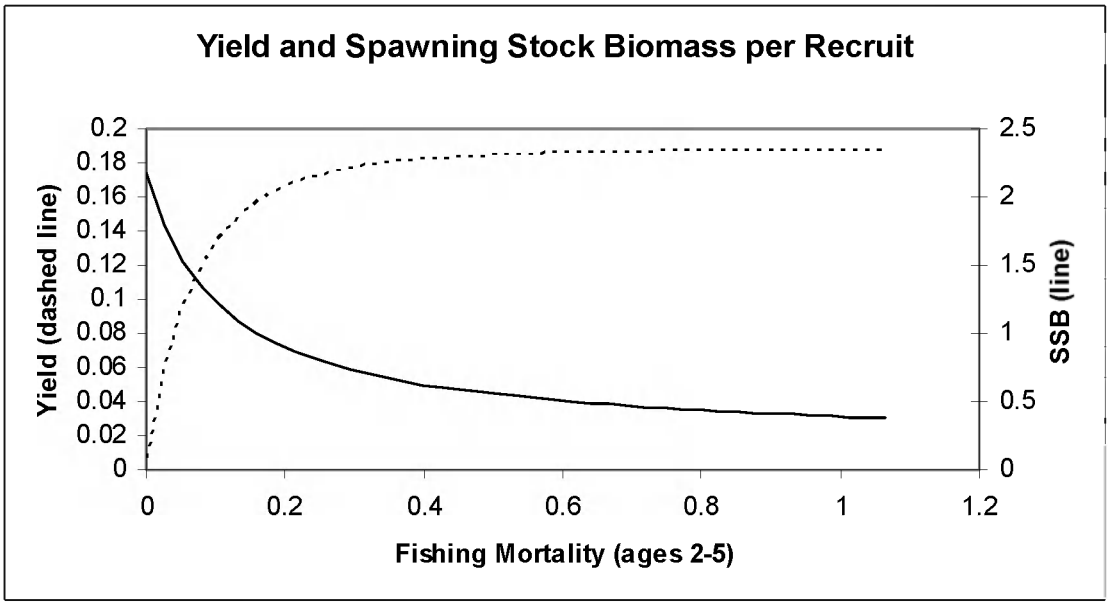


Figure 5.4.6.1 Whiting in Divisions VIIe–k. Landings, fishing mortality, recruitment and SSB.



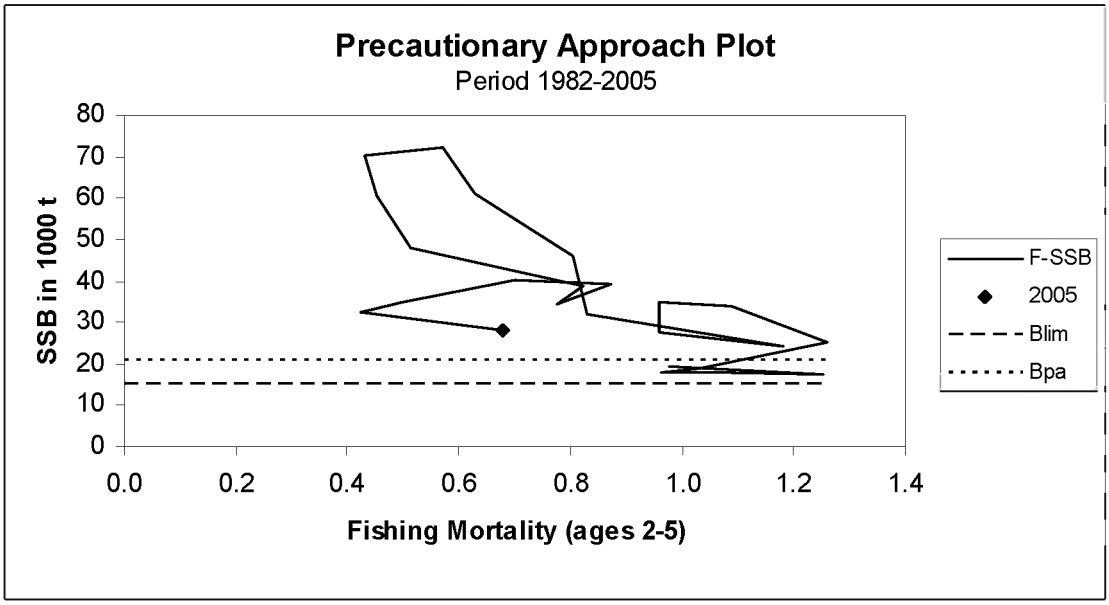


Figure 5.4.6.2 Whiting in Divisions VIIe–k. Stock and recruitment; Yield and SSB per recruit.

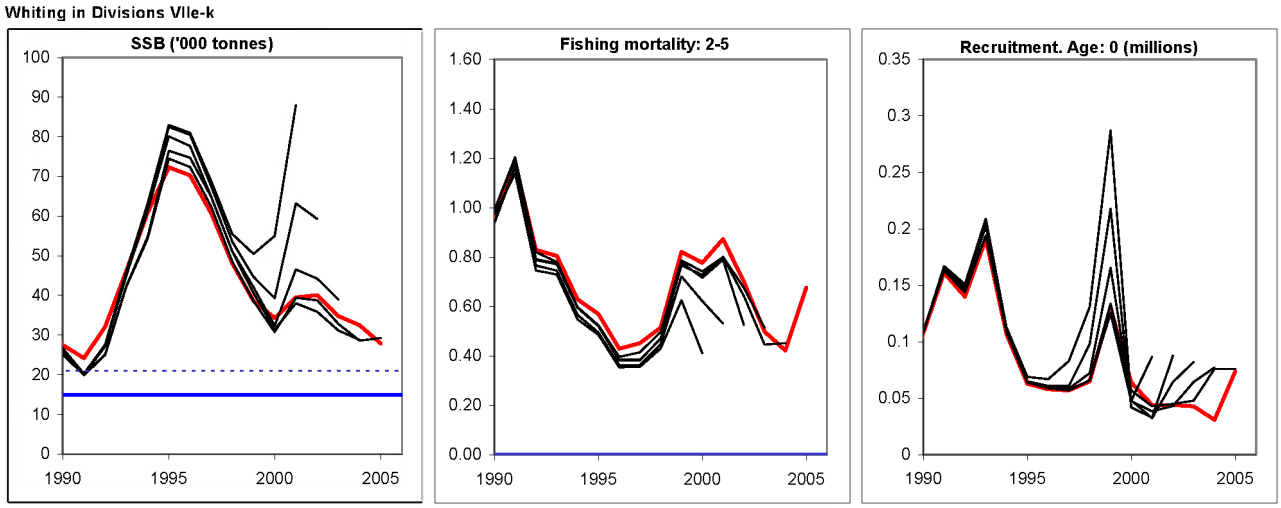


Figure 5.4.6.3 Whiting in Divisions VIIe–k. Historical performance of the assessment (SSB, fishing mortality, and recruitment).

Table 5.4.6.1 WHITING in Divisions VIIe–k. Nominal landings (t) as reported to ICES, and total landings as used by the Working Group.

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003[c]	2004	2005
Belgium	135	161	167	107	111	159	296	308	292	107	145	228	205	268	449	479	448	194	171	149	129	180	218
France	8,982	7,171	7,820	7,647	10,054	11,410	12,171	10,464	9,956	9,165	10,771	12,634	13,400	9,936	11,370	11,711[a]	16,418[b]	9,077[a]	7,203[a]	7,435[a]	5,897	4,811	4,681
Germany										14													
Ireland	1,487	1,301	2,241	1,309	1,452	398	2,817	1,478	1,258	1,691	3,631	5,618	6,077	6,115	6,893	5,226	5,807	4,795	5,008	5,332	4,093	4,215	NA
Netherlands		398		124										8		1			5	4	9	18	60
Spain													4	31	24	53	21	11	9	12		76	
UK (E/W/NI)	1,177	954	610	765	1,035	1,598	1,252	1,782	1,969	1,379	1,756	1,548	1,804	1,728	1,742	1,709	1,346	1,252	946	844	762	586	469
UK(Scotland)						1	5	74	33	8	17	6	23	34	42	68	3	2	11	12	5	7	
Total	11,781	9,985	10,838	9,952	12,652	13,566	16,541	14,106	13,508	12,364	16,320	20,034	21,513	18,120	20,520	19,247	24,043	15,331	13,353	13,788	10,895	9,893	5,428
Unallocated	0	0	0	0	0	1,562	0	0	0	0	0	0	1,165	140	12	-2	-4,126	-421	-498	-705	460	78	7,125
Total as used by Working Group	11,781	9,985	10,838	9,952	12,652	15,128	16,541	14,106	13,508	12,364	16,320	20,034	22,678	18,260	20,532	19,245	19,917	14,910	12,855	13,083	10,435	9,971	12,553

a: Preliminary.
b: Preliminary. Reported as VIIb–k.
c: As available from Eurostat in June 2005 (http://www.europa.eu.int/comm/eurostat).

Table 5.4.6.2 Nominal landings (t) of whiting in Division VIIb,c for 1995–2005.

COUNTRY	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
France	57	76	65	37*	…[1]	107	114	111	92	59	87
Ireland	1,894	1,233	403	323	206	563	357	386	423	135	NA
Netherlands	-	-	-	-	-	-	2	-	3		
Spain	+	+	-	27	1	4	-	6		31	2
UK(E/W/NI)	24	96	75	49	10	6	5	4	5	1	
UK(Scotland)	71	17	4	27	-	19	1	+	-		10.8
TOTAL	**2,046**	**1,422**	**547**	**463**	**217**	**699**	**479**	**507**	**523**	**226**	**99.8**

[1]**See VIIg–k.**

Table 5.4.6.3 Whiting in Divisions VIIe-k

Year	Recruitment Age 0 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-5
1982	62000	19300	11200	0.975
1983	50000	17400	11800	1.252
1984	54000	17900	10000	1.077
1985	72000	17800	10800	0.961
1986	133000	18800	10000	1.030
1987	105000	25000	12700	1.261
1988	33000	33900	15100	1.089
1989	55000	34800	16500	0.960
1990	108000	27500	14100	0.960
1991	161000	24200	13500	1.180
1992	140000	32100	12400	0.829
1993	191000	46200	16300	0.805
1994	107000	60900	20000	0.629
1995	63000	72300	22700	0.570
1996	58000	70300	18300	0.429
1997	57000	60800	20500	0.452
1998	65000	48100	19200	0.515
1999	130000	38700	19900	0.821
2000	64000	34300	14900	0.777
2001	44000	39500	12900	0.873
2002	44000	40100	13100	0.701
2003	43000	34800	10400	0.499
2004	31000	32500	10000	0.422
2005	74000	27900	12600	0.677
Average	81000	36463	14538	0.823

5.4.7 Plaice in Division VIIa (Irish Sea)

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 sustainably	Harvested sustainably	Harvested sustainably	

Based on the most recent estimate of SSB and fishing mortality, ICES classifies the stock as having full reproductive capacity and being harvested sustainably. The SSB in 2005 was above $\mathbf{B}_{pa}$ and average fishing mortality in the last three years has been below $\mathbf{F}_{pa}$. Fishing mortality on this stock has been maintained above $\mathbf{F}_{pa}$ for much of the time-series, but declined through the 1990s. SSB has been above $\mathbf{B}_{pa}$ throughout the period of assessment.

Management objectives

There are no explicit management objectives for this stock.

Reference points

	ICES considers that:	ICES proposed that:
Limit reference points	$\mathbf{B}_{lim}$ is not defined.	$\mathbf{B}_{pa}$ be set at 3100 t.
	$\mathbf{F}_{lim}$ is not defined.	$\mathbf{F}_{pa}$ be set at 0.45.
Target reference points		$\mathbf{F}_{y}$ not defined.

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 3–6	Yield/R	SSB/R
Average last 3 years	0.12	0.20	1.45
$\mathbf{F}_{max}$	0.36	0.23	0.64
$\mathbf{F}_{0.1}$	0.13	0.21	1.43
$\mathbf{F}_{med}$	0.52	0.23	0.49

Technical basis

$\mathbf{B}_{lim}$: There is no biological basis for defining B_{lim} as the stock-recruitment data are uninformative.	$\mathbf{B}_{pa} = \mathbf{B}_{loss}$.
$\mathbf{F}_{lim}$: There is no biological basis for defining $\mathbf{F}_{lim}$ as $\mathbf{F}_{loss}$ is poorly defined.	$\mathbf{F}_{pa} = \mathbf{F}_{med}$ in a previous assessment, and in long-term considerations. This is considered to provide a high probability that SSB remains above $\mathbf{B}_{loss}$ in the long term.

Single-stock exploitation boundaries

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

Fishing mortality is estimated to be below $\mathbf{F}_{max}$ (0.36) and to be close to $\mathbf{F}_{0.1}$ (0.13). There will be little gain to the long-term yield by increasing fishing mortalities above current levels. Fishing at $\mathbf{F}_{0.1}$ is expected to lead to landings of 2100 t in 2007.

Exploitation boundaries in relation to precautionary limits

In order to harvest the stock within precautionary limits, fishing mortality should be kept below $\mathbf{F}_{pa}$ (0.45). This corresponds to catches of less than 6500 t in 2007 and will lead to a reduction in SSB to 11 900 t in 2008.

Short-term implications

Outlook for 2007

Basis: F(2006) = $\mathbf{F}_{sq}$ = mean F(03–05) = 0.126; R06–08 = GM64–03 = 12 630 million; SSB(2006) = 13 940 t; SSB(2007) = 15 100 t; landings (2006) = 1990 t.

Rationale	TAC(2007) [1]	Basis	F(2007)	SSB(2008)
Zero catch	0	F=0	0	18035
High long-term yield	2122	F(0.1/long-term yld)		16007
Status quo	891	$\mathbf{F}_{sq}$ *0.4	0.050	17186
	1106	$\mathbf{F}_{sq}$ *0.5	0.063	16981
	1318	$\mathbf{F}_{sq}$ *0.6	0.075	16779
	1528	$\mathbf{F}_{sq}$ *0.7	0.089	16579
	1734	$\mathbf{F}_{sq}$ *0.8	0.101	16383
	1938	$\mathbf{F}_{sq}$ *0.9	0.113	16189
	2139	$\mathbf{F}_{sq}$	0.126	15998
	2338	$\mathbf{F}_{sq}$ *1.1	0.138	15810
Precautionary Limits	1587	TAC($\mathbf{F}_{pa}$)*0.2	0.09	16522
	2919	TAC($\mathbf{F}_{pa}$)*0.4	0.18	15263
	4169	TAC($\mathbf{F}_{pa}$)*0.6	0.27	14083
	5338	TAC($\mathbf{F}_{pa}$)*0.8	0.36	12983
	6425	$\mathbf{F}_{pa}$ (~3.6* $\mathbf{F}_{sq}$)	0.45	11962
	7430	TAC ($\mathbf{F}_{pa}$) *1.2	0.54	11022
	8354	TAC ($\mathbf{F}_{pa}$) *1.4	0.63	10162
	9196	TAC ($\mathbf{F}_{pa}$) *1.6	0.72	9381
	9956	TAC ($\mathbf{F}_{pa}$) *1.8	0.81	8681

Weights in t.
[1]It is assumed that landings in 2006 correspond to $\mathbf{F}_{sq}$.
Shaded scenarios are not considered consistent with the precautionary approach.

Management considerations

Average fishing mortality in the last three years has been below $\mathbf{F}_{pa}$ and no long-term gains are obtained by increasing the current fishing mortality towards $\mathbf{F}_{pa}$.

Plaice are taken in a mixed demersal fishery. The regulations affecting plaice and other demersal stocks in Division VIIa remain linked to those implemented under the Irish Sea cod recovery plan.

Scientific basis

Data and methods

The assessment is based on a catch-at-age analysis, using landings data and data from one age-disaggregated and two biomass surveys. Landings are at the lowest level in the time-series, but information on misreporting is not available. Discard levels are substantial in the fishery, but are not currently incorporated into the assessment.

Uncertainties in assessment and forecast

There are conflicting signals in the survey and commercial tuning fleet indices. The commercial tuning fleet indices are not used in the assessment. The assessment may thus be biased, but it is not known to what extent. Surveys indicate a substantial increase in abundance of plaice in recent years that is not apparent from commercial catch data. The assessment is strongly influenced by survey trends and the resulting estimates of rapidly increasing stock biomass should be treated with some caution until the discrepancy between these two data sources can be better explained.

Discards are not currently incorporated into the assessment. The results of preliminary analyses indicate that the current perception of exploitation levels is not dramatically revised when estimates of discard levels are included. However, discard levels are substantial in this fishery and methods for estimating previous discard levels are still being investigated. Systematic collection of discard information is required for improved assessment and advice.

Comparison with previous assessment and advice

This year's assessment is in line with last year's assessment and indicates an optimistic view of the status of the stock, suggesting $\mathbf{F}_{sq}$ is at $\mathbf{F}_{0.1}$ and SSB is at the highest observed levels in the time-series. These trends are consistent with last year's assessment although F values for the final year have been revised upwards marginally. The basis of the advice is the same as last year.

Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 9–18 May 2006 (ICES CM 2006/ACFM:30).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. To advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	Official landings	ACFM Landings
1987	F high; no long-term gains in increasing F		5.0		5.0	5.6	6.2
1988	No increase in F		4.8		5.0	4.4	5.0
1989	80% of F(87); TAC		5.8		5.8	4.2	4.4
1990	Halt decline in SSB; TAC		5.1		5.1	4.0	3.3
1991	Rebuild SSB to SSB(90); TAC		3.3		4.5	2.8	2.6
1992	70% of F(90)		3.0		3.8	3.2	3.3
1993	F = 0.55 ~ 2800 t		2.8		2.8	2.0	2.0
1994	Long-term gains in decreasing F		<3.7		3.1	2.1	2.1
1995	Long-term gains in decreasing F		2.4[1]		2.8	2.0	1.9
1996	No long-term gain in increasing F		2.5		2.45	1.9	1.7
1997	No advice		-		2.1	2.0	1.9
1998	No increase in F		2.4		2.4	1.8	1.8
1999	Keep F below $\mathbf{F}_{pa}$		2.4		2.4	1.6	1.6
2000	Keep F below $\mathbf{F}_{pa}$		<2.3		2.4	1.5	1.4
2001	Keep F below $\mathbf{F}_{pa}$		<2.4		2.0	1.5	1.5
2002	Keep F below $\mathbf{F}_{pa}$		<2.8		2.4	1.5	1.6
2003	No increase in F		1.9		1.675	1.5	1.5
2004	[2]	$F<\mathbf{F}_{pa}$		1.6	1.34	1.1	1.1
2005	[2]	$F<\mathbf{F}_{pa}$		2.97	1.608	1.0	1.2
2006	[2]	$F<\mathbf{F}_{pa}$		5.9	1.608		
2007		$F<\mathbf{F}_{pa}$		6.5			

Weights in '000 t.
[1] Catch at *status quo* F.
[2] Single-stock boundary, the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

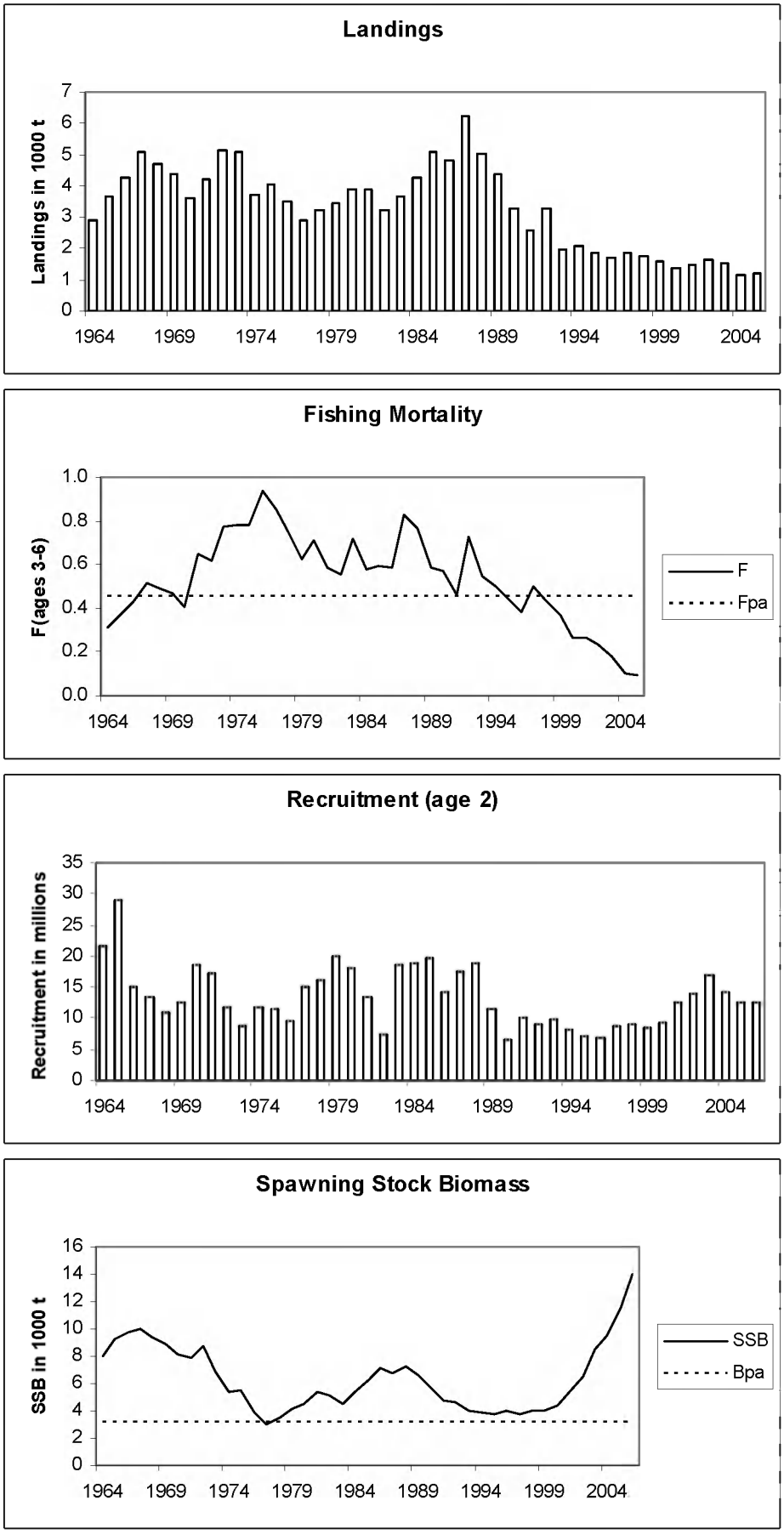
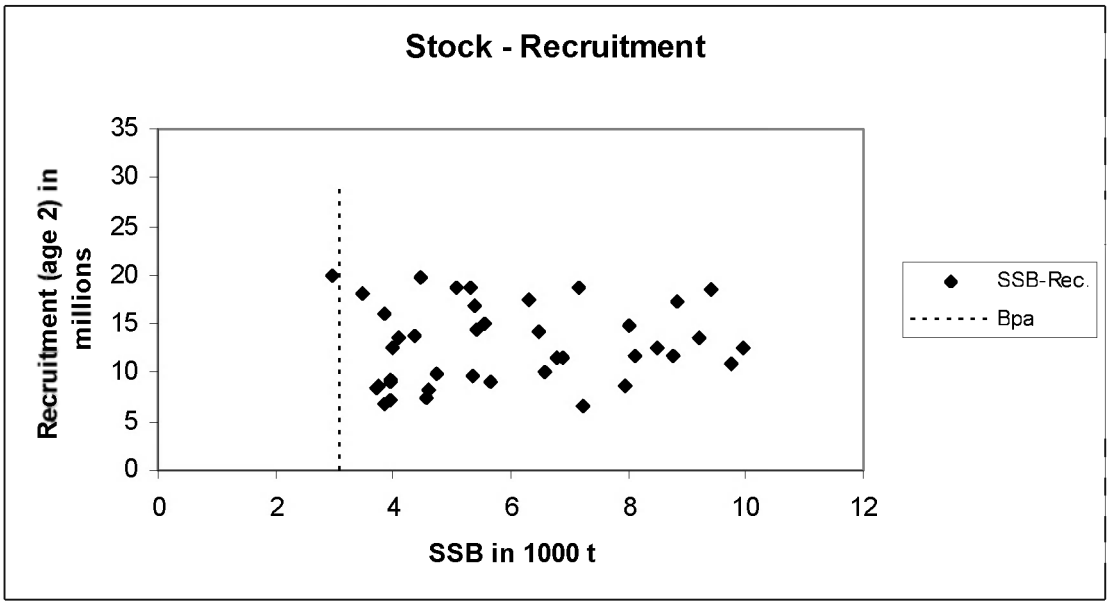
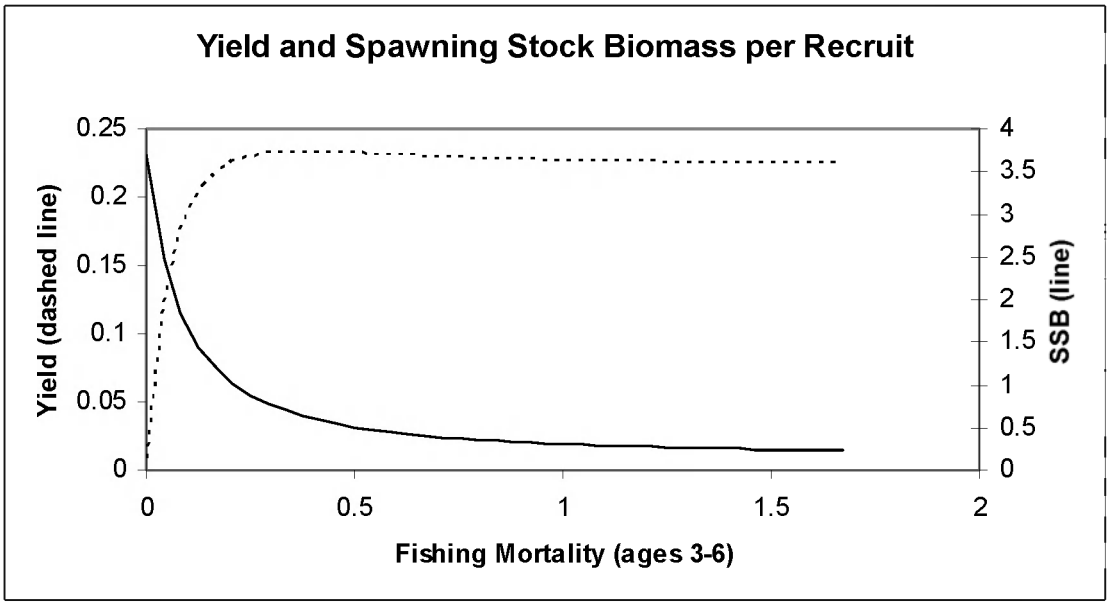


Figure 5.4.7.1 Plaice in Division VIIa (Irish Sea). Landings, fishing mortality, recruitment and SSB.





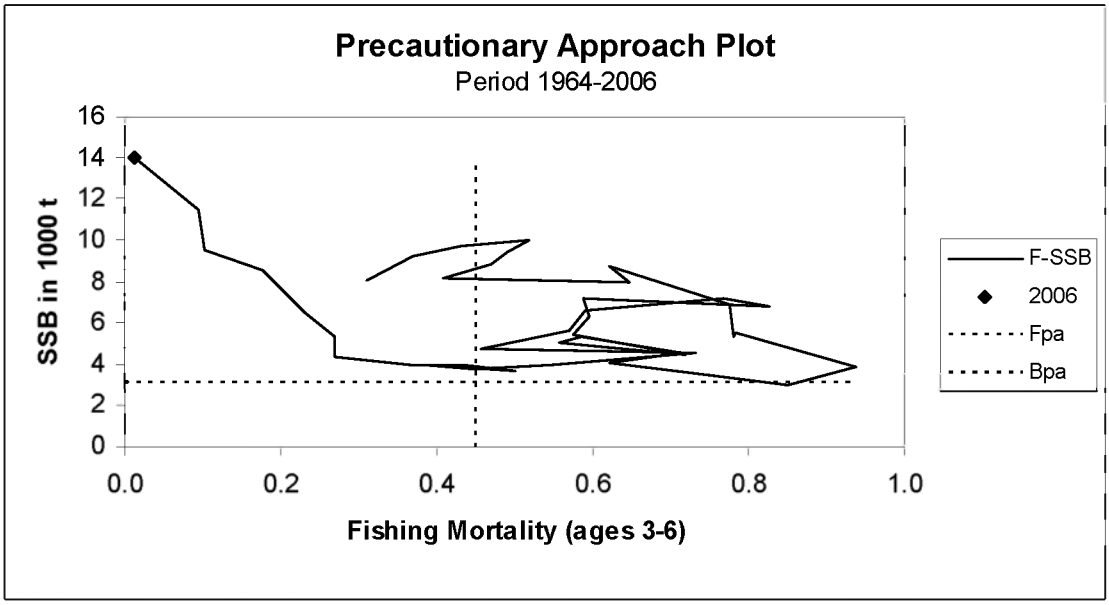


Figure 5.4.7.2 Plaice in Division VIIa (Irish Sea). Stock and recruitment; Yield and SSB per recruit.

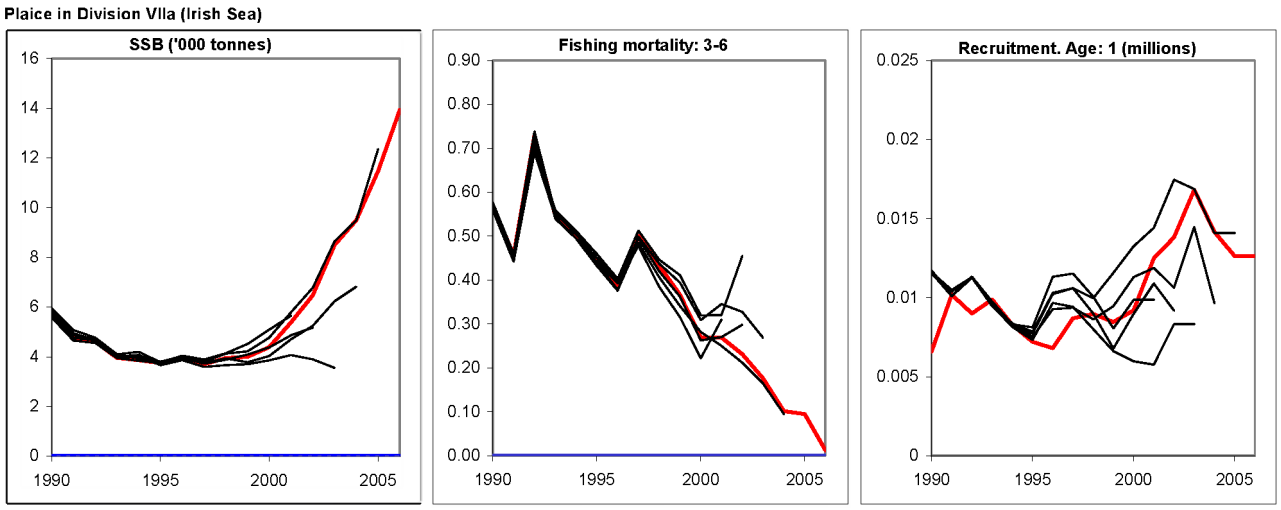


Figure 5.4.7.3 Plaice in Division VIIa. Historical performance of the assessment (SSB, fishing mortality, and recruitment).

Table 5.4.7.1 Nominal landings (t) of PLAICE in Division VIIa as officially reported to ICES.

Country	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Belgium	321	128	332	327	344[3]	459	327	275	325	482	636	628	431	566
France	42	19	13	10	11	8	8	5	14	9[1]	8	7	2	7
Ireland	1,355	654	547	557	538	543	730	541	420	378	370	490	328	
Netherlands	-	-	-	-	69	110	27	30	47	-	-	-		
UK (Eng.&Wales)[2]	1,381	1,119	1,082	1,050	878	798	679	687	610	607	569	409	369	421
UK (Isle of Man)	24	13	14	20	16	11	14	5	6	1	1	1	0	1
UK (N. Ireland)	…	…	…	…	…	…	…	…	…	…	…	…	…	…
UK (Scotland)	70	72	63	60	18	25	18	23	21	11	7	9	4	
UK (Total)														
Total	3,193	2,005	2,051	2,024	1,874	1,954	1,803	1,566	1,443	1,488	1,591	1,544	1,134	995
Discards	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unallocated	74	-9	15	-150	-167	-83	-38	34	-72	-15	31	10	-19	226
Total figures used by the Working Group for stock assessment	3,267	1,996	2,066	1,874	1,707	1,871	1,765	1,600	1,371	1,473	1,622	1,554	1,115	1,221

[1]Provisional.
[2]Northern Ireland included with England and Wales.
{UK (Total) excludes Isle of Man data}.

Table 5.4.7.2 Plaice in Division VIIa (Irish Sea).

Year	Recruitment Age 2 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-6
1964	21560	8021	2879	0.3094
1965	28910	9194	3664	0.3692
1966	14910	9739	4268	0.4311
1967	13530	9953	5059	0.5172
1968	10870	9398	4695	0.4896
1969	12470	8823	4394	0.4705
1970	18510	8111	3583	0.4084
1971	17250	7936	4232	0.6472
1972	11810	8771	5119	0.6194
1973	8722	6900	5060	0.7749
1974	11690	5347	3715	0.7784
1975	11490	5562	4063	0.7826
1976	9635	3844	3473	0.9351
1977	14980	2958	2904	0.8478
1978	16120	3482	3231	0.7466
1979	20030	4075	3428	0.6216
1980	18160	4556	3903	0.7136
1981	13520	5315	3906	0.5854
1982	7363	5067	3237	0.5575
1983	18680	4471	3639	0.7179
1984	18740	5419	4241	0.5746
1985	19740	6295	5075	0.5952
1986	14350	7157	4806	0.5883
1987	17540	6793	6220	0.8261
1988	18780	7216	5005	0.7654
1989	11470	6589	4372	0.5893
1990	6581	5666	3275	0.5687
1991	10190	4736	2554	0.4572
1992	9002	4605	3267	0.7300
1993	9881	3956	1996	0.5458
1994	8281	3862	2066	0.5007
1995	7202	3742	1874	0.4461
1996	6815	3959	1707	0.3842
1997	8694	3700	1871	0.4999
1998	8971	3947	1765	0.4333
1999	8459	3995	1600	0.3666
2000	9201	4380	1371	0.2691
2001	12490	5379	1473	0.2692
2002	13820	6477	1622	0.2313
2003	16820	8499	1554	0.1764
2004	14150	9493	1142	0.1015
2005	12630	11470	1221	0.0951
2006	12630	13946		
Average	13410	6344	3298	0.5198

5.4.8 Celtic Sea plaice (Divisions VIIf and g)

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
Reduced reproductive capacity	Unknown	Overexploited	

SSB peaked in 1988–1990, following a series of good year classes, then declined rapidly and has since 2000 remained around $\mathbf{B}_{lim}$. No F reference points have been defined. Fishing mortality has fluctuated around an average level (0.60) for the entire time-series. Recruitment was relatively high in most years in the 1980s, but has been lower since then. Some very weak classes have occurred since the late 1990s.

Management objectives

There are no specific management objectives for this stock.

Reference points

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 1100 t, the lowest observed spawning stock biomass $\mathbf{B}_{loss}$.	$\mathbf{B}_{pa}$ be set at 1800 t. Biomass above this affords a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty of assessments.
$\mathbf{F}_{lim}$ not defined.	$\mathbf{F}_{pa}$ not defined.

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 3–6	Yield/R	SSB/R
Average last 3 years	0.501	0.241	0.516
$\mathbf{F}_{max}$	0.315	0.247	0.853
$\mathbf{F}_{0.1}$	0.153	0.226	1.665
$\mathbf{F}_{med}$	0.533	0.240	0.483

Technical basis

$\mathbf{B}_{lim}=\mathbf{B}_{loss}$.	$\mathbf{B}_{pa}= \mathbf{B}_{lim} * 1.64$.
$\mathbf{F}_{lim}$=Not defined.	$\mathbf{F}_{pa}$ not defined.

Single-stock exploitation boundaries

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

Target reference points have not been agreed for this stock. A candidate for a target reference point which is 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 $\mathbf{F}_{0.1}$ (0.15) and $\mathbf{F}_{max}$ (0.31). There is no gain in yield to have a target above this level. Current F is estimated to be 0.35.

Exploitation boundaries in relation to precautionary considerations

A 50% reduction in F is needed to increase SSB to around $\mathbf{B}_{pa}$ in 2008. This corresponds to landings of less than 380 t in 2007.

If such a large reduction in F is not achievable in the short term, ICES recommends that a recovery plan be developed. This plan should include a sustained reduction of fishing mortality to rebuild the stock above $\mathbf{B}_{pa}$ in the medium term. Catch and effort reductions are required to promote such a reduction in fishing mortality.

Short-term implications

Outlook for 2007

Basis: F(2006) = $\mathbf{F}_{sq}$ = mean F(03–05) = 0.5; R06–07 = GM89–04 = 3.1 million; SSB(2006) = 1.28 kt; SSB(2007) = 1.41 kt; landings (2006) = 0.63 kt.

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 0.31.

Rationale	TAC(2007) (1)	Basis	F(2007)	SSB(2008)	%SSB change	%TAC change
Zero catch	0.00	F=0	0.00	2.16	53%	-100%
Status quo	0.69	$\mathbf{F}_{sq}$	0.50	1.51	7%	44%
High long-term yield	0.46	F(long-term yield)	0.31	1.72	22%	-4%
Status quo	0.08	$\mathbf{F}_{sq}$*0.1	0.05	2.08	47%	-83%
	0.24	$\mathbf{F}_{sq}$*0.31	0.16	1.93	36%	-49%
	0.38	$\mathbf{F}_{sq}$*0.5	0.25	1.80	27%	-20%
	0.54	$\mathbf{F}_{sq}$*0.75	0.38	1.64	16%	14%
	0.63	$\mathbf{F}_{sq}$*0.9	0.45	1.56	10%	33%
	0.69	$\mathbf{F}_{sq}$*1	0.50	1.51	7%	44%
	0.74	$\mathbf{F}_{sq}$*1.1	0.55	1.45	3%	56%
	0.82	$\mathbf{F}_{sq}$*1.25	0.63	1.38	-2%	72%

All weights in thousand tonnes.

(1) It is assumed that the TAC will be implemented and that the landings in 2007 therefore correspond to the TAC.

Shaded scenarios are not considered consistent with the precautionary approach.

Management considerations

The TACs have been gradually reduced over the last 20 years in line with ICES advice. Nevertheless, fishing mortality has remained stable and high. This could be caused by reduced recruitment or increased discarding of small fish. Improving the selection pattern in the fishery would be beneficial in both cases.

ICES has explored simulations with long-term target Fs below 0.65 for this stock. These indicate that when a HCR is developed for this stock, target fishing mortalities within the range of $\mathbf{F}_{0.1}$ (0.15) and $\mathbf{F}_{max}$ (0.31) are predicted to result in the highest long-term yields, whilst posing little risk of being below $\mathbf{B}_{lim}$ in the long term. When such a HCR is developed interactions between the Celtic Sea plaice and sole stock should be considered.

The high level of discarding indicated in this mixed fishery would suggest a mis-match between the mesh size employed and the size of the fish landed. Increases in the mesh size of the gear should result in fewer discards and, ultimately, in increased yield from the fishery. The use of larger-mesh gear should be encouraged in this fishery in instances where mixed fishery issues allow for it.

Ecosystem considerations

There is some evidence from tagging that plaice from the southern and western coasts of Wales move southwards to join the adult population off the north Cornish coast during spawning.

Factors affecting the fisheries and the stock

In the 1970s, the plaice fishery in Divisions VIIf,g was mainly carried out by Belgian beam trawlers and Belgian and UK otter trawlers. Effort in the UK and Belgian beam-trawl fleets increased in the late 1980s, but has since declined. Recently, many otter trawlers have been replaced by beam trawlers targeting sole. Landings gradually increased until 1989, then declined rapidly in 1991. The main fishery occurs in the spawning area off the north Cornish coast, at depths greater than 40 m, about 20 to 25 miles offshore. Although plaice are taken throughout the year, the larger landings occur during February–March after the peak of spawning, and again in September.

Regulations and their effects

Plaice in the Bristol Channel and Celtic Sea (ICES Divisions VIIf and VIIg) are managed by TAC and technical measures. Misreporting is known to occur as quotas become more restrictive.

Technical measures in force for this stock are minimum mesh sizes, minimum landing size, and restricted areas for certain classes of vessels. Technical regulations regarding allowable mesh sizes for specific target species, and associated minimum landing sizes, came into force on 1 January 2000. The minimum landing size for plaice in Divisions VIIf,g is 27 cm.

Council Regulation (EC) No. 27/2005, Annex III, part A 12 (b) prohibited fishing in ICES rectangles 30E4, 31E4, and 32E3 during January–March 2005 with the intention of reducing fishing mortality on cod. This restriction did not apply to beam trawlers during March 2005. Beam trawlers account for the vast majority of plaice landed by vessels in Divisions VIIf,g. The proportion of plaice taken from the closed area remained constant in 2005, but declined markedly in February and March 2006. Proportions taken in January and April, immediately before and after the closure, are higher than in previous years. CPUE of plaice in February and March is not dramatically reduced, reflecting the decrease in effort during this period and the fact that plaice can be caught in areas outside of the closed area. This probably had little impact on the fishing mortality on plaice.

Scientific basis

Data and methods

The analytical age-based assessment (XSA) is based on landings, one survey index, and two commercial CPUE series.

Uncertainties in assessment and forecast

This assessment is conditional on the accuracy of the commercial CPUE and total catch data. Misreporting and under-reporting of landings is suspected as quotas become more restrictive. Discards are substantial. Due to the short time-series discards are not included in the assessment.

There is a strong retrospective bias of overestimation of SSB and underestimation of fishing mortality. Recent forecasts for this stock have been overly optimistic, probably due to this bias problem. The GM assumptions of average recruitment in the most recent years contribute little to forecasted landings.

Comparison with previous assessment and advice

There has been little change in the perception of the state of the stock.

The advice for an F reduction to rebuild above $\mathbf{B}_{pa}$ or to implement a recovery/management plan is consistent with last year's advice.

Source of information

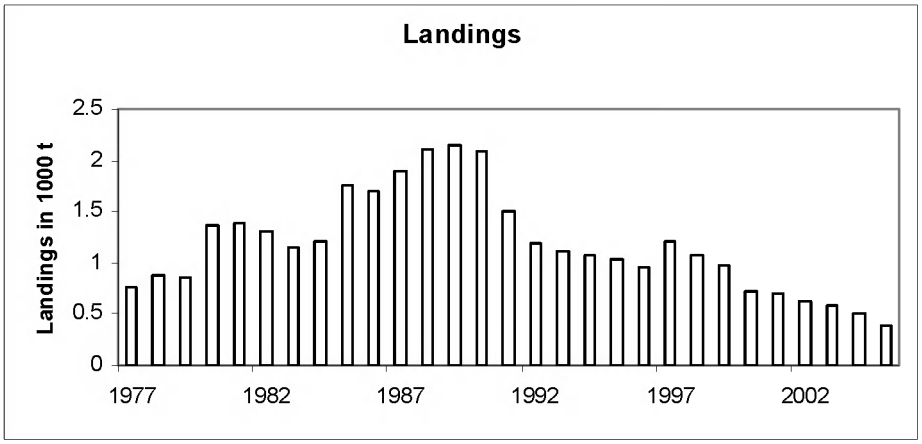
Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 27 June–6 July 2006 (ICES CM 2006/ACFM:33).

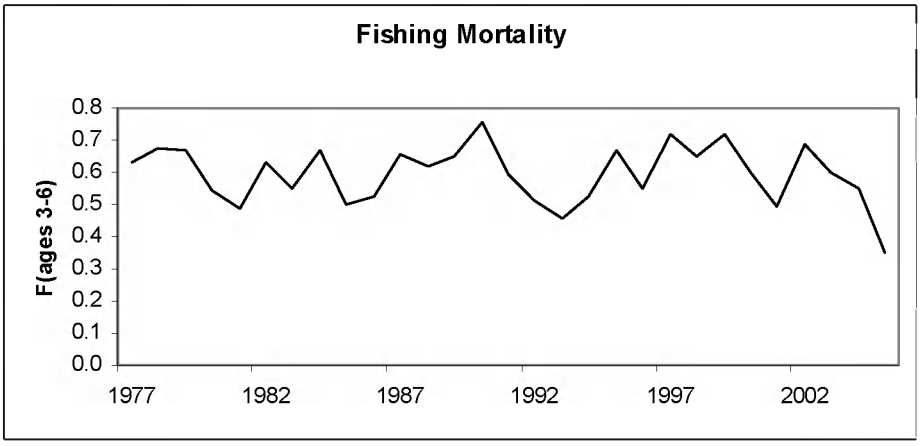
Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	Official landings	ACFM Landings
1987	TAC not to be restrictive on other species		-		1.8	1.91	1.90
1988	TAC not to be restrictive on other species		-		2.5	2.19	2.12
1989	TAC not to be restrictive on other species		-		2.5	2.58	2.15
1990	F likely to be F(88)		~1.9		1.9	2.22	2.08
1991	F likely to be F(89)		~1.7		1.9	1.83	1.50
1992	No long-term gains in increasing F		-		1.5	1.36	1.19
1993	No long-term gains in increasing F		-		1.4	1.30	1.11
1994	No long-term gains in increasing F		-		1.4	0.98	1.07
1995	No increase in F		1.29		1.4	0.96	1.03
1996	20% reduction in F		0.93		1.1	0.98	0.95
1997	20% reduction in F		1.10		1.1	1.26	1.22
1998	20% reduction in F		1.00		1.1	1.15	1.07
1999	35% reduction in F		0.67		0.9	0.66	0.97
2000	30% reduction in F		0.70		0.80	0.72	0.74
2001	40% reduction in F		0.60		0.76	0.68	0.72
2002	At least 35% reduction in F		0.68		0.68	0.62	0.63
2003	At least 40% reduction in F		<0.66		0.66	0.51	0.59
2004	[1]	F < 0.10 or recovery plan	[1]	<0.21	0.56	0.49	0.51
2005	[1]	70% Reduction in F or recovery plan	[1]	<0.25	0.48	0.31	0.39
2006	[1]	50% reduction in F or Recovery plan	[1]	<0.40	0.48		
2007		50% reduction in F or Recovery plan		<0.38			

Weights in '000 t.

[1] Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

(Official landings figures have been corrected following the discovery of errors in the time-series).





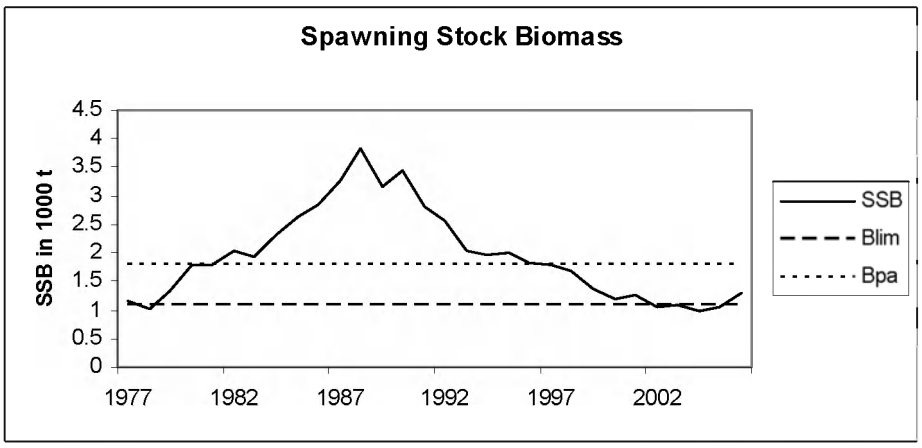
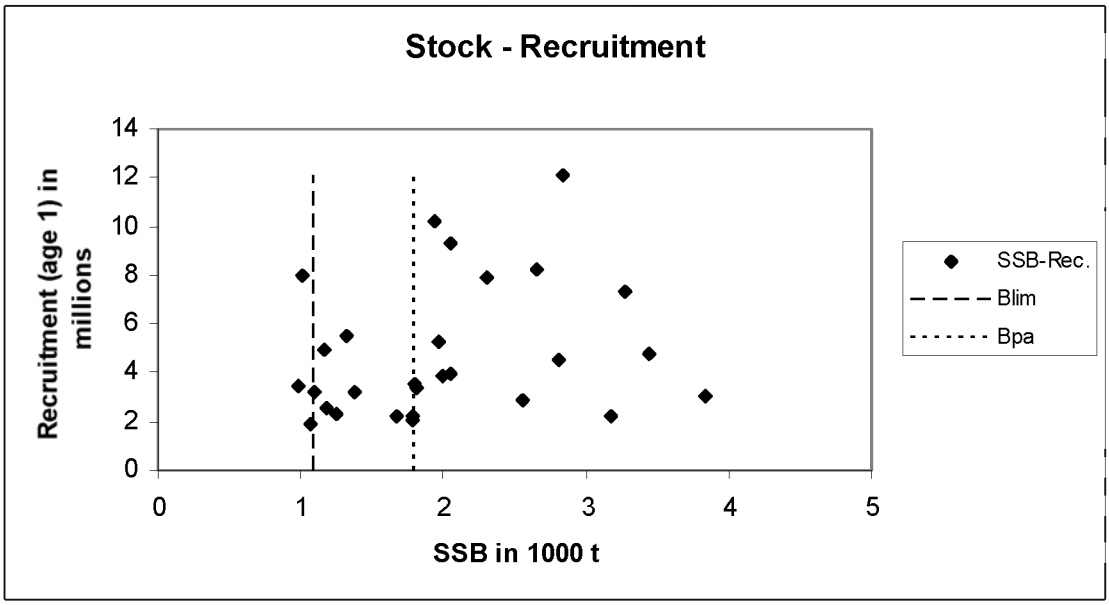
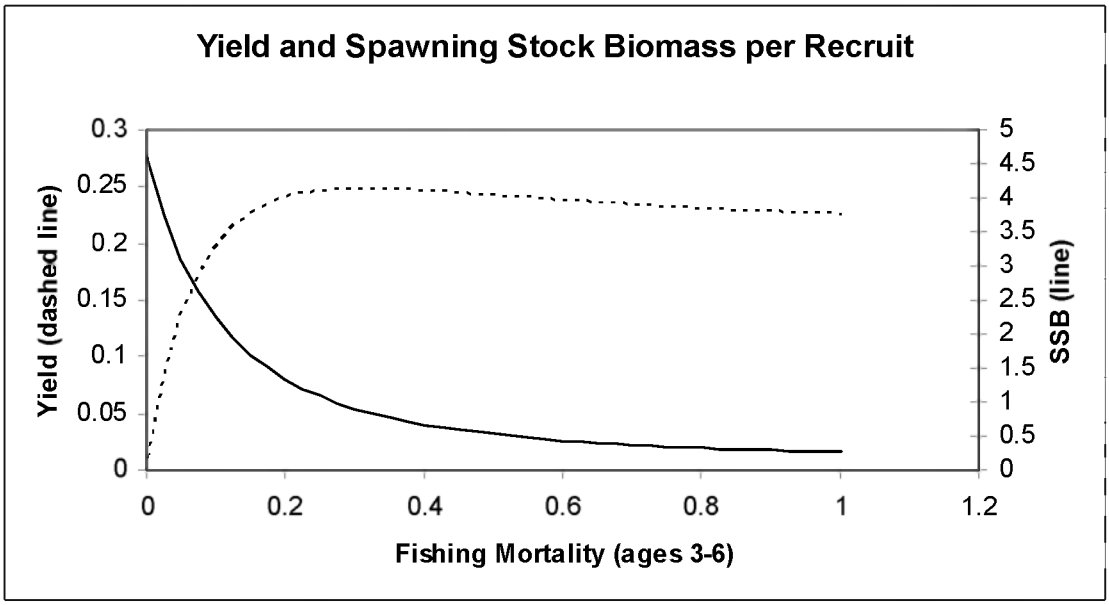


Figure 5.4.8.1 Celtic Sea plaice (Divisions VIIf and g). Landings, fishing mortality, recruitment and SSB.





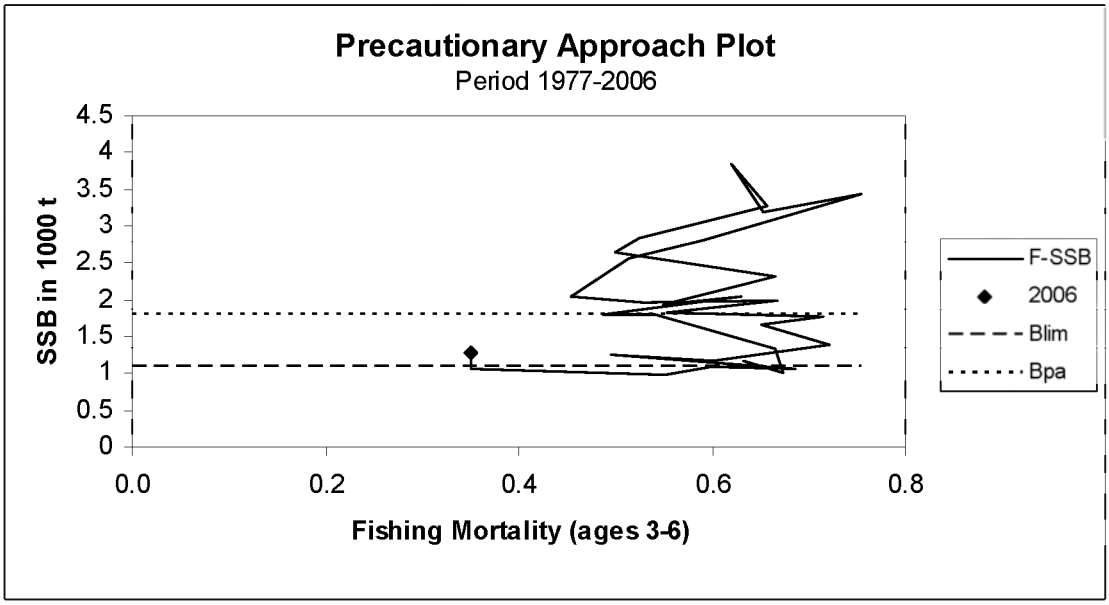


Figure 5.4.8.2 Celtic Sea plaice (Divisions VIIf and g). Stock and recruitment; Yield and SSB per recruit.

Results for different values of target F, assuming Fsq in 2005, and target F 2006 onwards.

Run	Target F	F value	Yield: mean 2020-2023			Prob. (B<Blim,%) at equilibrium		
			Yield-25%	Yield-50%	Yield-75%	Risk	F-reductior	Yield prop.
2	F0.1	0.16	630	689	755	0.000	0.70	0.91
7		0.25	683	748	827	0.000	0.54	0.99
1	Fmax	0.33	684	758	846	0.000	0.39	1.00
5	0.8*Fsq	0.43	668	748	846	0.000	0.20	0.99
4	Fsq	0.54	645	733	843	1.500	0.00	0.97
3	Fmed	0.56	641	729	841	2.925	-0.04	0.96
6	1.2*Fsq	0.65	618	710	831	22.575	-0.20	0.94

Boxed scenarios represent possible target fishing mortalities.

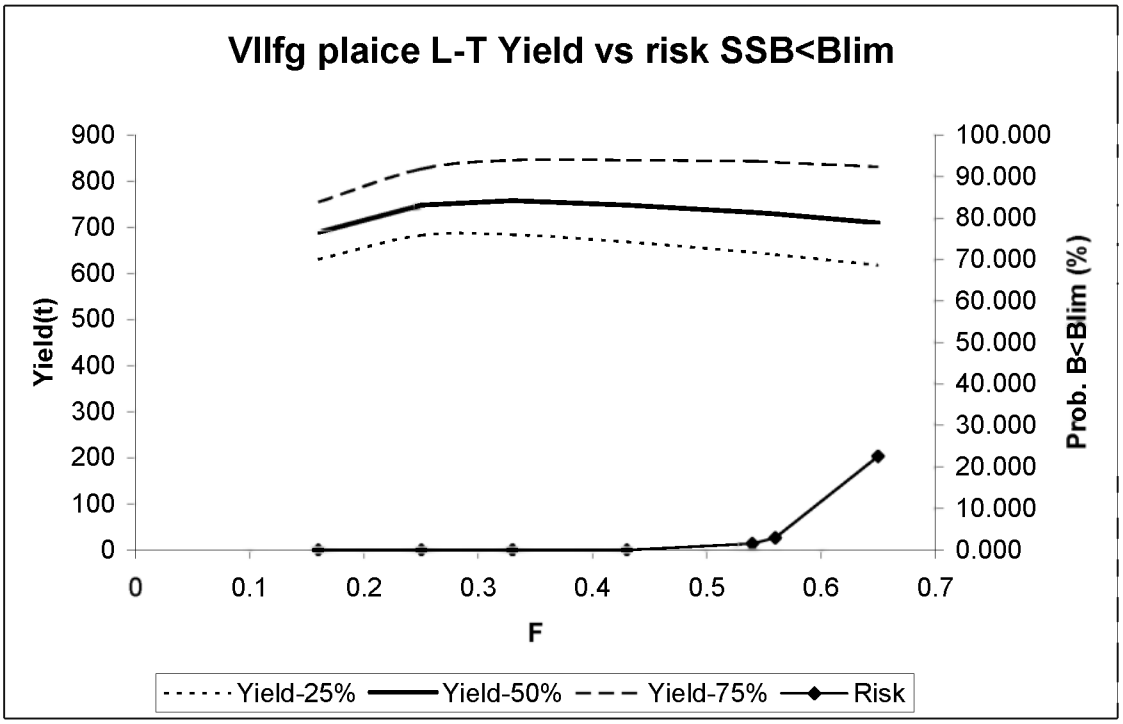


Figure 5.4.8.3

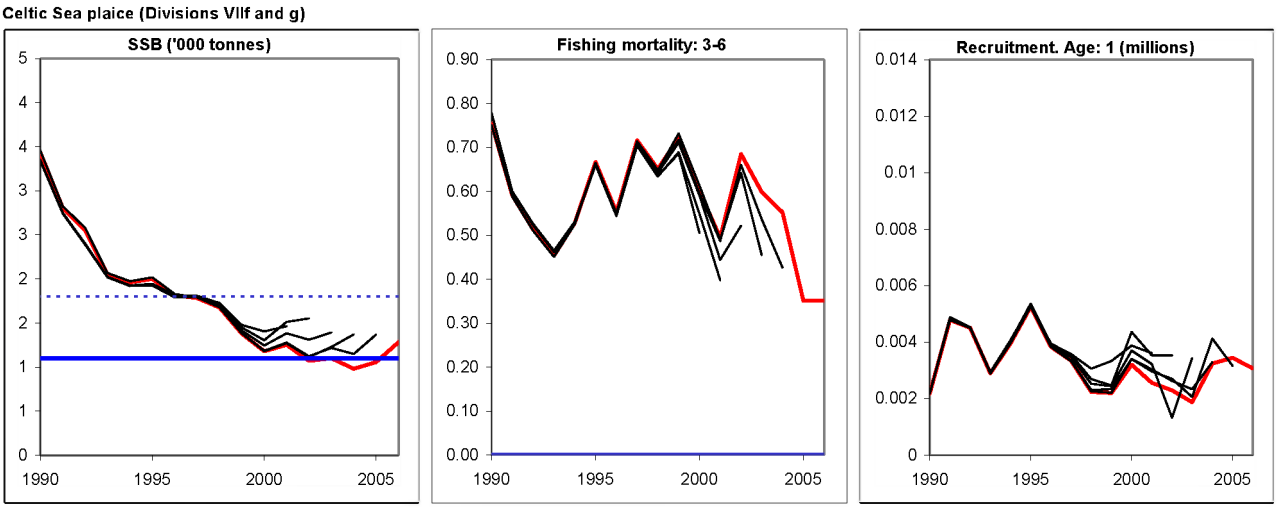


Figure 5.4.8.4 Celtic Sea plaice. Historical performance of the assessment (SSB, fishing mortality, and recruitment).

Table 5.4.8.1 Plaice in divisions VIIf&g
Nominal landings (t) as reported to ICES, and total landings as used by the working group

National landings as estimated by the working group 1977 - 1985; as reported to ICES and total landings as used by the working group 1986 onwards

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Belgium	214	196	171	372	365	341	314	283	357	665	581	617	843	794	836
UK (Engl. & Wales)	150	152	176	227	251	196	279	366	466	529	496	629	471	497	392
France	365	527	467	706	697	568	532	558	493	878	708	721	1089	767	444
Ireland	28	0	49	61	64	198	48	72	91	302	127	226	180	160	155
N. Ireland												1			
Netherlands										9					
Scotland	0	0	0	7	0	0	0	0	0	1				1	
Total	757	875	863	1373	1377	1303	1173	1279	1407	2384	1912	2194	2583	2219	1827
Unallocated	0	0	0	0	0	0	-27	-69	345	-693	-11	-78	-432	-137	-326
Total as used by WG	757	875	863	1373	1377	1303	1146	1210	1752	1691	1901	2116	2151	2082	1501

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Belgium	371	542	350	346	410	594	540	371	224	241	248	221	212	168
UK (Engl. & Wales)	302	290	251	284	239	258	176	170	134	136	105	127	87	55
France	504	373	298	254	246	329	298		287	262	186	165	145	85
Ireland	180	89	82	70	83	78	135	115	76	45	79	51	45	n/a
N. Ireland														
Netherlands														
Scotland	5	9	1	2										
Total reported	1362	1303	982	956	978	1259	1149	656	721	684	618	564	489	308
Unallocated	-174	-189	88	72	-26	-42	-82	312	-2	26	12	28	21	80
Total as used by WG	1188	1114	1070	1028	952	1217	1067	968	719	710	630	592	510	388

Table 5.4.8.2 Celtic Sea plaice (Divisions VIIf and g).

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-6
1977	3582	1170	757	0.632
1978	4965	1010	875	0.673
1979	8006	1323	863	0.666
1980	5552	1789	1373	0.541
1981	2051	1793	1377	0.488
1982	3551	2056	1303	0.630
1983	9274	1943	1146	0.550
1984	10233	2306	1210	0.666
1985	7922	2648	1752	0.499
1986	8230	2835	1691	0.524
1987	12075	3276	1901	0.657
1988	7311	3837	2116	0.619
1989	3066	3181	2151	0.652
1990	2188	3436	2082	0.754
1991	4787	2804	1501	0.591
1992	4504	2553	1188	0.513
1993	2900	2051	1114	0.454
1994	3962	1962	1070	0.528
1995	5255	2001	1028	0.667
1996	3839	1816	952	0.553
1997	3347	1784	1217	0.716
1998	2240	1677	1067	0.651
1999	2197	1380	968	0.721
2000	3206	1181	719	0.601
2001	2564	1253	710	0.495
2002	2293	1072	630	0.685
2003	1877	1101	592	0.599
2004	3248	982	510	0.552
2005	3449	1057	388	0.351
2006	3074	1284	388	0.351
Average	4692	1952	1155	0.586

5.4.9 Plaice in Division VIIe (Western Channel)

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
Increased risk	Increased risk	Overexploited	

The stock estimates are uncertain, but the assessment is indicative of trends. There are, however, strong indications that fishing mortality has been above $\mathbf{F}_{pa}$ and SSB has been below $\mathbf{B}_{pa}$ since the early 1990s. Recent recruitments seem to be weak.

Management objectives

There are no specific management objectives for this stock.

Reference points

Precautionary Approach reference points (established in 1998):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 1300 t, the lowest observed spawning stock biomass.	$\mathbf{B}_{pa}$ be set at 2 500 t. Biomass above this affords a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty in assessments.
$\mathbf{F}_{lim}$ not defined.	$\mathbf{F}_{pa}$ be set at 0.45.

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 3–7	Yield/R	SSB/R
Average last 3 years	0.70	0.28	0.38
$\mathbf{F}_{max}$	0.23	0.30	1.14
$\mathbf{F}_{0.1}$	0.10	0.27	2.26
$\mathbf{F}_{med}$	0.52	0.29	0.51

Technical basis

$\mathbf{B}_{lim}$=$\mathbf{B}_{loss}$.	$\mathbf{B}_{pa}$ = MBAL.
$\mathbf{F}_{lim}$=Not defined.	$\mathbf{F}_{pa}$ = 0.45 low probability that (SSB_{MT}< $\mathbf{B}_{pa}$).

Single-stock exploitation boundaries

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

Fishing mortalities between $\mathbf{F}_{0.1}$ = 0.10 and $\mathbf{F}_{max}$ = 0.23 can be considered as candidate target reference points, which are consistent with taking high long-term yields and achieving a low risk of depleting the productive potential. The recent fishing mortality is clearly well above these potential fishing mortality targets.

Exploitation boundaries in relation to precautionary limits

Given the low stock size, recent poor recruitment, high fishing mortality, the uncertainty in the assessment, and the inability to reliably forecast catch, ICES recommends a substantial reduction in catch until the estimate of SSB is above $\mathbf{B}_{pa}$ or other strong evidence of rebuilding is observed.

Short-term implications

Due to considerable uncertainty in current estimates of the stock and in recent recruitment estimates it is not possible to provide a short-term forecast.

Management considerations

There are uncertainties in the stock definition of Channel plaice (Divisions VIId and VIIe). If the present stock definition is valid the following needs to be considered. As the TAC for plaice in the Channel is set for Divisions VIId,e combined, the results from this assessment need to be considered along with those for the much larger Division VIId stock. Given that the Division VIId component dominates the TAC, a catch control does not guarantee that fishing mortality in Division VIIe is constrained. Management measures should be put in place to control fishing mortality even locally in the VIIe stock area.

Plaice are taken in a mixed demersal species otter trawl fishery, and as a bycatch in the sole beam trawl fishery. The major commercial species that interact with VIIe plaice are VIIe sole and VIIe–k cod.

Factors affecting the fisheries and the stock

The fisheries taking plaice in the Western Channel mainly involve vessels from the bordering countries: the total landings (2004) are split among UK vessels (80%), France (16%), and Belgium (4%). Landings of plaice in the Western Channel were low and stable between 1950 and the mid-1970s, and increased rapidly during 1976 to 1988 as beam trawls began to replace otter trawls, although plaice are taken mainly as a bycatch in beam-trawling directed at sole and anglerfish. Estimated landings have been fairly stable since 1994. The main fishery is south and west of Start Point. Although plaice are taken throughout the year, the larger landings are made during February, March, October, and November.

The effects of regulations

The catch of VIIe plaice is managed by a TAC applied to VIId (Eastern Channel) and VIIe combined. Consequently the TAC management does not control fishing mortality on the VIIe stock. There are also technical measures including mesh size and MLS (27 cm) for this species. There is some discarding, in particular of fish below the MLS in the first two quarters.

Council Regulation EC No. 27/2005, Annex IVc on 'Fishing effort for vessels in the context of the recovery of Western Channel sole stocks' limits the number of days at sea to 20 per month for beam trawlers with mesh size equal to or greater than 80 mm and for static demersal nets, including gillnets, trammel nets, and tangle nets. There is no obvious reduction in nominal effort in 2005 compared to 2004 for the main fleets.

Scientific basis

Data and methods

The analytical age-based assessment is based on landings, one survey, and three commercial CPUE series. Discard data are becoming available and indicate that discarding is variable, but lower compared to other plaice stocks.

Information from the fishing industry

Misreporting of landings is thought to have occurred in the past, but industry comments indicate that in recent years this has not been a problem.

Fisheries science partnership surveys of the western Channel conducted cooperatively between CEFAS and the UK industry gave similar catch rates of plaice in 2003 and 2004 for all sizes of fish combined, although some small-scale spatial changes in distribution were observed. Lower catch rates were observed in the 2005 survey.

Uncertainties in assessment and forecast

There is some uncertainty about the stock structure in VIIe plaice. Historical tagging information show that plaice may migrate from the VIIe into the VIId and the North Sea after spawning. A considerable proportion of the juvenile recruits in VIIe are thought to originate from VIId and the southern North Sea. There is also evidence of a resident stock in VIIe. Catch-at-age data have not been adjusted to take into account the impact of any migrations and it is unclear if these migrations persist.

This assessment is tuned using data from the commercial fishery as well as one survey. The accuracy of the assessment will depend on whether these commercial catch rates reflect changes in population abundance. The retrospective analysis indicates consistent downward revisions in the estimation of F in recent years. The cause of this retrospective pattern is unknown, but it leads to uncertainty and potential bias in the F, rendering a deterministic short-term forecast inaccurate.

The recruit estimates in the most recent 3-4 years are very uncertain, as shown by historical and retrospective assessments. Because of this and the uncertainty in current stock abundance no short-term forecast can be provided.

Comparison with previous assessment and advice

Recent recruitment estimates have been revised substantially. Results from this assessment indicate that historical SSB estimates are consistent, but the 2004 estimate of SSB has been revised downwards by 27%. Fishing mortality has been revised downwards by the most recent assessment.

The advice is consistent with that provided last year.

Source of information

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 27 June–6 July 2006 (ICES CM 2006/ACFM:33).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC[1]	Official Landings	ACFM Landings
1987	Precautionary TAC		6.8		8.3	1.92	1.96
1988	Precautionary TAC		6.9		9.96	2.33	2.46
1989	No increase in effort; TAC		11.7		11.7	2.25	2.36
1990	No increase in F; TAC		10.7		10.7	1.99	2.59
1991	50% reduction in F in VIIe		8.8		10.7	1.65	1.85
1992	Sq. F gives over mean SSB		2.0[2]		9.6	1.56	1.62
1993	Not outside safe biological limits		-		8.5	1.44	1.42
1994	Within safe biological limits		-		9.1	1.29	1.16
1995	No increase in F		1.4[2]		8.0	1.16	1.03
1996	60% reduction in F		0.6[2]		7.5	1.14	1.04
1997	60% reduction in F		0.51[2]		7.09	1.37	1.32
1998	60% reduction in F		0.5[2]		5.7	1.24	1.13
1999	Reduce F below $\mathbf{F}_{pa}$		1.1[2]		7.4	1.15	1.15
2000	Reduce F below $\mathbf{F}_{pa}$		< 1.08[2]		6.5	1.10	1.08
2001	Reduce F below $\mathbf{F}_{pa}$		< 0.93[2]		6.0	0.96	0.97
2002	Reduce F below $\mathbf{F}_{pa}$		< 0.89[2]		6.7	1.25	1.26
2003	At least 50% reduction in F		< 0.53[2]		5.97	1.22	1.22
2004	[3]	A 55% reduction in F	[3]	<0.660	6.06	0.95	1.14
2005		A 64% reduction in F		<0.580	5.15	1.06	1.20
2006		Substantial reduction in catch		-	5.15		
2007		Substantial reduction in catch		-			

Weights in '000 t.
[1]TACs for Divisions VIId,e.
[2]For Division VIIe only.
[3] Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

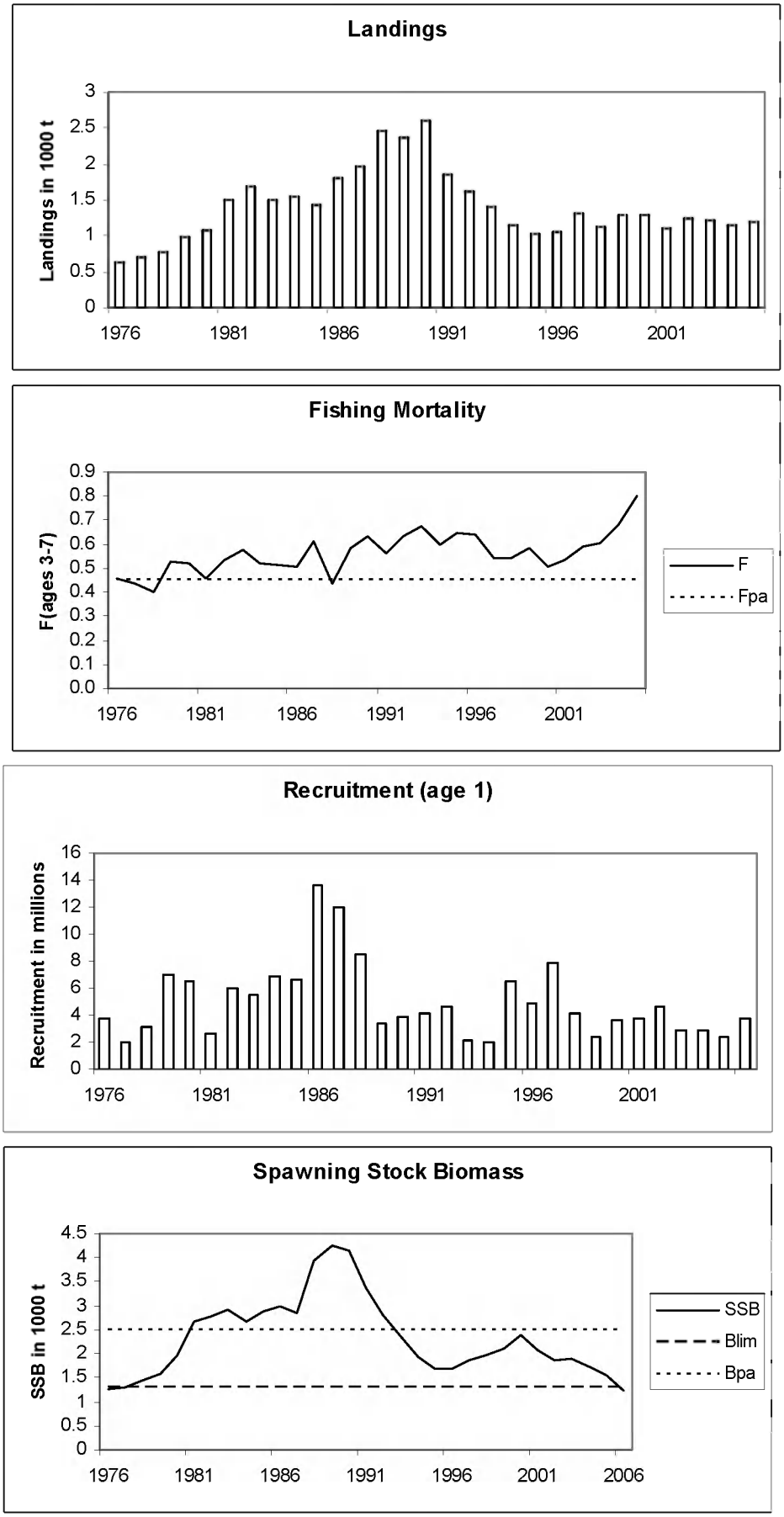
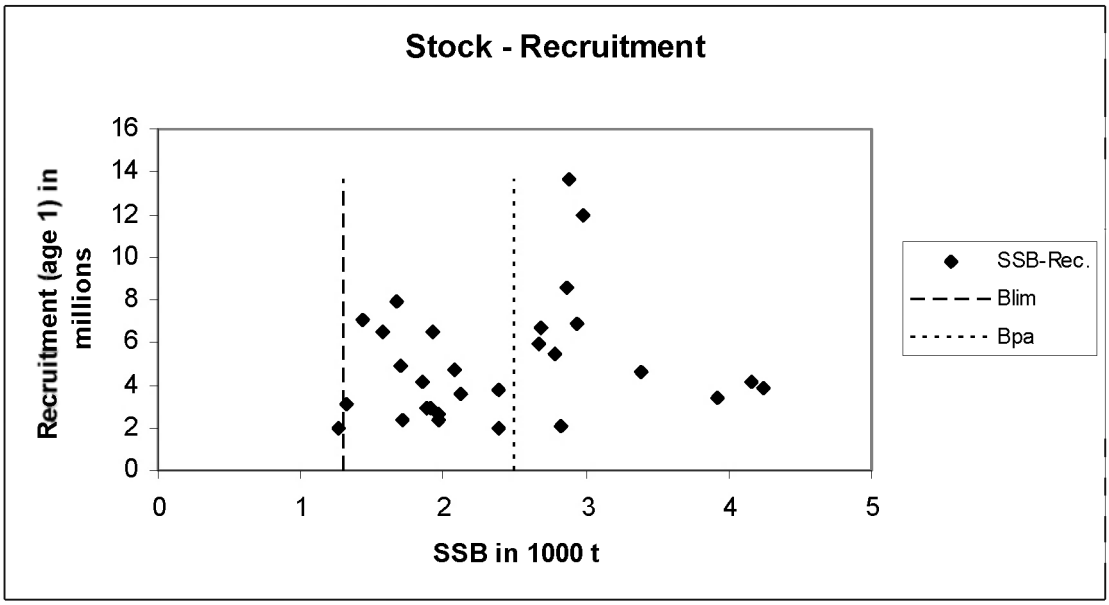
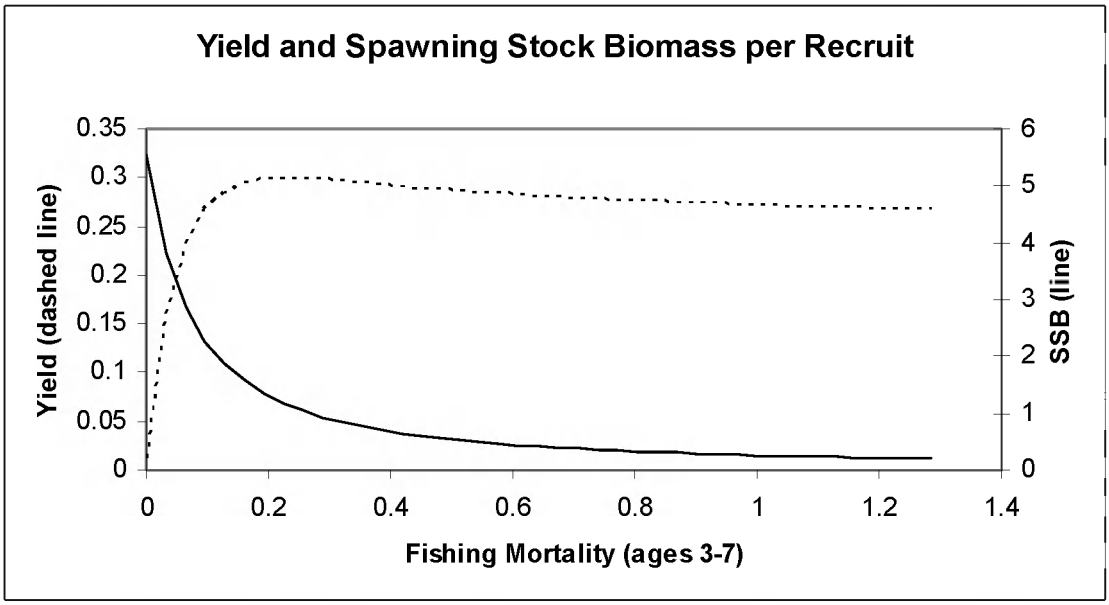


Figure 5.4.9.1 Plaice in Division VIIe (Western Channel). Landings, fishing mortality, recruitment and SSB.





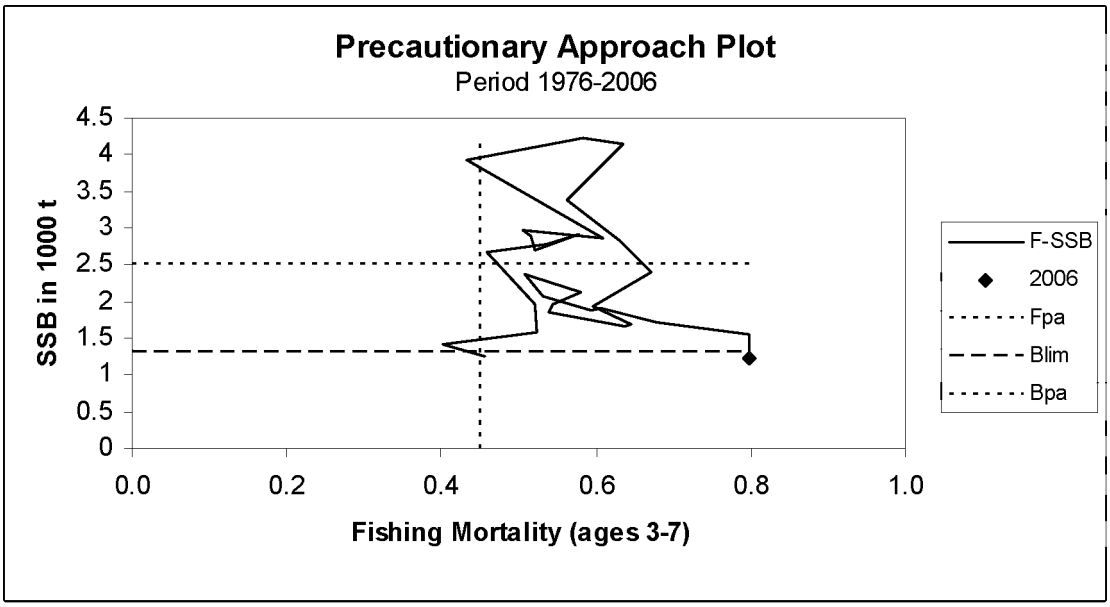


Figure 5.4.9.2 Plaice in Division VIIe (Western Channel). Stock and recruitment; Yield and SSB per recruit.

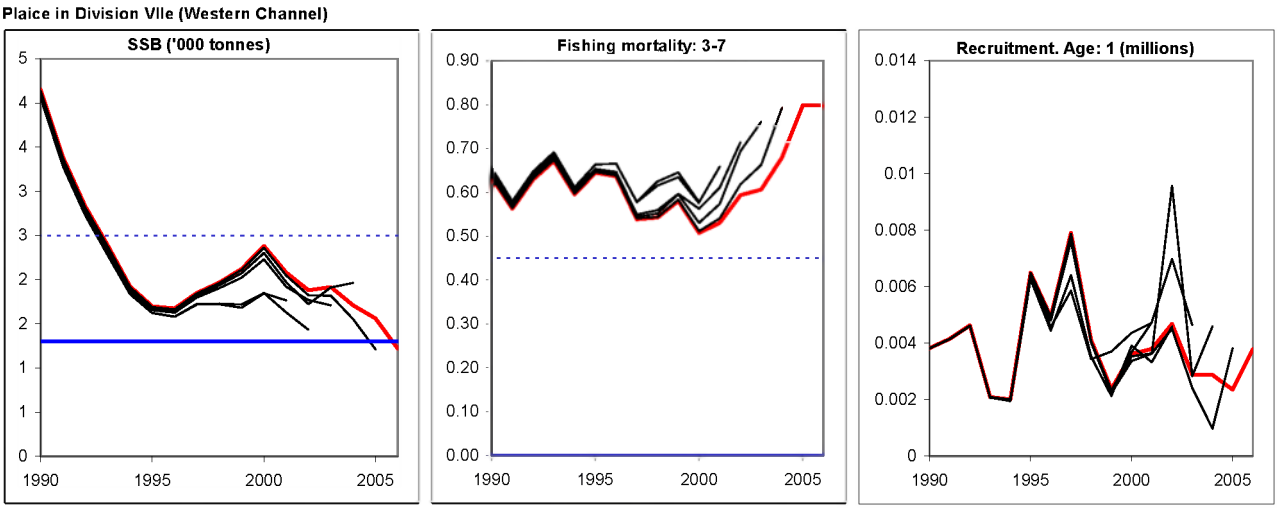


Figure 5.4.9.3 Plaice in Division VIIe. Historical performance of the assessment (SSB, fishing mortality, and recruitment).

Table 5.4.9.1 Plaice in VIIe. Nominal landings (t) in Division VIIe, as used by Working Group.

Year	Belgium	Denmark	France	UK (Engl. & Wales)	Others	Total reported	Unallocated[1]	Total
1976	5	-[3]	323	312	-	640	-	640
1977	3	-[3]	336	363	-	702	-	702
1978	3	-[3]	314	467	-	784	-	784
1979	2	-[3]	458	515	-	975	2	977
1980	23	-[3]	325	609	9	966	113	1079
1981	27	-	537	953	-	1517	-16	1501
1982	81	-	363	1109	-	1553	135	1688
1983	20	-	371	1195	-	1586	-91	1495
1984	24	-	278	1144	-	1446	101	1547
1985	39	-	197	1122	-	1358	83	1441
1986	26	-	276	1389	-[1]	1691	119	1810
1987	68	-	435	1419	-	1922	36	1958
1988	90	-	584	1654	-	2328	130	2458
1989	89	-	448[1]	1708	2	2247	111	2358
1990	82	2	N/A[2]	1885	18	1987	606	2593
1991	57	-	251[1]	1323	16	1647	201	1848
1992	25	-	419	1102	14	1560	64	1624
1993	56	-	284	1080	24	1444	-27	1417
1994	10	-	277	998	3	1288	-132	1156
1995	13	-	288	857	-	1158	-127	1031
1996	4	-	279	855	-	1138	-94	1044
1997	6	-	329	1038	1	1374	-51	1323
1998	22	-	327[4]	892	1	1242	-111	1131
1999	12	-	194[1]	947	-	1153	118	1271
2000	4	-	360	926	+	1290	-9	1281
2001	12	-	303	797	-	1112	-6	1106
2002	27	-	238	978	+	1253	4	1257
2003	39	-	216	985	-	1217	1	1218
2004	46	-	184	912	-	1142	12	1154
2005	48	-	116[4]	891	-	1059	140	1199

[1]Estimated by the Working Group.

[2]Divisions VIId,e = 4,739 t.

[3]Included in Division VIId

[4]Preliminary

Table 5.4.9.2 Plaice in Division VIIe (Western Channel)

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-7
1976	3811	1265	640	0.457
1977	2009	1318	702	0.438
1978	3100	1428	784	0.402
1979	7028	1579	977	0.524
1980	6457	1968	1079	0.522
1981	2640	2667	1501	0.459
1982	5943	2781	1688	0.536
1983	5447	2930	1495	0.578
1984	6866	2689	1547	0.521
1985	6681	2879	1441	0.515
1986	13604	2974	1810	0.505
1987	11978	2860	1958	0.610
1988	8536	3924	2458	0.433
1989	3415	4240	2358	0.583
1990	3823	4151	2593	0.634
1991	4154	3384	1848	0.563
1992	4629	2829	1624	0.630
1993	2090	2391	1417	0.672
1994	2006	1924	1156	0.596
1995	6488	1698	1031	0.645
1996	4934	1675	1044	0.637
1997	7906	1850	1323	0.539
1998	4102	1968	1131	0.543
1999	2376	2121	1299	0.581
2000	3620	2382	1281	0.508
2001	3796	2080	1106	0.531
2002	4681	1880	1247	0.594
2003	2885	1916	1218	0.607
2004	2877	1710	1154	0.680
2005	2354	1563	1199	0.799
2006	3792*	1218		
Average	4969	2330	1397	0.569

* Geometric mean

5.4.10 Plaice Southwest of Ireland (Division VIIh–k)

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	

The state of the stock is unknown. No assessment was performed, due to the short series of data and lack of reliable tuning indices.

Management objectives

There are no explicit management objectives for this stock.

Reference points

No precautionary reference points have been established.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary considerations

Catches in 2005 should be no more than the recent average (2003–2005) of around 196 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.

Management considerations

Landings are substantially below the TAC and have been declining. The 2005 landings are the lowest observed in the time-series. The advice based on recent average landings may not be precautionary enough if this stock is in decline. Plaice are taken as part of a mixed demersal fishery by otter trawlers. Management options proposed for plaice should also take into consideration other demersal fish species taken in the fishery.

Factors affecting the fisheries and the stock

The effects of regulations

Plaice is managed through a precautionary TAC and technical conservation measures. The agreed TAC for plaice in 2004 and 2005 is 466 t, following a TAC of 582 t in 2003. The agreed TAC for 2006 is 396 t. Boat quota restrictions were imposed on Irish vessels for hake, cod, and anglerfish, and these are likely to have impacted the plaice landings.

Council Regulation (EC) No. 1954/2003 established measures for the management of fishing effort in a 'biologically sensitive area' in areas of Divisions 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).

Changes in fishing technology and fishing patterns

Ireland, UK, and France are the major participants in this fishery. Plaice are predominantly caught within mixed species otter trawl fisheries in Division VIIj. Irish vessels operate from the ports of Castletownbere, Dingle, Union Hall, Baltimore, and Schull. Increasingly these Irish vessels target mainly hake, anglerfish, and megrim and not the more traditional inshore species (plaice, sole, whiting, and cod). Otter trawlers accounted for the majority, with beam trawlers and seiners taking smaller catches of plaice.

Scientific basis

Data and methods

Data update and screening methods only. No analytical assessment was performed.

Source of information

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 27 June–6 July 2006 (ICES CM 2006/ACFM:33).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	ACFM landings
1993	-		-		-	652
1994	-		-		-	578
1995	-		-		-	541
1996	-		-		-	431
1997	-		-		-	639
1998	-		-		-	439
1999	-		-		-	456
2000	-		-		-	363
2001	-		-		1215	276
2002	-		-		1080	325
2003	Reduce TAC to recent average (1998–2000)		450		582	208
2004	[1]	Reduce TAC to recent average (2000–2002)	[1]	320	466	217
2005		Reduce TAC to recent average (2001–2003)		271	466	164
2006		Reduce TAC to recent average (2002–2004)		245	396	
2007		Reduce TAC to recent average (2003–2005)		196		

Weights in t.

[1] Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

Table 5.4.10.1 Plaice in Divisions VII h-k (Southwest Ireland). Nominal landings (t), 1973-2005, as officially

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Belgium	153	120	66	252	169	130	116	273	222	219	162	216
Denmark	-	-	-	-	-	-	7	-	-	-	-	-
France	1164	500	576	15	21	21	26	28	589	662.00	367	514
Ireland	199	150	186	195	139	184	204	287	346	205	295	394
Netherlands	16	-	3	88	352	230	-	-	2	9	169	1166
Spain	-	-	-	-	-	-	-	7	9	6	6	-
UK - Eng+Wales	.	.	.	.	.	.	.	.	.	.	.	.
UK - England & \	17	4	43	16	13	21	9	49	112	110	81	165
UK - Scotland	-	-	-	-	-	-	-	-	1	-	-	-
Un. Sov. Soc. Re	2	3	-	-	-	-	-	-	-	-	-	-
Total	1551	777	874	566	694	586	362	644	1281	1211	1080	2455

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	166	339	263	263	433	330	267	250	352	202	257
Denmark	-	-	-	-	-	-	-	-	-	-	-
France	55	87	85	135	229	77	173	90	64	48	60
Ireland	433	302	300	369	454	338	478	477	383	271	321
Netherlands	1237	26	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	-	-	-	-	-	-
UK - Eng+Wales	.	.	.	.	73	88	287	264	218	258	282
UK - England & \	174	252	246	433	.	.	.	.	.	.	.
UK - Scotland	-	1	-	1	-	1	-	6	7	1	4
Un. Sov. Soc. Re	-	-	-	-	-	-	-	.	.	.	.
Total	2065	1007	894	1201	1189	834	1205	1087	1024	780	924

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Belgium	341	449	351	45	4	27	69	20	67	31.8
Denmark	-	-	-	-	-	-	-	-	-	.
France	48	69	49	.	87	80	86	33	34	7.474
Ireland	305	344	286	299	200	160	155	127	91	.
Netherlands	52	-	13	1	2	-	-	-	-	.
Spain	-	-	-	-	5	3	2	6	6	.
UK - Eng+Wales	154	138	106	82	75	73	59	56	36	27.9
UK - England & \	.	.	.	.	.	.	.	.	.	.
UK - Scotland	1	-	-	-	1	-	-	-	-	.
Un. Sov. Soc. Re	.	.	.	.	.	.	.	.	.	.
Total	901	1000	805	427	374	343	371	242	234	67
Unallocated	470	361	366	-29	11	67	46	34	17	-97
Total figures used by Working Group	431	639	439	456	363	276	325	208	217	164

5.4.11 Plaice West of Ireland (Division VIIb,c)

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	

The state of the stock is unknown, but landings show a declining trend in recent years. No assessment was performed, due to the short series of data and lack of reliable tuning indices.

Management objectives

There are no explicit management objectives for this stock.

Reference points

No precautionary reference points have been established.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary considerations

Catches in 2005 should be no more than the recent average (2003–2005) of around 55 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.

Management considerations

Landings have been declining and 2005 landings are the lowest observed in the time-series. The advice based on recent average landings may not be precautionary enough if this stock is in decline. Plaice are taken as part of a mixed demersal fishery by otter trawlers. Management options proposed for plaice should also take into consideration other demersal fish species and *Nephrops* taken in the VIIb,c fishery.

Factors affecting the fisheries and the stock

Ireland is the major participant in this fishery with around 90% of the international landings taken in 1993–2003. Plaice are normally caught in mixed species otter trawl fisheries in Division VIIb. These vessels mainly target other demersal fish species and *Nephrops*.

The effects of regulations

Plaice is managed by a precautionary TAC and technical measures. The agreed TACs have been 160 t in 2003–2005 and 144 in 2006.

Council Regulation (EC) No. 1954/2003 established measures for the management of fishing effort in a 'biologically sensitive area' in areas of 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).

Scientific basis

Data and methods

Data update and screening methods only. No analytical assessment was performed.

Source of information

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 27 June–6 July 2006 (ICES CM 2006/ACFM:33).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	ACFM landings
1993	-		-		-	197
1994	-		-		-	215
1995	-		-		-	315
1996	-		-		-	240
1997	-		-		-	213
1998	-		-		-	183
1999	-		-		-	172
2000	-		-		-	108
2001	-		-		240	87
2002	No advice		-		180	71
2003	Reduce TAC to recent landings		160		160	72
2004	[1]	Reduce TAC to recent av. landings (2000–2002)	[1]	90	160	55
2005		Reduce TAC to recent av. landings (2001–2003)		77	160	38
2006		Reduce TAC to recent av. landings (2002–2004)		65	144	
2007		Reduce TAC to recent av. landings (2003–2005)		55		

Weights in t.

[1] Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

Table 5.4.11.1 Nominal landings (t) of plaice in Division VIIb,c for 1973-2005.

Table 5.4.1 **Plaice in Divisions VII b, c (Southwest Ireland). Nominal landings (t) 1973-2005 as officially reported to ICES.**

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Denmark	-	-	-	-	-	-	2	-	-	-	-	-
France	60	45	10	9	4	16	6	12	9	8.00	37	2
Ireland	124	106	153	133	135	122	117	142	135	122	108	110
Spain	-	-	-	-	-	-	-	65	58	22	7	-
UK - Eng+Wales+N.Irl.	.	.	.	.	.	.	.	.	.	.	.	.
UK - England & Wales	1	1	-	-	-	-	-	-	4	4	-	3
UK - Scotland	-	-	-	-	-	-	-	-	-	-	-	3
Total	185	152	163	142	139	138	125	219	206	156	152	118

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Denmark	-	-	-	-	-	-	-	-	-	-	-
France	10	11	13	9	1	11	9	3	2	1	5
Ireland	150	114	153	157	159	130	179	180	191	200	239
Spain	-	-	-	-	-	-	-	-	-	-	-
UK - Eng+Wales+N.Irl.	.	.	.	.	1	2	-	6	1	2	1
UK - England & Wales	7	5	1	2	.	.	.	.	.	.	.
UK - Scotland	-	-	-	-	13	90	3	3	2	3	1
Total	167	130	167	168	174	233	191	192	196	206	246

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Denmark	-	-	-	-	-	-	-	-	-	.
France	1	3	-	.	31	8	17	8	16	10
Ireland	248	206	160	157	99	70	51	56	39	.
Spain	-	-	-	-	-	-	-	2	1	.
UK - Eng+Wales+N.Irl.	2	-	1	-	-	-	2	-	-	.
UK - England & Wales	.	.	.	.	.	.	.	.	.	.
UK - Scotland	-	-	-	2	-	-	-	-	-	.
Total	251	209	161	159	130	78	70	66	56	10
Unallocated	-11	4	22	13	-22	9	1	6	-1	27
Total as used by the Working Group	240	213	183	172	108	87	71	72	55	38

[1]**See VIIg–k.**

5.4.12 Sole in Division VIIa (Irish Sea)

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
Reduced reproductive capacity	Overexploited	Overexploited	Not defined	

Recent recruitment levels have been lower than earlier in the time-series. SSB has declined to low levels and is estimated to be close to the lowest observed level in 2005. Any rapid rise in SSB in the short term is unlikely given recent recruitment levels. Fishing mortality has been close to $\mathbf{F}_{lim}$ throughout the time-series. F *status quo* is estimated to be close to $\mathbf{F}_{pa}$.

Management objectives

There are no explicit management objectives for this stock.

Reference points

	ICES considers that:	ICES proposed that:
Limit reference points	$\mathbf{B}_{lim}$ is 2800 t, the lowest observed spawning stock in an earlier assessment.	$\mathbf{B}_{pa}$ be set at 3800 t, which is considered to be the minimum SSB required to ensure a high probability of maintaining SSB above its lowest observed value, taking into account the uncertainty of assessments.
	$\mathbf{F}_{lim}$ is 0.4. Although poorly defined, there is evidence that fishing mortality in excess of 0.4 has led to a general stock decline and is only sustainable during periods of above-average recruitment.	$\mathbf{F}_{pa}$ be set at 0.30. This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$.
Target reference points		Not defined.

Yield and spawning biomass per Recruit from 2006 assessment
F-reference point:

	Fish Mort Ages 4-7	Yield/R	SSB/R
Average last 3 years	0.29	0.18	0.64
Fmax	0.43	0.19	0.39
F0.1	0.21	0.17	0.95
Fmed	0.24	0.18	0.82

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 $\mathbf{F}_{0.1}$.

Technical basis:

$\mathbf{B}_{lim} = \mathbf{B}_{loss}$.	$\mathbf{B}_{pa} \sim \mathbf{B}_{lim} * 1.4$.
$\mathbf{F}_{lim} = \mathbf{F}_{loss}$ poorly defined; based on historical considerations.	$\mathbf{F}_{pa}$ = see above.

Single-stock exploitation boundaries

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

Fishing mortality is estimated to be well above $\mathbf{F}_{0.1}$ (0.21). There will be little gain to the long-term yield by increasing fishing mortalities above $\mathbf{F}_{0.1}$.

Exploitation boundaries in relation to precautionary limits

Given the low SSB and low recruitment since 2000, it is not possible to identify any non-zero catch which will be compatible with the precautionary approach. However, a zero catch in 2007 should allow SSB to achieve $\mathbf{B}_{pa}$ in 2008. If the implied 100% reduction is not possible then ICES recommends that a recovery plan be implemented which ensures a safe and rapid rebuilding of SSB to levels above $\mathbf{B}_{pa}$.

Short-term implications

Outlook for 2007

Basis: F(2006) = $\mathbf{F}_{sq}$ = mean F(03–05) = 0.290; R95–03 = GM = 4.641 million; SSB(2006) = 3015 t; SSB(2007) = 3.035 t; landings (2006) = 736 t.

Rationale	TAC(2007) ([1])	Basis	F(2007)	SSB(2008)
Zero catch	0	F=0	0	3819
High long-term yield		F(0.1/long-term yld)		
	185	$\mathbf{F}_{sq}$ *0.2	0.058	3636
Status quo	356	$\mathbf{F}_{sq}$ *0.4	0.116	3467
	516	$\mathbf{F}_{sq}$ *0.6	0.174	3310
	664	$\mathbf{F}_{sq}$ *0.8	0.232	3164
	803	$\mathbf{F}_{sq}$	0.290	3028
	824	$\mathbf{F}_{sq}$ *1.033 ($\mathbf{F}_{pa}$)	0.300	3007
	932	$\mathbf{F}_{sq}$ *1.2	0.349	2902
	1053	$\mathbf{F}_{sq}$ *1.4	0.407	2785
Precautionary Limits	191	TAC($\mathbf{F}_{pa}$)*0.2	0.060	3630
	367	TAC($\mathbf{F}_{pa}$)*0.4	0.120	3456
	531	TAC($\mathbf{F}_{pa}$)*0.6	0.180	3295
	683	TAC($\mathbf{F}_{pa}$)*0.8	0.240	3146
	824	TAC($\mathbf{F}_{pa}$)*1.0	0.300	3007
	956	TAC ($\mathbf{F}_{pa}$) *1.2	0.360	2897
	1079	TAC ($\mathbf{F}_{pa}$) *1.4	0.420	2759

Weights in tonnes.
[1]It is assumed that landings in 2006 correspond to $\mathbf{F}_{sq}$.
Shaded scenarios are not considered consistent with the precautionary approach.

Management considerations

It is not possible for the stock to reach $\mathbf{B}_{pa}$ in one year without a complete closure of the fishery. A management plan for effort reduction that can be phased in over a number of years and implemented in conjunction with technical conservation measures should be considered.

There are indications that area misreporting of sole occurs, and there are also indications that some fleets are not limiting their uptake to their quota. Such practices have the potential of masking the true stock trends for sole. Sole is caught in a mixed fishery with other flatfish as well as gadoids. Information on discards is very limited, but information from 2003 is indicative of discard ranges up to 5% in weight.

Factors affecting the fisheries and the stock

The effects of regulations

Technical measures in force are minimum mesh sizes and minimum landing size (24 cm). Limited observations indicate that the rate of discarding of sole is relatively low.

The closures of cod spawning-grounds that have been in force since 2000 are unlikely to have had a big impact on the sole fishery. In 2000 the closure covered the Western and Eastern Irish Sea. Since then, closure has been mainly in the western part, whereas the main sole fishery has taken place in the eastern part of the Irish Sea.

Scientific basis

Uncertainties in assessment and forecast

Substantial revisions have been made to the catch-at-age data for 2003 and 2004. The assessment is tuned using two UK beam trawl survey series. The retrospective analysis indicates poor convergence of the assessment for both SSB and Fbar(4-7) but shows little evidence of substantial retrospective bias. The assessment indicates a change in exploitation pattern in the most recent years with a shift in the fishery towards younger fish.

Comparison with previous assessment and advice

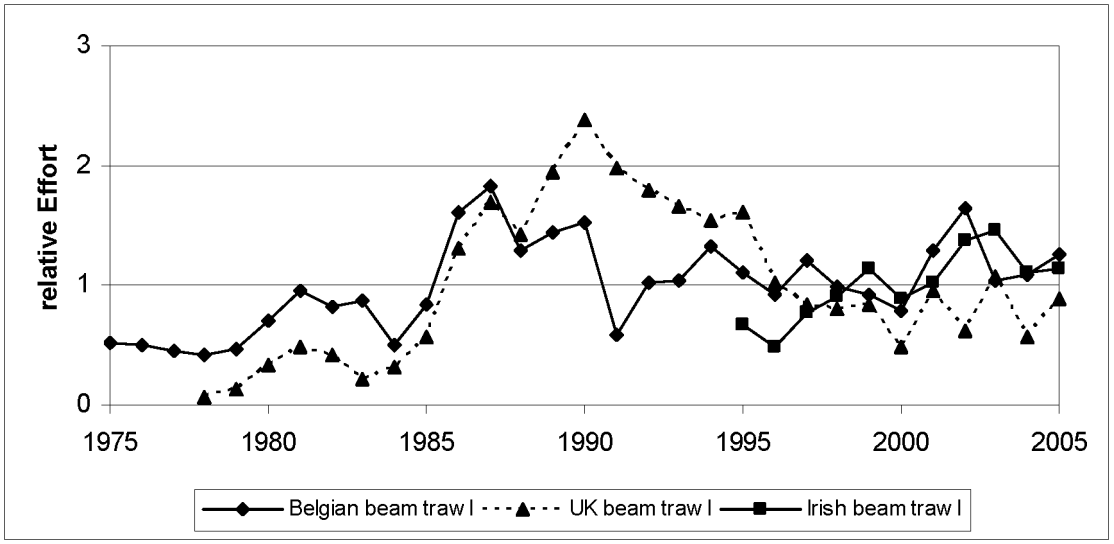
The 2006 assessment is based on a revised catch-at-age and weight-at-age data set. Last year no analytical assessment was conducted because of concerns on the quality of these data and the advice was based on the average landings from 2002-04. This year an analytical assessment was the basis for the advice.

Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 9–18 May 2006 (ICES CM 2006/ACFM:30).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	Official landings	ACFM Landings[2]
1987	No increase in F		1.9		2.1	2.0	2.8
1988	80% of F(86); TAC		1.6		1.75	1.9	2.0
1989	80% of F(87); TAC		< 1.48		1.48	1.8	1.8
1990	Interim advice		1.05[3]		1.5	1.6	1.6
1991	90% of F(89); TAC		1.3		1.5	1.2	1.2
1992	No long-term gains in increased F		1.2[1]		1.35	1.2	1.3
1993	F = F(91) ~ 920 t		0.92		1.0	1.0	1.0
1994	No long-term gains in increased F		1.51[1]		1.5	1.4	1.4
1995	20% reduction in F		0.8		1.3	1.3	1.3
1996	20% reduction in F		0.8		1.0	1.0	1.0
1997	20% reduction in F		0.8		1.0	1.0	1.0
1998	20% reduction in F		0.85		0.9	0.9	0.9
1999	Reduce F below $\mathbf{F}_{pa}$		0.83		0.9	0.8	0.9
2000	Reduce F below $\mathbf{F}_{pa}$		< 1.08		1.08	0.8	0.8
2001	Reduce F below $\mathbf{F}_{pa}$		< 0.93		1.1	1.0	1.1
2002	Keep F below $\mathbf{F}_{pa}$		<1.10		1.1	1.0	1.1
2003	Keep F below $\mathbf{F}_{pa}$		<1.01		1.01	1.0	1.0
2004	[4]	Maintain SSB above $\mathbf{B}_{pa}$		<0.79	0.80	0.6	0.7
2005	[4]	F<$\mathbf{F}_{pa}$		<1.00	0.96	0.77	0.8
2006	[4]	Recent catch levels (2002–2004)		<0.93	0.96		
2007	Maintain SSB above $\mathbf{B}_{pa}$	Zero catch		0			

Weights in '000 t.
[1]Catch at *status quo* F.
[2] Not including misreporting.
[3]Revised in 1990 to 1.5.
[4]Single-stock boundary; the exploitation of this stock should be conducted in the context of mixed fisheries.



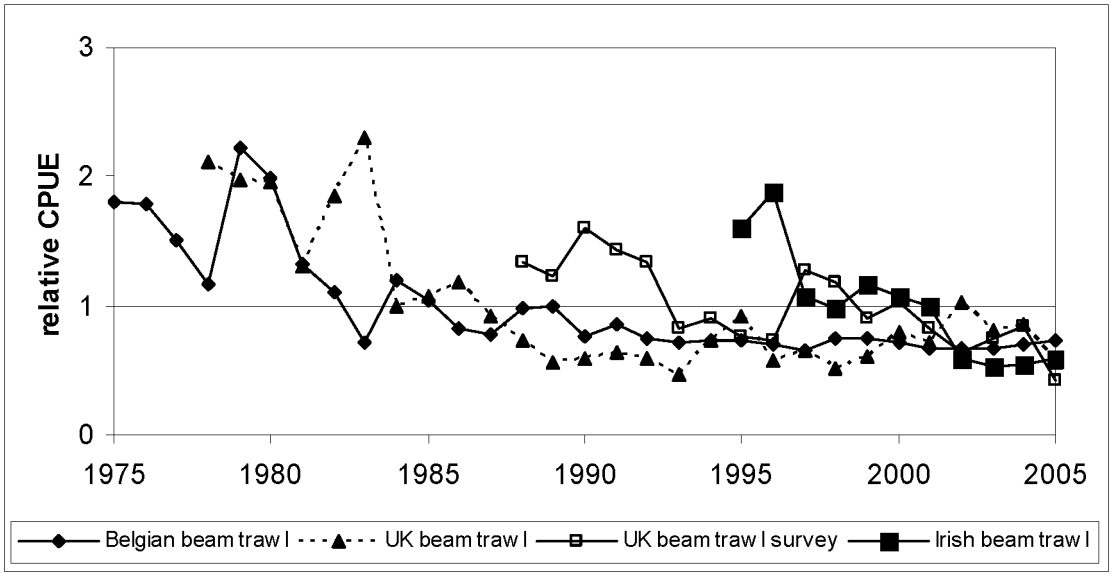


Figure 5.4.12.1 Sole in VIIa. Relative CPUE and effort series for the commercial fleets used in tuning, and relative CPUE for the UK beam trawl survey

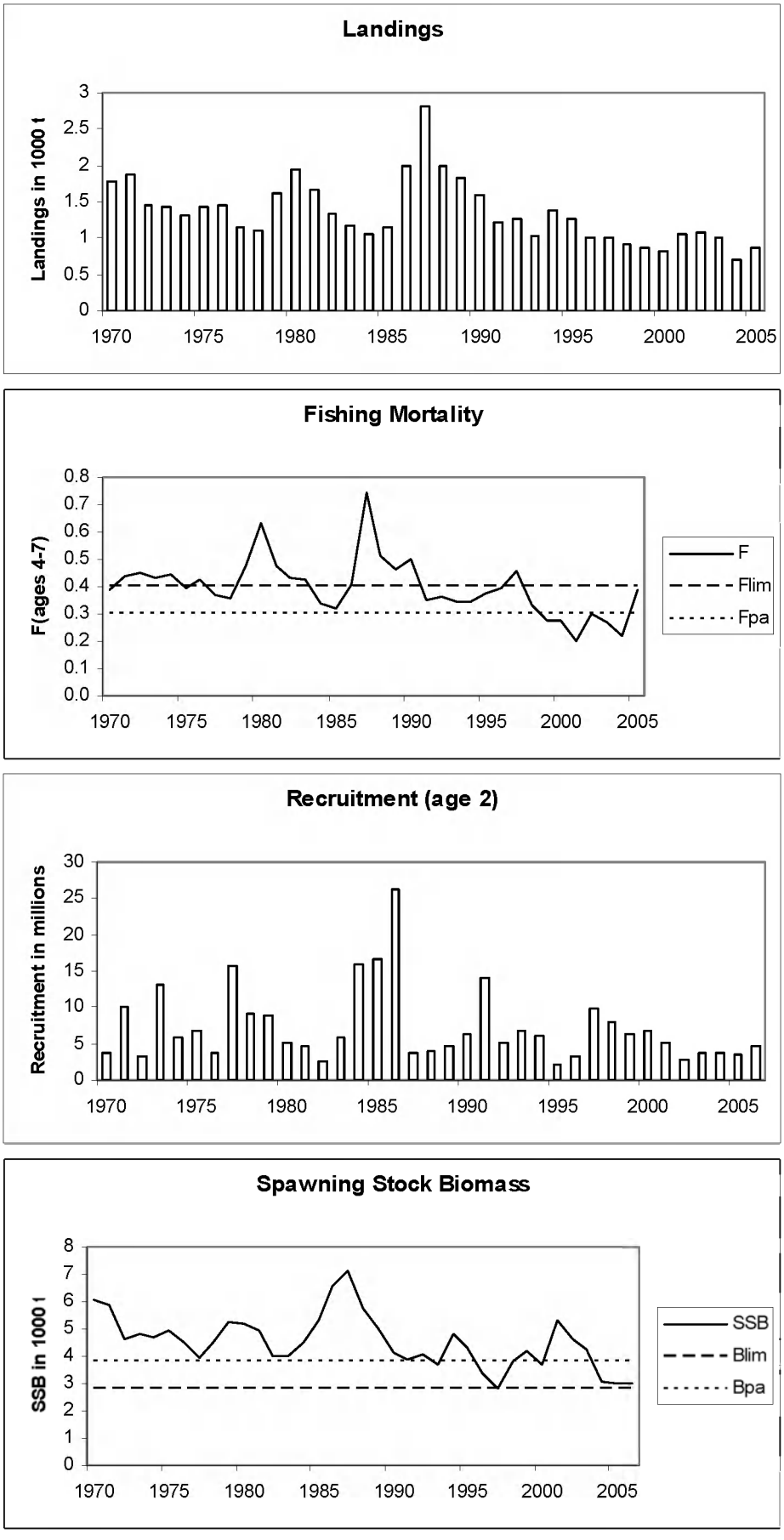
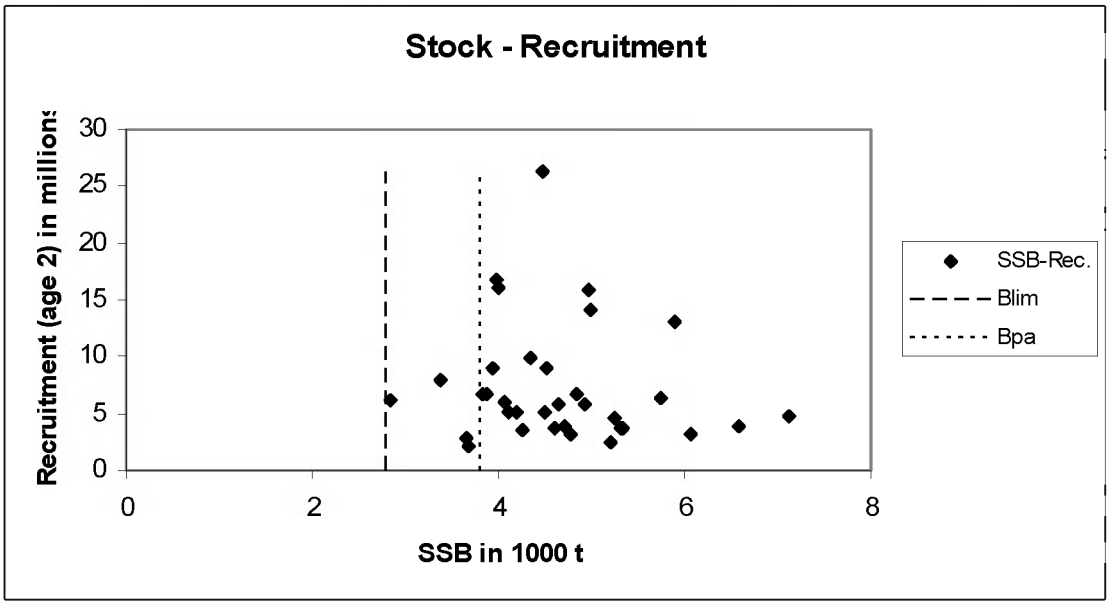
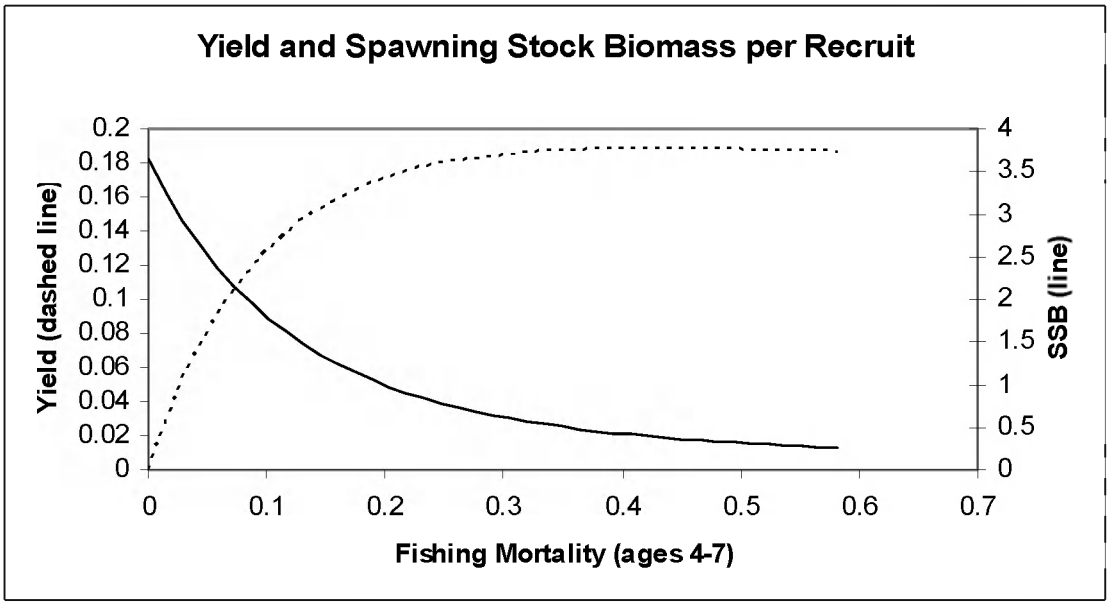


Figure 5.3.12.2 Sole in Division VIIa (Irish Sea). Landings, fishing mortality, recruitment and SSB.





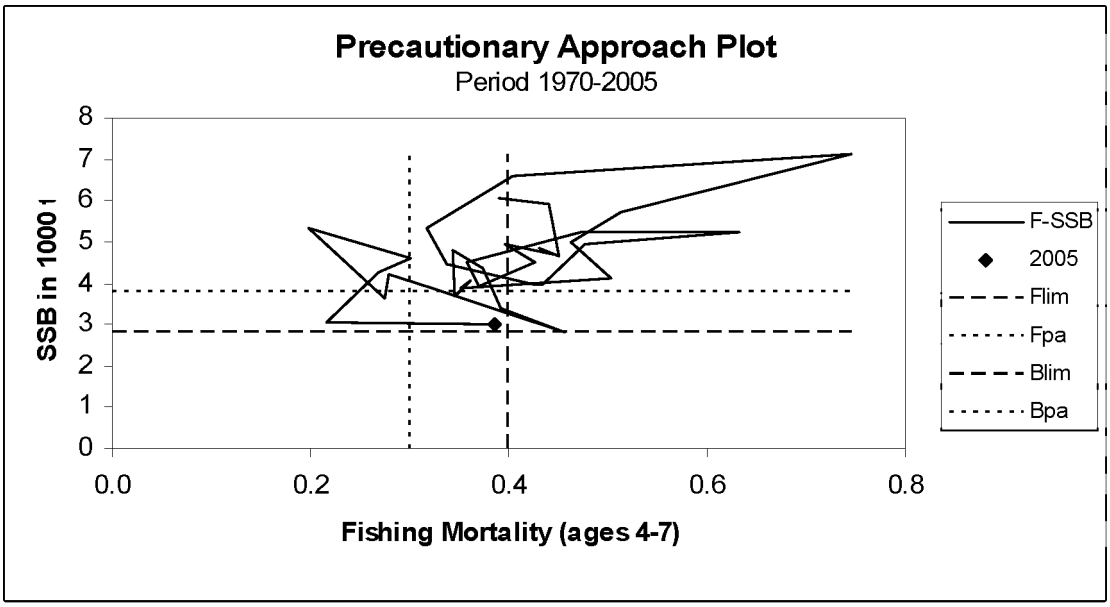


Figure 5.4.12.3 Sole in Division VIIa (Irish Sea) Summary plot. Stock and recruitment; Yield and SSB per recruit.

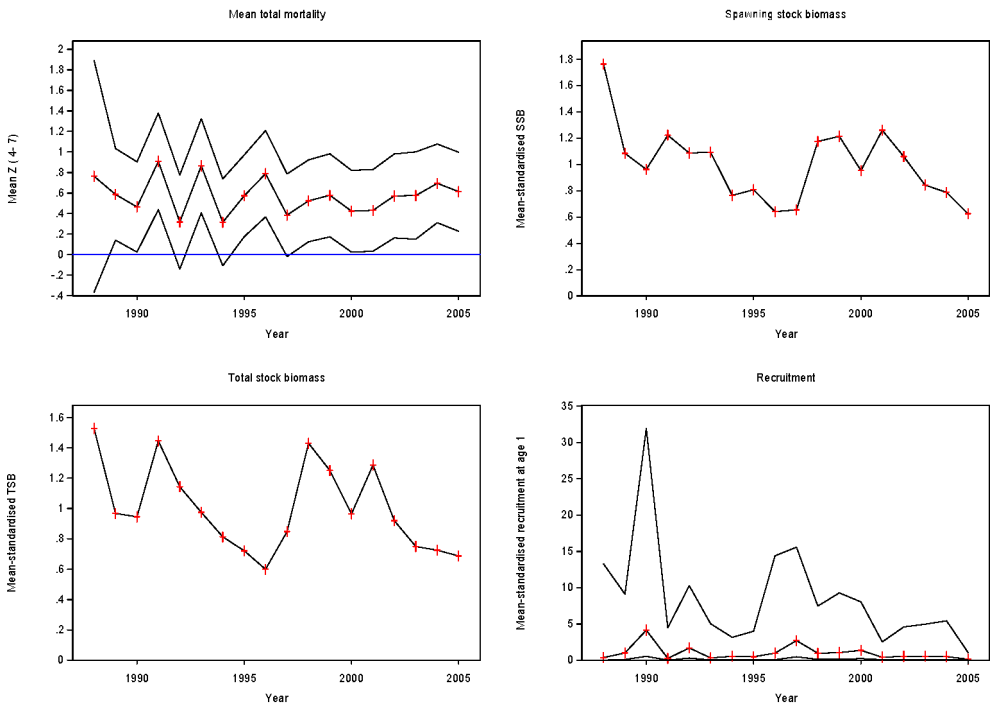


Figure 5.4.12.4 Results from Surba analysis for UK (E&W) September beam trawl survey.

Table 5.4.12.1 Irish Sea Sole. Nominal landings (tonnes) as officially reported by ICES

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005*
Belgium	930	987	915	1010	786	371	531	495	706	675	533	570	525	469	493	674	817	687	527	662
France	17	5	11	5	2	3	11	8	7	5	5	3	5 *	1 *	3	4	4	4	1	2
Ireland	235	312	366	155	170	198	164	98	226	176	133	130	134	120	135	135	96	103	77	n/a
Netherlands	-	-	-	-	-	-	-	-	-	-	149	123	60	46	60	-	-	-	-	-
UK (Engl.& Wales)[1]	637	599	507	613	569	581	477	338	409	424	194	189	161	165	133	...	...	...	...	...
UK (Isle of Man)	1	3	1	2	10	44	14	4	5	12	4	5	3	1	1	+	+	+	+	+
UK (N. Ireland)[1]	50	72	47																	
UK (Scotland)	46	63	38	38	39	26	37	28	14	8	5	7	9	8	8	4	3	3	1	n/a
United Kingdom																195	165	217	106	103
Total	1,916	2,041	1,885	1,823	1,576	1,223	1,234	971	1,367	1,300	1,023	1,027	897	810	833	1,012	1,085	1,014	712	767
Unallocated	79	767	114	10	7	-11	25	52	7	-34	-21	-24	14	54	-15	41	2	0	-13	33
Total used by Working Group in Assessment	1,995	2,808	1,999	1,833	1,583	1,212	1,259	1,023	1,374	1,266	1,002	1,003	911	863	818	1,053	1,087	1,014	699	800

* Preliminary

[1] 1989 onwards: N. Ireland included with England & Wales

Table 5.4.12.2 Sole in Division VIIa (Irish Sea).

Year	Recruitment Age 2 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4-7
1970	3695	6071	1785	0.390
1971	10180	5895	1882	0.440
1972	3187	4653	1450	0.450
1973	13141	4831	1428	0.430
1974	5875	4707	1307	0.444
1975	6688	4963	1441	0.395
1976	3861	4508	1463	0.427
1977	15813	3946	1147	0.369
1978	9082	4496	1106	0.357
1979	8932	5238	1614	0.473
1980	5120	5213	1941	0.633
1981	4585	4922	1667	0.476
1982	2554	3992	1338	0.434
1983	5800	3976	1169	0.425
1984	16027	4480	1058	0.338
1985	16754	5335	1146	0.318
1986	26285	6591	1995	0.405
1987	3766	7114	2808	0.745
1988	3904	5739	1999	0.514
1989	4696	4999	1833	0.463
1990	6433	4118	1583	0.503
1991	14178	3875	1212	0.352
1992	5100	4063	1259	0.361
1993	6726	3687	1023	0.346
1994	6047	4782	1374	0.344
1995	2178	4341	1266	0.374
1996	3180	3370	1002	0.392
1997	9830	2834	1003	0.457
1998	7895	3819	911	0.329
1999	6237	4202	863	0.278
2000	6710	3657	818	0.275
2001	5063	5318	1053	0.197
2002	2851	4601	1087	0.302
2003	3773	4265	1014	0.269
2004	3785	3064	699	0.217
2005	3463	3021	856	0.386
2006	4641	3015		
Average	7244	4532	1350	0.397

5.4.13 Sole in Division VIIf and g (Celtic Sea)

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
Full reproductive capacity	Increased risk	Overexploited	

Based on the most recent estimates of SSB, ICES classifies the stock as having full reproductive capacity. The exceptional year class of 1998 has increased SSB to above the long-term average, but as the contribution of this year class on SSB wanes, SSB declines again. Based on the most recent estimates of fishing mortality, ICES classifies the stock as being at risk of being harvested unsustainably. Fishing mortality has been fluctuating around a high level exceeding $\mathbf{F}_{pa}$ since the mid-1980s.

Management objectives

There are no specific management objectives for this stock.

Reference points

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is not defined.	$\mathbf{B}_{pa}$ be set at 2 200 t. There is no evidence of reduced recruitment at the lowest biomass observed and $\mathbf{B}_{pa}$ can therefore be set equal to the lowest observed SSB.
$\mathbf{F}_{lim}$ is 0.52, the fishing mortality estimated to lead to potential stock collapse.	$\mathbf{F}_{pa}$ be set at 0.37. This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$ and maintaining SSB above $\mathbf{B}_{pa}$ in 10 years, taking into account the uncertainty of assessments.

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 4–8	Yield/R	SSB/R
Average last 3 years	0.494	0.190	0.430
$\mathbf{F}_{max}$	0.274	0.198	0.838
$\mathbf{F}_{0.1}$	0.126	0.179	1.741
$\mathbf{F}_{med}$	0.331	0.197	0.680

Technical basis

$\mathbf{B}_{lim}$: Not defined.	$\mathbf{B}_{pa}$: $\mathbf{B}_{loss}$.
$\mathbf{F}_{lim}$: $\mathbf{F}_{loss}$.	$\mathbf{F}_{pa}$: $\mathbf{F}_{lim}$ x 0.72; implies a less than 5% probability that ($SSB_{MT} < \mathbf{B}_{pa}$).

Single-stock exploitation boundaries

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

Target reference points have not been agreed for this stock. A candidate for a target reference point which is 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 $\mathbf{F}_{0.1}$ (0.13) and $\mathbf{F}_{max}$ (0.27). There is no gain in yield having a target above this level. The risk to the stock at this level of fishing mortalities appears to be very low in the medium term.

Exploitation boundaries in relation to precautionary limits

A 24% reduction in F is needed to reduce F below $\mathbf{F}_{pa}$. This corresponds to landings of less than 840 tonnes in 2007.

Outlook for 2007

Basis: F(2006) = $\mathbf{F}_{sq}$ = mean F(03-05) = 0.49; R71–03 = GM = 4.9 million; SSB(2006) = 2.69 kt; SSB(2007) = 2.53 kt; landings (2006) = 1.1 kt.
The maximum fishing mortality which would be in accordance with precautionary limits (F (precautionary limits)) is 0.37.
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 0.27.

Rationale	TAC(2007) [1]	Basis	F(2007)	SSB(2008)	%SSB change	%TAC change
Zero catch	0.00	F=0	0.00	3.61	43%	-100%
Status quo	1.06	$\mathbf{F}_{sq}$	0.49	2.42	-4%	12%
High long-term yield	0.64	F(long-term yield)	0.27	2.89	14%	-33%
Status quo	0.59	$\mathbf{F}_{sq}$ *0.5	0.25	2.95	16%	-38%
	0.69	$\mathbf{F}_{sq}$ *0.6	0.29	2.83	12%	-27%
	0.79	$\mathbf{F}_{sq}$ *0.7	0.34	2.72	8%	-17%
	0.83	$\mathbf{F}_{sq}$ *0.75	0.37	2.67	6%	-13%
	0.88	$\mathbf{F}_{sq}$ *0.8	0.39	2.62	3%	-7%
	0.97	$\mathbf{F}_{sq}$ *0.9	0.44	2.51	-1%	3%
	1.06	$\mathbf{F}_{sq}$ *1	0.49	2.42	-4%	12%
	1.14	$\mathbf{F}_{sq}$ *1.1	0.54	2.33	-8%	20%
Precautionary limits	0.10	TAC($\mathbf{F}_{pa}$) *0.1	0.04	3.50	38%	-90%
	0.24	TAC($\mathbf{F}_{pa}$) *0.25	0.09	3.35	32%	-75%
	0.45	TAC($\mathbf{F}_{pa}$) *0.5	0.19	3.10	23%	-52%
	0.65	TAC($\mathbf{F}_{pa}$) *0.75	0.28	2.88	14%	-31%
	0.76	TAC($\mathbf{F}_{pa}$) *0.9	0.33	2.75	9%	-20%
	0.84	$\mathbf{F}_{pa}$ = $\mathbf{F}_{sq}$ *0.76	0.37	2.67	5%	-12%
	0.91	TAC($\mathbf{F}_{pa}$) *1.1	0.41	2.59	2%	-5%
	1.00	TAC($\mathbf{F}_{pa}$) *1.25	0.46	2.48	-2%	6%

All weights in thousand tonnes.

[1] It is assumed that the TAC will be implemented and that the landings in 2007 therefore correspond to the TAC.

Shaded scenarios are not considered consistent with the precautionary approach.

Management considerations

ICES has explored simulations with long term-target Fs below 0.59 for this stock. These show a range of fishing mortalities from 0.27 to 0.49 that are predicted to result in the highest long-term yields (around 950 t), whilst posing little risk of being below $\mathbf{B}_{loss}$ in the long term (Figure 4.3.18). Above F of 0.49 the risk of going below $\mathbf{B}_{loss}$ increases rapidly and as the estimation of this break point is sensitive to model assumptions a target fishing mortality should be chosen at the lower level within the range of $\mathbf{F}_{max}$. This would not lead to lower long-term yield. A Harvest Control Rule (HCR) should therefore be developed to reduce F to this type of target level in the medium term whilst minimizing the risk of SSB decreasing below $\mathbf{B}_{loss}$.

As sole is mainly taken in a beam-trawl fishery as part of a mixed demersal fishery, predominantly with plaice; a similar analysis for VIIf,g plaice was carried out, indicating a target F range for plaice between 0.15 and 0.31. A dialogue between managers and stakeholders will be required to define an appropriate management plan for this fishery.

In recent years, fishing mortality has been high. SSB declined until 1998; since then it has increased somewhat due to the contribution of some good year classes, particularly the 1998 year class. As the contribution of this year class

wanes, SSB declines again. At current levels of fishing mortality, there is a high probability that SSB will be below $\mathbf{B}_{pa}$ in some years. SSB levels just above $\mathbf{B}_{pa}$ are still low compared to the values observed in the past.

Effort restrictions are in place for many areas but not in the Celtic Sea, which makes the latter vulnerable to unrestricted increases in effort. This is undesirable where stocks are already overexploited. There was a substantial effort increase by the major fleet (Belgian fleet) in 2004 and 2005. However, preliminary results from 2006 indicate that the effort displacement into the Celtic Sea by Belgian beam trawl vessels is decreasing due to the non-effort-limitation in Subarea VIId in 2006.

Factors affecting the fisheries and the stock

The fisheries for sole in the Celtic Sea and Bristol Channel involve vessels from Belgium, taking two thirds, the UK one quarter, and France and Ireland taking minimal amounts of the total landings. The sole fishery is concentrated on the north Cornish coast off Trevose Head and around Lands End.

Sole are taken mainly in a beam trawl fishery that started in the early 1960s and, to a lesser extent, in the longer established otter trawl fisheries. In the 1970s, the fishery was mainly carried out by Belgian beam trawlers and Belgian and UK otter trawlers. The use of beam trawls (to target sole and plaice) increased during the mid-1970s, and the Belgian otter trawlers have now been almost entirely replaced by beam trawlers. Effort in the Belgium beam-trawl fleet increased in the late 1980s as vessels normally operating in the North Sea were attracted to the west by improved fishing opportunities. Beam trawling by UK vessels increased substantially from 1986, reaching a peak in 1990 and decreasing thereafter. In the Celtic Sea, the beam and otter trawl fleets also take plaice, rays, brill, turbot, and anglerfish.

Ecosystem considerations

The main spawning areas for sole in the Celtic Sea are in waters 40- to 75-m deep, off Trevose Head, and spawning usually takes place between February and April. Juvenile sole are found in relatively high abundance in depths up to 40 m, and adult sole (fish aged 3 plus) are generally found in deeper water. Spawning and nursery grounds are well defined.

The results of recent tagging experiments suggest that there is only limited movement of sole between the Bristol Channel and adjacent areas.

The effects of regulations

In 2004, effort limitations (due to e.g. recovery plans for cod in the Irish Sea and the Eastern Channel) on most fishing grounds where the Belgian fleet normally operates resulted in a concentration of the Belgian effort into the Celtic Sea, where no such effort restrictions were in place.

Council Regulation (EC) No. 27/2005, Annex III, part A 12 (b) prohibited fishing in ICES rectangles 30E4, 31E4, and 32E3 during January–March 2005. This restriction did not apply to beam trawlers in March. Council Regulation (EC) No 51/2006, Annex III, part A 4.2 prohibited fishing in ICES rectangles 30E4, 31E4, and 32E3 (except within 6 miles from the base line) during February and March 2006 for all vessels and gear.

There is evidence that the closure of rectangles 30E4, 31E4, and 32E3 have redistributed effort to other areas. Monthly sightings of beam trawlers and otter trawlers (vessels of all nationalities) in 2004 to 2006 show that, during the first months of the year, beam trawl effort is particularly concentrated in rectangle 30E4 except when the closure is in force. Otter trawl effort in Divisions VIIf,g is less concentrated during the first 3 months of the year and the spatial distribution of effort appears to be less affected by the closed area. VMS data for French, Belgian, and UK (E&W) vessels show a similar overall picture, given that the French fleet consists mainly of otter trawlers whereas the Belgian fleet are beam trawlers.

Beam trawlers account for the vast majority of sole landed by UK (E&W) vessels in Divisions VIIf,g. The proportion of sole taken from the closed area was significantly reduced in March 2006, but increased to previous levels in the months either side of the closure period. Overall effort levels were reduced in February and March 2006 but, as for plaice, CPUE levels did not decline.

Changes in fishing technology and fishing patterns

There have not been any major shifts between fisheries. Beam trawlers still account for more than 93% of the Belgian fleet; however, due to high fuel prices; several vessels of this fleet segment have tested different methods in order to reduce their fuel costs. These include (a) reducing the weight of the beam trawl by decreasing the length of the beam

or reducing the weight of the shoes. There is also evidence of fishers from other countries beginning to experiment with gear designs to improve fuel efficiency.

Some large beam trawlers in the Belgium fleet (~1200 Kw) are currently testing two technical modifications for the beam trawl, including T90-codends in combination with a benthos release panel in the belly of the beam trawl. Indications are that the remaining fleet is considering a voluntary uptake of these modifications.

There is evidence from the Belgian beam trawl fleet sector, which had previously underreported their engine horsepower, have now re-aligned their engine horsepower upwards to increase their fishing entitlements, allocated under national management measures. Similar situations have arisen in a number of other countries.

There is evidence of a switch to targeting other species by the main beam trawl fleet in this area.

Scientific basis

Data and methods

The analytical age-based assessment is based on landings, two commercial CPUE series, and one survey index.

Information from the fishing industry

A number of DEFRA-funded surveys (Fisheries Science Partnership) were conducted in 2003, 2004, 2005, and 2006, using chartered UK fishing vessels in order to obtain new information on the catch rates, length distributions, and discard rates of target species. Investigations conducted in the Western Channel, Eastern Celtic Sea, and Bristol Channel during 2003–2006 confirmed that catch rates were highest in the area off the coast of North Cornwall. There was a trend for sole to be larger in the catches near Cornwall than in the north of the survey region near Pembrokeshire. The bycatch of cod was very small.

There was little information from the Pre-WG industry briefing meetings on VIIf,g sole.

Uncertainties in assessment and forecast

The catch numbers appear to be reasonably reliable though there is some variability in survey tuning data.

The contribution of recruitment of the incoming year class to the short-term forecast is low, and last year's forecast was close to the realized catches.

Comparison with previous assessment and advice

Results are very close to those of the previous assessment. The perception of the stock has not changed and the basis for the advice is similar.

Source of information

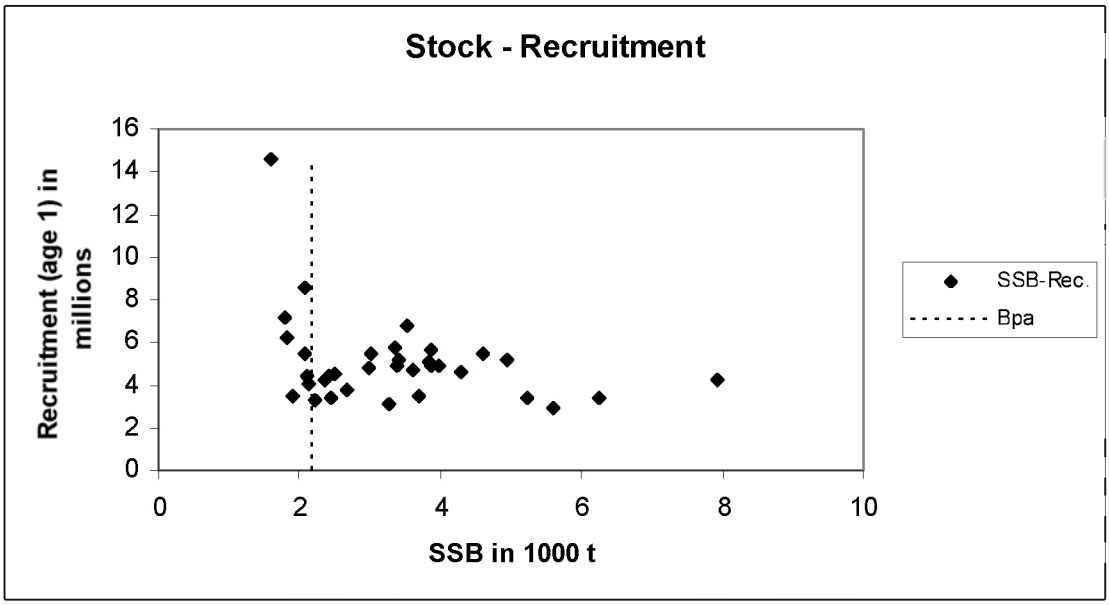
Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 27 June–6 July 2006 (ICES CM 2006/ACFM:33).

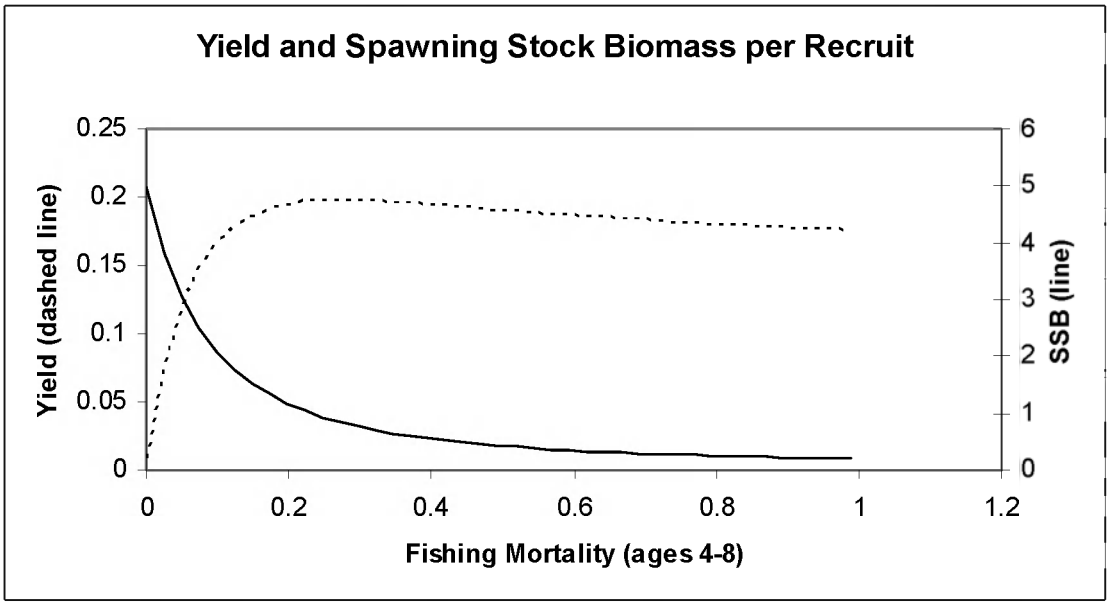
Year	ICES advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	ACFM Landings
1987	*Status quo* F; TAC		1.6		1.6	1.22
1988	F = F(pre-86); TAC		0.9		1.1	1.15
1989	F at F(81–85); TAC		1.0		1.0	0.99
1990	No increase in F		1.2		1.2	1.19
1991	No increase in F		1.1		1.2	1.11
1992	No long-term gains in increasing F		1.1		1.2	0.98
1993	No long-term gains in increasing F		-		1.1	0.93
1994	No long-term gains in increasing F		-		1.1	1.01
1995	No increase in F		1.0		1.1	1.16
1996	20% reduction in F		0.8		1.0	1.00
1997	20% reduction in F		0.8		0.9	0.93
1998	20% reduction in F		0.7		0.85	0.88
1999	Reduce F below $\mathbf{F}_{pa}$		0.81		0.96	1.01
2000	Reduce F below $\mathbf{F}_{pa}$		<1.16		1.16	1.09
2001	Reduce F below $\mathbf{F}_{pa}$		< 0.81		1.02	1.17
2002	Reduce F below $\mathbf{F}_{pa}$		< 1.00		1.07	1.35
2003	Reduce F below $\mathbf{F}_{pa}$		< 1.24		1.24	1.39
2004	[1]	Reduce F below $\mathbf{F}_{pa}$	[1]	< 1.00	1.05	1.25
2005	[1]	Reduce F below $\mathbf{F}_{pa}$	[1]	< 0.84	1.00	1.04
2006	[1]	Reduce F below $\mathbf{F}_{pa}$	[1]	< 0.88	9.50	
2007	[1]	Reduce F below $\mathbf{F}_{pa}$	[1]	< 0.84		

Weights in '000 t.

[1] Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

Figure 5.4.13.1 Sole in Divisions VIIf and g (Celtic Sea). Landings, fishing mortality, recruitment and SSB.





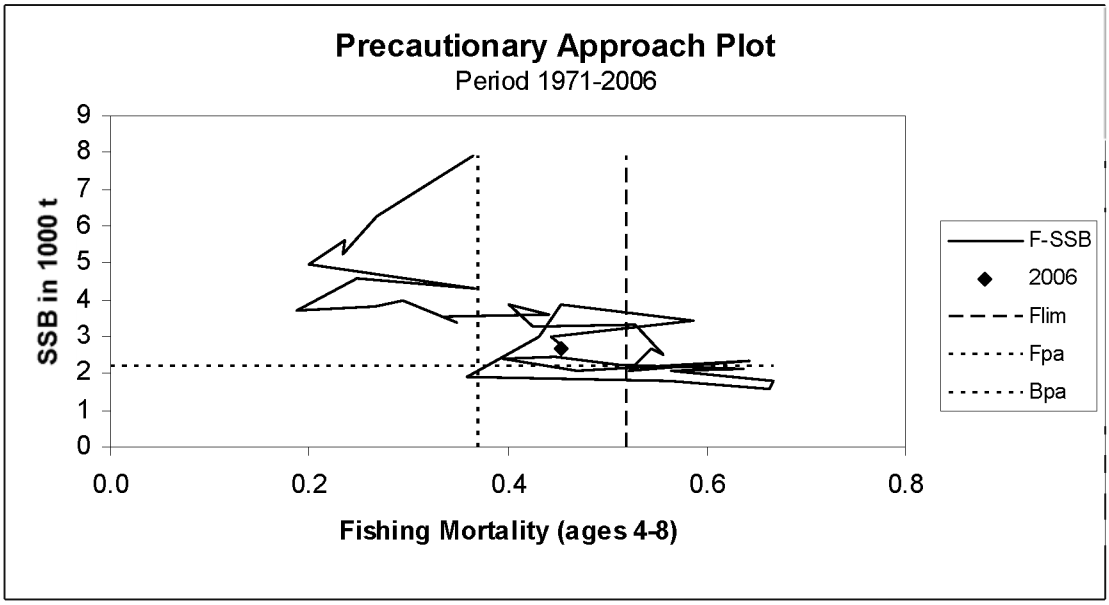


Figure 5.4.13.2 Sole in Divisions VIIf and g (Celtic Sea). Stock and recruitment; Yield and SSB per recruit.

Results for different values of target F, assuming Fsq in 2006, and target F 2007 onwards.

Run	Target F	F value	Yield: mean 2021-2024			Prob. (B<1600t,%) at equilibrium		
			Yield-25%	Yield-50%	Yield-75%	Risk	F-reduction	Yield prop.
1	F0.1	0.13	792	852	917	0.000	0.73	0.90
2	Fmax	0.27	867	943	1035	0.000	0.45	1.00
3	Fpa	0.37	840	929	1036	0.000	0.24	0.99
4	0.8*Fsq	0.39	834	925	1034	0.000	0.20	0.98
5	Fsq	0.49	800	902	1021	3.925	0.00	0.96
6	1.2*Fsq	0.59	717	832	966	53.150	-0.20	0.88

Boxed scenarios represent possible target fishing mortalities.

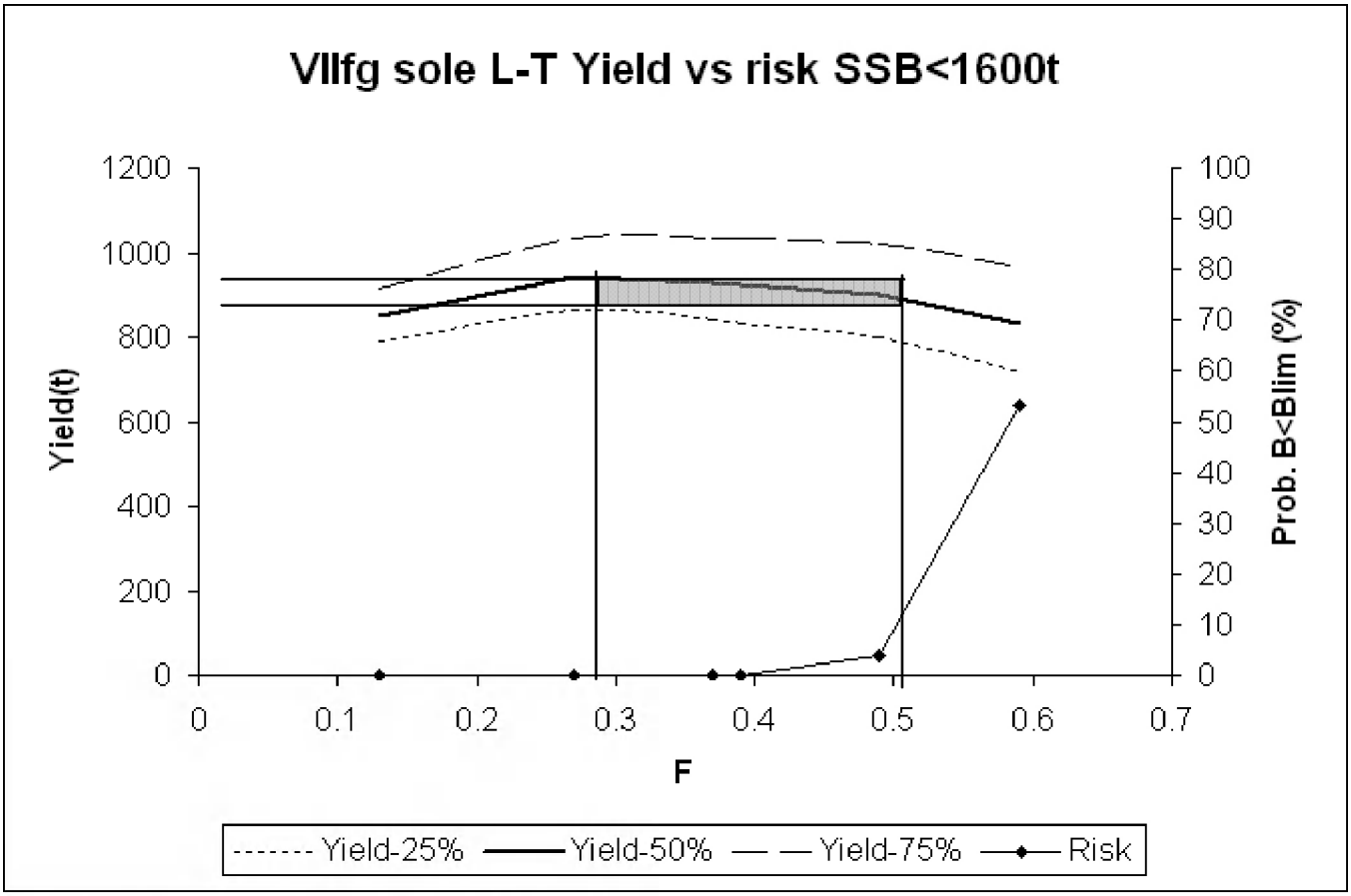


Figure 5.4.13.3 VIIfg sole - CS5 results 2006 WG.

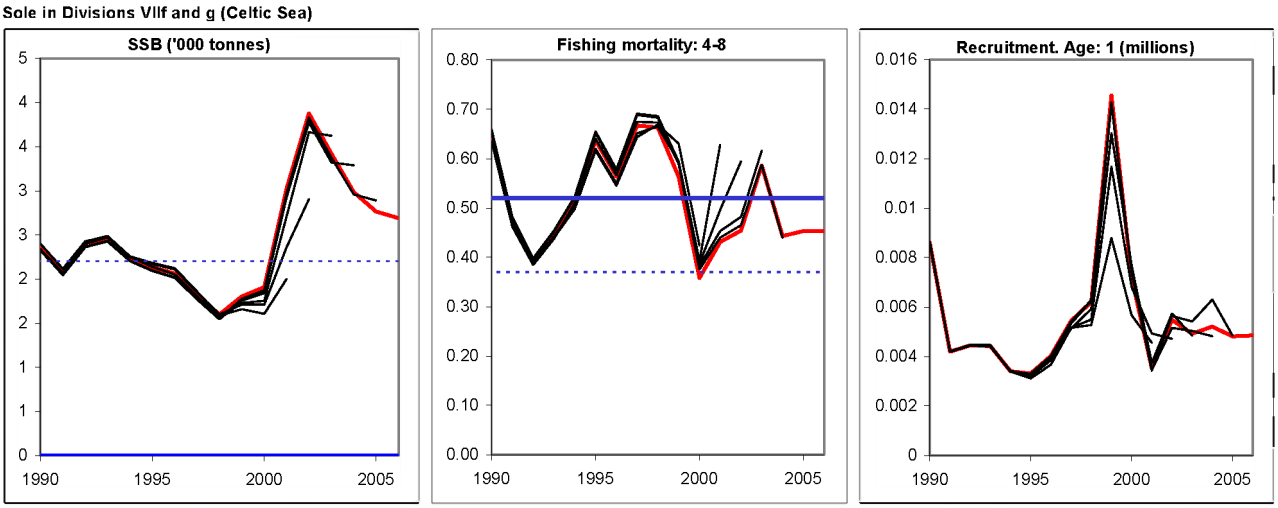


Figure 5.4.13.4 Sole in Divisions VIIf and g. Historical performance of the assessment (SSB, fishing mortality, and recruitment).

Table 5.4.13.1 Celtic Sea SOLE. Divisions VIIf and VIIg. Official nominal landings (t), 1986–2005 and data used by the Working Group.

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005[1]
Belgium	1039*	701*	705*	684*	716*	982*	543*	575*	619*	763*	695*	660*	675*	604	694	720	703	715	735	646
Denmark	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
France	146	117	110	87	130	80	141	108	90	88	102	99	98	61	74	77	66	77	79	61
Ireland	188*	9	72	18	40	32	45	51	37	20	19	28	42	51	29	35	32	26	33	n/a
UK(E. & W,NI.)	611*	437	317	203	353	402	325	285	264	294	265	251	198	231	243	288	318	342	283	217
UK(Scotland	-	-	-	-	0	0	6	11	8	-	0	0	-	0	-	-	+	+	-	-
Netherlands	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	1,989	1,264	1,204	992	1,239	1,496	1060	1030	1,018	1,165	1081	1038	1013	886	1,040	1,120	1,119	1,160	1,130	924
Unallocated	-389	-42	-58	-	50	-389	-79	-102	-9	-8	-86	-111	-138	65	51	48	226	232	119	120
Total used in assessment	1,600	1,222	1,146	992	1,189	1,107	981	928	1,009	1,157	995	927	875	1,012	1,091	1,168	1,345	1,392	1,249	1044

[1]Preliminary.
* Including VIIg–k.

Table 5.4.13.2 Sole in Divisions VIIf and g (Celtic Sea).

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4-8
1971	9560	7930	1861	0.365
1972	4254	6248	1278	0.268
1973	3371	5225	1391	0.233
1974	3386	5593	1105	0.235
1975	2963	4954	919	0.200
1976	5182	4299	1350	0.367
1977	4624	4598	961	0.248
1978	5482	3706	780	0.187
1979	3528	3836	954	0.267
1980	5123	3974	1314	0.294
1981	4854	3385	1212	0.348
1982	4878	3520	1128	0.335
1983	6776	3620	1373	0.442
1984	4692	3875	1266	0.400
1985	5632	3279	1328	0.425
1986	3145	3340	1600	0.528
1987	5724	2495	1222	0.557
1988	4483	2678	1146	0.544
1989	3724	2085	992	0.521
1990	8586	2367	1189	0.643
1991	4196	2091	1107	0.470
1992	4452	2407	981	0.394
1993	4423	2449	928	0.447
1994	3403	2229	1009	0.512
1995	3316	2133	1157	0.637
1996	4027	2063	995	0.564
1997	5433	1816	927	0.667
1998	6206	1600	875	0.663
1999	14556	1802	1012	0.563
2000	7191	1907	1091	0.358
2001	3527	3024	1168	0.431
2002	5479	3877	1345	0.454
2003	4919	3419	1392	0.586
2004	5205	2985	1249	0.443
2005	4809	2765	1044	0.453
2006	4850	2690		
Average	5166	3341	1158	0.431

5.4.14 Sole in Division VIIe (Western Channel)

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
Increased risk	Harvested unsustainably	Overexploited	

Based on the most recent estimates of SSB, ICES classifies the stock as being at risk of reduced reproductive capacity.

SSB has declined since 1980 when fishing mortality increased and is close to a historic low in 2005. Based on the most recent estimates of fishing mortality, ICES classifies the stock as being harvested unsustainably. Fishing mortality has been above $\mathbf{F}_{pa}$ since 1978, and mostly above $\mathbf{F}_{lim}$ since 1982.

Management objectives

There are no specific management objectives for this stock.

Reference points

Precautionary Approach reference points (revised in 2001):

ICES considers that:	ICES proposes that:
$\mathbf{B}_{lim}$ is 2 000 t, the lowest observed spawning stock biomass.	$\mathbf{B}_{pa}$ be set at 2800 t.
$\mathbf{F}_{lim}$ is 0.28, the fishing mortality estimated to lead to potential stock collapse.	$\mathbf{F}_{pa}$ be set at 0.2.

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 3–7	Yield/R	SSB/R
Average last 3 years	0.412	0.206	0.468
$\mathbf{F}_{max}$	0.271	0.210	0.743
$\mathbf{F}_{0.1}$	0.115	0.189	1.619
$\mathbf{F}_{med}$	0.251	0.210	0.803

Technical basis

$\mathbf{B}_{lim} = \mathbf{B}_{loss}$.	$\mathbf{B}_{pa}$: historical development: Biomass below this has increased risk of reduced recruitment.
$\mathbf{F}_{lim} = \mathbf{F}_{loss}$.	$\mathbf{F}_{pa}$:$\mathbf{F}_{lim}$*0.72.

Single-stock exploitation boundaries

Exploitation boundaries in relation to existing management plans

There is no agreed management plan.

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

Fishing mortality around $\mathbf{F}_{0.1}$ =0.12 can be considered as candidate target reference points, which are consistent with taking high long-term yields and achieving a low risk of depleting the productive potential. The present fishing mortality (0.41) is above the candidate reference point.

Exploitation boundaries in relation to precautionary limits

Rebuilding the stock above $\mathbf{B}_{pa}$ in just one year would require that fishing mortality to be reduced by at least 68%. This would correspond to landings of around 350 tonnes in 2007. If this reduction is not possible then ICES recommends that a recovery plan be implemented which ensures a safe and rapid rebuilding of SSB to levels above $\mathbf{B}_{pa}$.

Short-term implications

Outlook for 2007

Basis: F(2006) = $\mathbf{F}_{sq}$ = mean F(03–05) = 0.41; R05–06 = GM = 4.3 million; SSB(2006) = 2.33 kt; SSB(2007) = 2.28 kt; landings (2006) = 1.02 kt.

The maximum fishing mortality which would be in accordance with precautionary limits (F (precautionary limits)) is 0.2.

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 around 0.12.

Rationale	TAC(2007) [1]	Basis	F(2007)	SSB()	%SSB change	%TAC change
Zero catch	0.00	F=0	0.00	3.15	38%	-100%
Status quo	0.98	$\mathbf{F}_{sq}$	0.41	2.21	-3%	4%
High long-term yield	0.35	F(long-term yield)	0.13	2.81	23%	-63%
Status quo	0.12	$\mathbf{F}_{sq}$ *0.1	0.04	3.04	33%	-88%
	0.23	$\mathbf{F}_{sq}$ *0.2	0.08	2.93	28%	-76%
	0.35	$\mathbf{F}_{sq}$ *0.32	0.13	2.81	23%	-63%
	0.77	$\mathbf{F}_{sq}$ *0.75	0.31	2.42	6%	-19%
	0.90	$\mathbf{F}_{sq}$ *0.9	0.37	2.29	0%	-4%
	0.98	$\mathbf{F}_{sq}$ *1	0.41	2.21	-3%	4%
	1.06	$\mathbf{F}_{sq}$ *1.1	0.45	2.14	-6%	13%
	1.17	$\mathbf{F}_{sq}$ *1.25	0.51	2.03	-11%	24%
Precautionary limits	0.06	TAC($\mathbf{F}_{pa}$) *0.1	0.02	3.10	36%	-94%
	0.20	TAC($\mathbf{F}_{pa}$) *0.36	0.07	2.96	30%	-79%
	0.29	TAC($\mathbf{F}_{pa}$) *0.54	0.11	2.87	26%	-69%
	0.35	TAC($\mathbf{F}_{pa}$)*65	0.13	2.81	23%	-63%
	0.47	TAC($\mathbf{F}_{pa}$) *0.9	0.18	2.69	18%	-50%
	0.52	$\mathbf{F}_{pa}$ = $\mathbf{F}_{sq}$ *0.49	0.20	2.65	16%	-44%
	0.57	TAC($\mathbf{F}_{pa}$) *1.1	0.22	2.60	14%	-39%
	0.64	TAC($\mathbf{F}_{pa}$) *1.25	0.25	2.54	11%	-32%
	0.75	TAC($\mathbf{F}_{pa}$) *1.5	0.30	2.43	6%	-20%
	0.86	TAC($\mathbf{F}_{pa}$) *1.75	0.35	2.33	2%	-9%
	0.96	TAC($\mathbf{F}_{pa}$) *2	0.40	2.23	-2%	2%
	1.06	TAC($\mathbf{F}_{pa}$) *2.25	0.45	2.14	-6%	12%

Weights in '000 t.

[1] It is assumed that the TAC will be implemented and that the landings in 2007 therefore correspond to the TAC.

Shaded scenarios are not considered consistent with the Precautionary Approach.

Management considerations

There is no obvious evidence of a reduction in fishing mortality despite recent changes in management.

Last year ICES explored simulations with long-term target Fs below 0.6 for this stock. These show a range of fishing mortalities from 0.1 to 0.3 that are predicted to result in the highest long-term yields, whilst posing little risk of being below $\mathbf{B}_{lim}$ in the long term. A Harvest Control Rule (HCR) should therefore be developed to reduce F to this type of target level in the medium term, whilst minimizing the risk of SSB decreasing below $\mathbf{B}_{lim}$.

The long-term yield is predicted to be close to 900 t at $\mathbf{F}_{0.1}$, slightly higher than in the previous assessments due to a slight increase in recruitment and selection pattern.

Any harvest control rule developed for sole should also take into account plaice as these two species are strongly linked in the fishery.

The 2003 assessment and additional investigations undertaken since then do not suggest that the stock is in imminent danger of collapse. This assertion is confirmed by the 2006 assessment; however, it is clear that the SSB continues to decline at current levels of F.

Misallocated landings between VIId and VIIe has been a big problem and to remedy this situation the European Commission increased the TAC in VIIe in 2005 and 2006. Misallocation continued, but at a much reduced rate due to these increased TACs.

Although sole is the main target species in the beam trawl fishery, catches of cuttlefish, plaice, monkfish, and lemon sole are also important. Management measures applied to sole must take account of management measures applied to the other quota species, particularly VIIe plaice and to a lesser degree VIIe–k cod.

Factors affecting the fisheries and the stock

In recent years, UK vessels have accounted for around 60% of the total landings, with France taking approximately a third and Belgian vessels the remainder. UK landings were low and stable between 1950 and the mid-1970s, but increased rapidly after 1978 due to the replacement of otter trawlers by beam trawlers. In recent years the WG estimates of landings indicate a slight increase in the percentage taken by French vessels. The principal gears used are otter trawls and beam trawls, and sole tends to be the target species of an offshore beam-trawl fleet, which is concentrated off the south Cornish coast, and also takes plaice and anglerfish and, at times, cuttlefish as part of a diverse mixed fishery.

The effects of regulations

Management of this stock has been by TAC, applied to sole in Division VIIe (i.e. the same as the assessment area). Industry information and commercial landings data analysis indicate that TACs have always been overshot and therefore do not provide effective control of fishing mortality. The agreed TAC in 2004 was 300 t, and landings were 1001 t. The TAC has been set to 865 t for 2005 to tackle area misreporting and underreporting problems in conjunction with an effort control regime. However, the ICES estimate of landings was 1026 t in 2005. Since 2005 beam trawlers with mesh size equal to or greater than 80 mm, which are responsible for the majority of the landings of this stock, have been restricted to 20 days at sea. The same 20 days at sea limitation has been applied to the static demersal nets, including gillnets, trammel nets, and tangle nets (Council Regulation (EC) No. 27/2005). There is no obvious reduction in nominal effort in 2005 compared to 2004 for the main fleets, and the fishing mortality is increasing.

Technical measures applied to this stock include a minimum landing size (24 cm) and minimum mesh size of 80 mm for beam trawlers. Local regulations restricting certain gear and vessel types are also in place.

Changes in fishing technology and fishing patterns

Whilst industry information indicates that fewer beam trawlers may now be active in the fishery, the overall standardized effort statistics do not show a significant reduction in effort in recent years.

Effective effort may possibly be reduced due to displacement and licence amalgamation and retargeting to other species and areas. However, the boats, although fewer in number are now bigger on average than they have been in the past and this could result in increased effective effort.

In 2005 and 2006 the increased fuel prices are known to have had a negative impact on the profitability of beam trawl fleets. This might result in decreased effort and changes in fishing patterns, but no information is available yet for ICES to evaluate this. The issue and resulting consequences are discussed in the WGFTFB 2006 report. No specific comments regarding the fleets exploiting the western channel sole fishery were raised in this report.

Other factors

In the Western Channel the peak spawning period of sole is April and May. The main spawning areas are to the west of the Isle of Wight and in the vicinity of Hurd Deep. The nurseries are in estuaries, tidal inlets, and shallow, sandy bays. Adult sole in the Western Channel may recruit from local nurseries and from those in the Eastern Channel, but there is no evidence of subsequent emigration from the Western Channel. Coupled with the localised spawning areas in the Western Channel, this suggests that adult sole in the Western Channel are largely isolated from those found in northern Biscay, the eastern Celtic Sea, and the Eastern Channel.

Scientific basis

Data and methods

The assessment is analytical, based on landings, one survey index, and 4 commercial CPUE series (2 of which are historic).

Variations in effort and fleet catchability may occur as vessels move in and out of the fishery, depending on the prevailing catch rates of sole.

Strategic misallocation and underreporting of landings from this stock have affected the assessment in the past. In 2002, the database was revised and now includes landings misreported to two rectangles in Division VIId since 1986.

Information from the fishing industry

The industry has been cooperative in a number of scientific endeavours with regards to this stock:

The fisheries science partnership conducted cooperatively between CEFAS and the UK industry has provided some information on age structure and distribution of this stock (CEFAS Fisheries Science Partnership Report (www.cefas.co.uk/fsp.)

Uncertainties in assessment and forecast

Substantial area misreporting of catches has been evident for a number of years and the catch statistics have been partially corrected for this. The extent of underreporting is unknown and the current stock assessment and forecast will be conditional on the accuracy of the landing statistics. Misallocation, mainly to Area VIId has continued in 2005, but at a much reduced rate due to the increase in the 2005 TAC. All sole landings into rectangles 28E8 and 29E8 have been reattributed to VIIe, for the purposes of the WG. Estimates of unreported landings are not available and so cannot be included in the assessment. Indications from this year's analysis are that levels of underreporting appear to have declined following high levels of misreporting in the early 1990s.

This assessment is tuned using data from the commercial fishery as well as from one survey. The accuracy of the assessment and forecast will depend on whether these commercial catch rates reflect changes in population abundance.

The evidence in the tuning data regarding the current level of fishing mortality is diverging, making the 2005 estimate uncertain. There are strong indications that fishing mortality has increased in recent years.

Comparison with previous assessment and advice

The current assessment revises fishing mortality downwards (17%) and SSB upwards (20%) in recent years and also results in a reduction of the 2002 and 2003 year class which were previously considered relatively strong. Because of the uncertainty of the estimate of the incoming year-class abundance, the catch projections are based on an average for the years 1969–2003, discounted for natural mortality.

The basis for the advice is consistent with last year's advice, although the advised level of catch is higher than last year due to the upwards revision of SSB in the new assessment.

Source of information

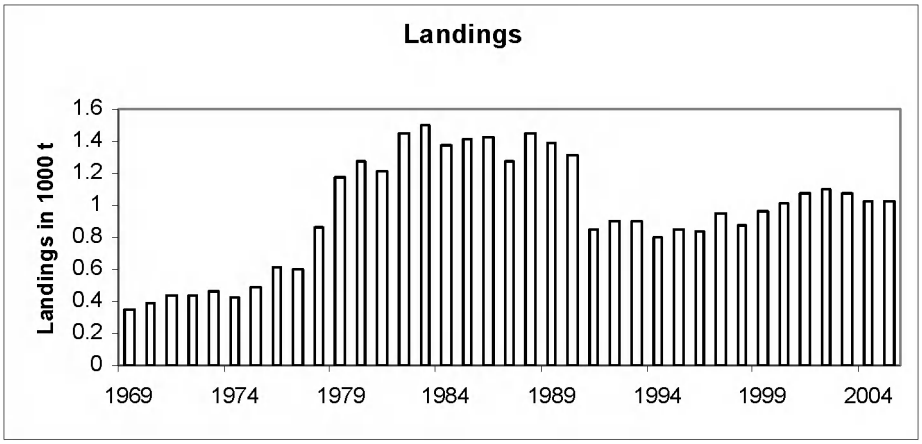
Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 27 June–6 July 2006 (ICES CM 2006/ACFM:33).

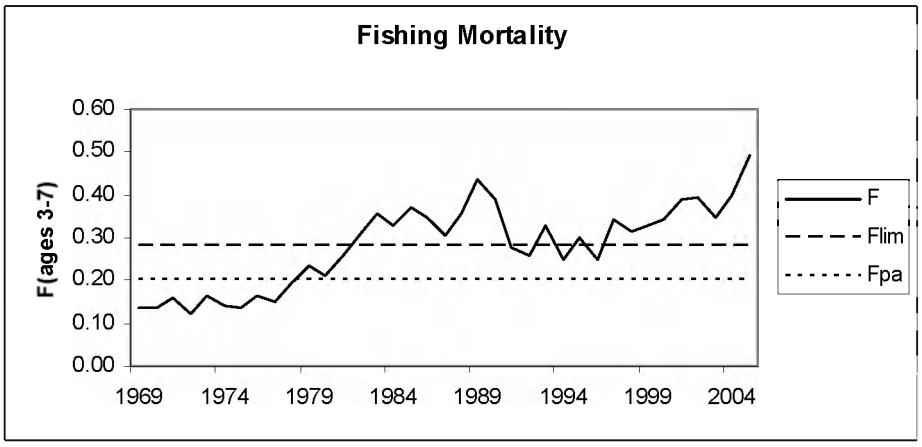
Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	Official Landings	ACFM Landings (a)
1987	No increase in F		1.15		1.15	1.11	1.28
1988	No decrease in SSB; TAC		1.3		1.3	0.95	1.44
1989	No decrease in SSB; TAC		1.0		1.0	0.8	1.39
1990	SSB = 3000 t; TAC		0.9		0.9	0.75	1.31
1991	TAC		0.54		0.8	0.84	0.85
1992	70% of F(90)		0.77		0.8	0.77	0.89
1993	35% reduction in F		0.7		0.9	0.79	0.90
1994	No increase in F		1.0		1.0	0.84	0.80
1995	No increase in F		0.86		0.95	0.88	0.86
1996	$F_{96} < F_{94}$		0.68		0.70	0.74	0.83
1997	No increase in F		0.69		0.75	0.86	0.95
1998	No increase in F		0.67		0.67	0.77	0.88
1999	Reduce F below $\mathbf{F}_{pa}$		0.67		0.70	0.66	0.96
2000	Reduce F below $\mathbf{F}_{pa}$		< 0.64		0.64	0.65	0.91
2001	Reduce F below $\mathbf{F}_{pa}$		<0.58		0.60	0.62	1.07
2002	Reduce F below $\mathbf{F}_{pa}$		<0.45		0.53	0.54	1.11
2003	Rebuilding plan or F=0		-		0.39	0.40	1.08
2004	F=0 or recovery plan [1]		0		0.30	0.48	1.00
2005	80% reduction in F or recovery plan		<0.23		0.865	0.73	1.03
2006	80% reduction in F or recovery plan		<0.24		0.940		
2007	68% reduction in F or recovery plan		<0.35				

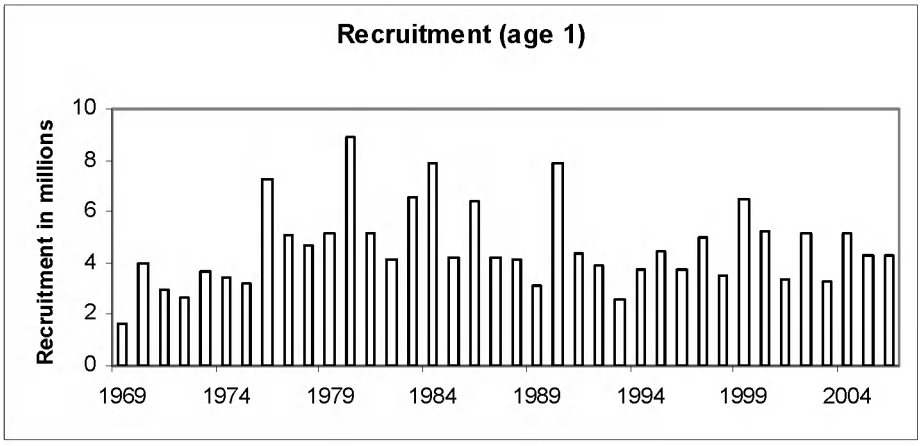
Weights in '000 t.

a) Includes misallocated landings, i.e. moving landings between two areas – not underreporting.

[1] Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.







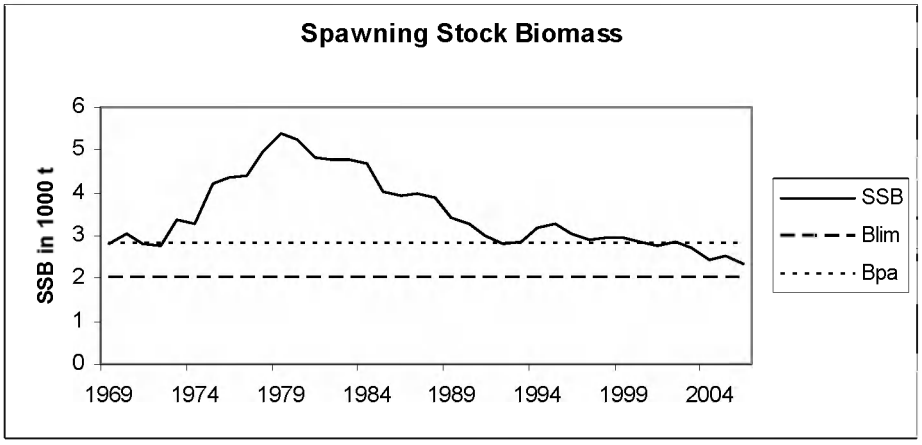
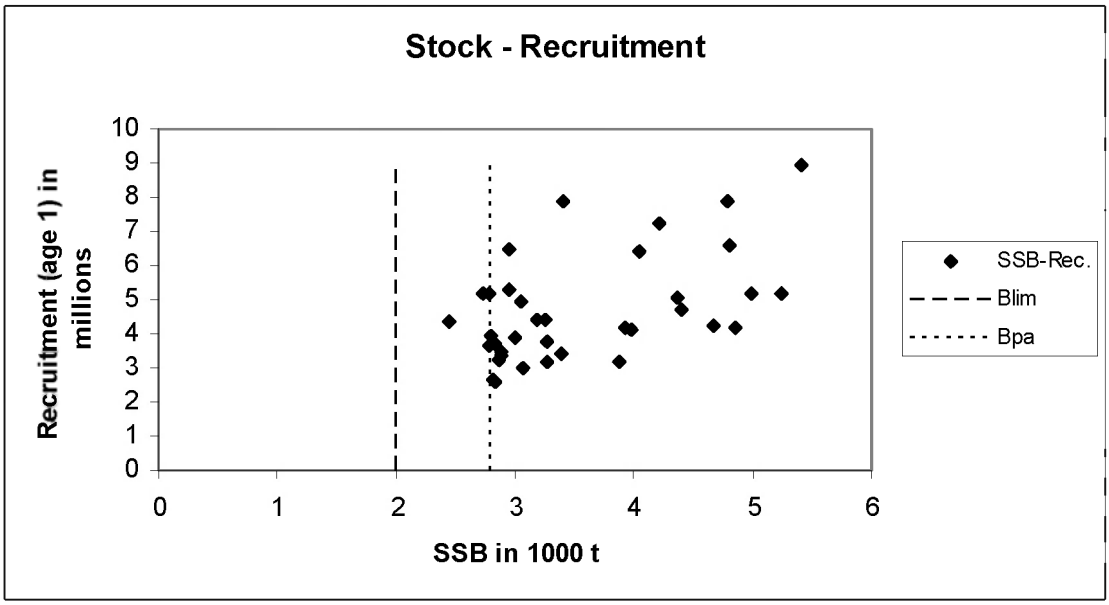
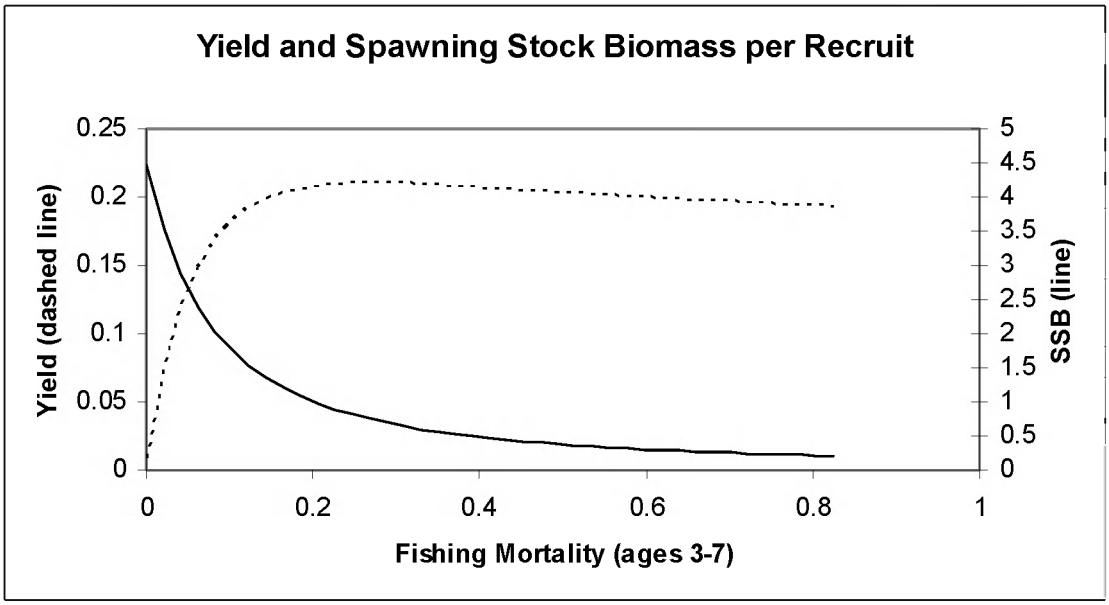


Figure 5.4.14.1 Sole in Division VIIe (Western Channel). Landings, fishing mortality, recruitment and SSB.





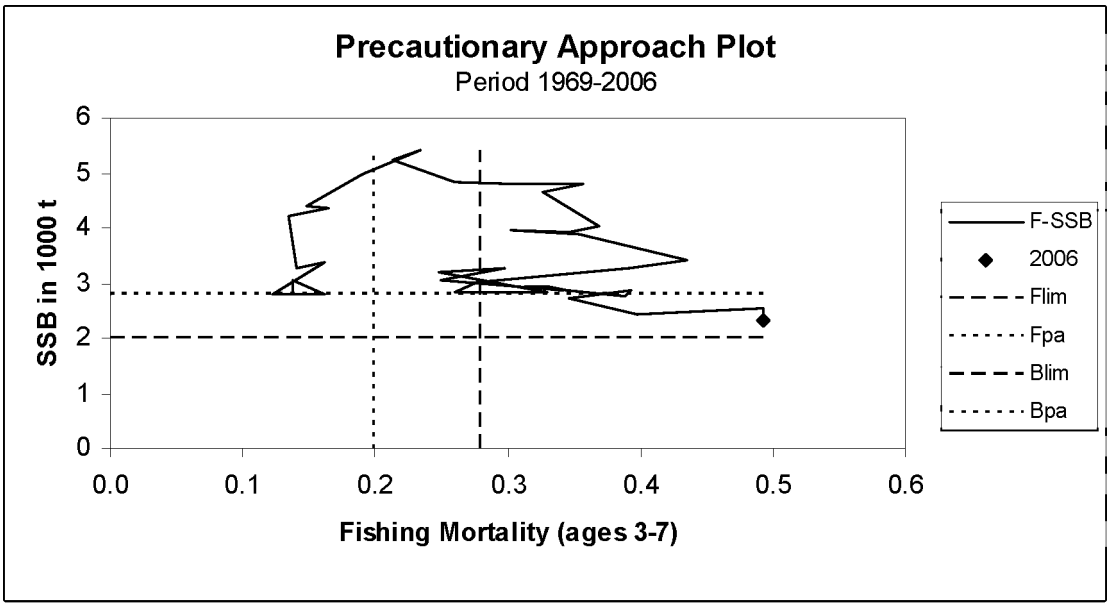


Figure 5.4.14.2 Sole in Division VIIe (Western Channel). Stock and recruitment; Yield and SSB per recruit.

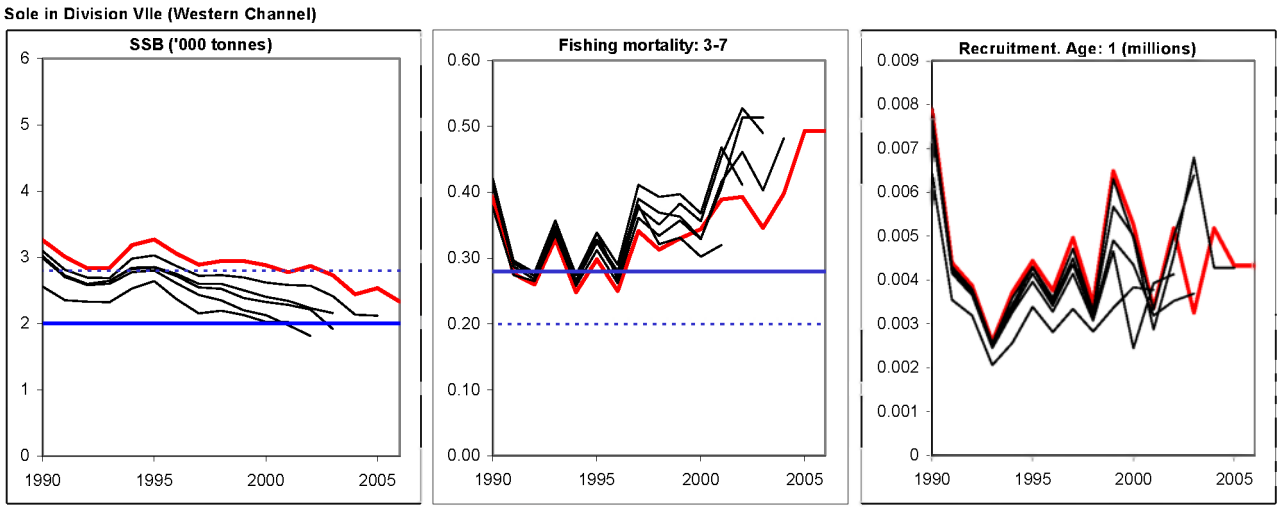


Figure 5.4.14.3 Sole in Division VIIe. Historical performance of the assessment (SSB, fishing mortality, and recruitment).

Table 5.4.14.1 Division VIIe sole. Nominal landings (t), 1972–2005 used by Working Group.

Year	Belgium	France	UK (Engl & Wales)	Other	Total Reported	Unallocated [2]	Total used by WG	
1972	6	230[3]	201	-	437	-	437	
1973	2	263[3]	194	-	459	-	459	
1974	6	237	181	-	424	3	427	
1975	3	271	217	-	491	-	491	
1976	4	352	260-	-	616	-	616	
1977	3	331	271	-	606	-	606	
1978	4	384	453	20	861	-	861	
1979	1	515	665	-	1,181	-	1,181	
1980	45	447	764	13	1,269	-	1,269	
1981	16	415	788	1	1,220	-5	1,215	
1982	98	321	1,028	-	1,447	-1	1,446	
1983	47	405	1,043	3	1,498	-	1,498	
1984	48	421	901	-	1,370	-	1,370	
1985	58	130	911	-	1,099	310	1,409	
1986	62	467	840[2]	127	1,496	-77	1,419	*
1987	48	432	632[2]	-	1,112	168	1,280	*
1988	67	98	784[2]	-	949	495	1,444	*
1989	69	112	610[2]	6	797	593	1,390	*
1990	41	81	632[2]	-	754	561	1,315	*
1991	35	325	477[2]	-	837	15	852	*
1992	41	267	457[2]	9	774	121	895	*
1993	59	236	480[2]	18	793	111	904	*
1994	33	257	548[2]	-	838	-38	800	*
1995	21	294	565[2]	-	880	-24	856	*
1996	8	297	437[2]	-	742	91	833	*
1997	13	348	496[2]	1	858	91	949	*
1998	40	343	389[2]	-	772	108	880	*
1999	13	254	396[2]	-	663	294	957	*
2000	4	241	413[2]	-	658	256	914	*
2001	19	224	407[2]	-	650	419	1069	*
2002	33	198	309[2]	-	540	568	1108	*
2003	1	147	237[2]	1	405	673	1078	*
2004	7	302	171	-	480	539	1019	*
2005[1]	26	219	505	-	730	296	1026	*

[1]Provisional.
[2]UK total reported.
[3] Not currently available due to a delay in data compilation.
* Total revised to include additional unallocated landings from 1986 inclusive.

Table 5.4.14.2 Sole in Division VIIe (Western Channel).

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3–7
1969	1634	2791	353	0.137
1970	3954	3065	391	0.138
1971	2986	2810	432	0.161
1972	2646	2785	437	0.122
1973	3645	3386	459	0.162
1974	3399	3275	427	0.141
1975	3174	4209	491	0.134
1976	7229	4358	616	0.164
1977	5072	4407	606	0.148
1978	4695	4981	861	0.191
1979	5164	5413	1181	0.235
1980	8945	5248	1269	0.213
1981	5180	4849	1215	0.260
1982	4157	4801	1446	0.306
1983	6586	4792	1498	0.356
1984	7877	4668	1370	0.326
1985	4252	4052	1409	0.369
1986	6441	3919	1419	0.346
1987	4184	3977	1280	0.303
1988	4106	3874	1444	0.354
1989	3152	3404	1390	0.436
1990	7900	3259	1315	0.391
1991	4398	3007	852	0.276
1992	3876	2831	895	0.260
1993	2603	2839	904	0.329
1994	3730	3184	800	0.248
1995	4440	3270	856	0.298
1996	3766	3054	833	0.250
1997	4968	2888	949	0.341
1998	3479	2945	880	0.313
1999	6495	2944	957	0.330
2000	5265	2880	1018	0.344
2001	3360	2775	1069	0.389
2002	5187	2868	1106	0.393
2003	3258	2728	1078	0.346
2004	5185	2441	1019	0.398
2005	4333*	2534	1026	0.493
2006	4333*	2330		
Average	4607	3522	963	0.287

* Geometric mean.

5.4.15 Irish Sea herring (Division VIIa)

State of the stock

Based on the most recent estimates of SSB and fishing mortality ICES classifies the state of the stock as uncertain. It seems likely that the stock has been relatively stable for the last 10 years, and that the fishing mortality does not appear to be increasing above the recent average. There are no recruitment indices for this stock.

Management objectives

There are no explicit management objectives for this stock.

Reference points

	ICES considers that:	ICES proposed that:
Precautionary Approach reference points	B_{lim} is 6000 t.	B_{pa} be set at 9 500 t.
	F_{lim} is not defined.	F_{pa} is not defined.
Target reference points	Not defined.	Not defined.

Technical basis

B_{lim}: lowest observed SSB.	B_{pa}: B_{lim} *1.58.
F_{lim} is not defined.	F_{pa} is not defined.

Single stock exploitation boundaries

Exploitation boundaries in relation to precautionary limits

The SSB is uncertain but stable at around B_{pa}, while F is uncertain but not increasing. Therefore the TAC of 4 800 t which has been implemented in recent years is not expected to be detrimental to the stock.

Management considerations

The catch data may not have been reliable in the recent past, but enforcement has improved in the past year.

Ecosystem considerations

There are irregular cycles in the productivity of herring stocks (weights-at-age and recruitment). There are many hypotheses as to the cause of these changes in productivity, but in most cases it is thought that the environment plays an important role (through transport, prey, and predation). Coincident periods of high and low production have been seen in the herring in VIaN and Irish Sea herring. Exploitation and management strategies must account for the likelihood of productivity changing. Productivity changes may invalidate biomass-based reference points, but not those based on fishing mortality.

Factors affecting the fisheries and the stock

Regulations and their effects

Areas closed to herring fishing were established around the east coast of Ireland and west coast of Britain to protect juveniles when an industrial fishery operated in the 1970s. A closed area exists to the east of the Isle of Man to protect the spawning aggregations.

Other factors

The stock identity is complex as the juveniles mix with those of the Celtic Sea and the adults migrate from the Irish Sea after spawning. The stock identity is being reviewed by an EU-funded project and results are expected in 2007. During this year an additional smaller, mainly gillnet fishery of 11 vessels registered herring landings. The effort from these vessels was centred off the Northern Irish coastline, in the area of the collapsed Mourne fishery.

Scientific basis

Data and methods

The exploratory assessment of the stock is based on survey data and catch-at-age data.

Uncertainties in assessment and forecast

The assessment is not considered accurate with respect to recent F and SSB, but it is indicative of trends and levels in the past. Estimates of recent recruitments are based on catch and survey information. The current estimate of high 2005 recruitment is not reliable. There is a retrospective pattern which shows an underestimate of fishing mortality and an overestimate of SSB.

Source of information

Report of the Herring Assessment Working Group for the Area South of 62°N 14–23 March 2006 (ICES CM 2006/ACFM:20).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM Catch
1987	TAC	4.3	4.5	5.8
1988	TAC (Revised advice in 1988)	10.5 (5.6)	10.5	10.2
1989	TAC	5.5	6.0	5.0
1990	Precautionary TAC	5.7	7.0	6.3
1991	TAC	5.6	6.0	4.4
1992	TAC	6.6	7.0	5.3
1993	TAC	4.9-7.4	7.0	4.4
1994	Precautionary TAC	5.3	7.0	4.8
1995	Precautionary TAC	5.1	7.0	5.1
1996	If required, precautionary TAC	5.0	7.0	5.3
1997	No advice given	-	9.0	6.6
1998	*Status quo* F	6.5	9.0	4.9
1999	F=Proposed $\mathbf{F}_{pa}$=0.36	4.9	6.6	4.1
2000	F=90% F(98)=0.31	3.9	5.4	2.0
2001	*Status quo* F= 0.26	5.1	6.9	5.5
2002	Average catch of 1996–2000	4.8	4.8	2.4
2003	2002 TAC	4.8	4.8	2.4
2004	Advice 2003 catch	4.8	4.8	2.5
2005	*Status quo* TAC	4.8	4.8	4.4
2006	*Status quo* TAC	4.8	4.8	
2007	*Status quo* TAC	4.8		

Weights in '000 t.

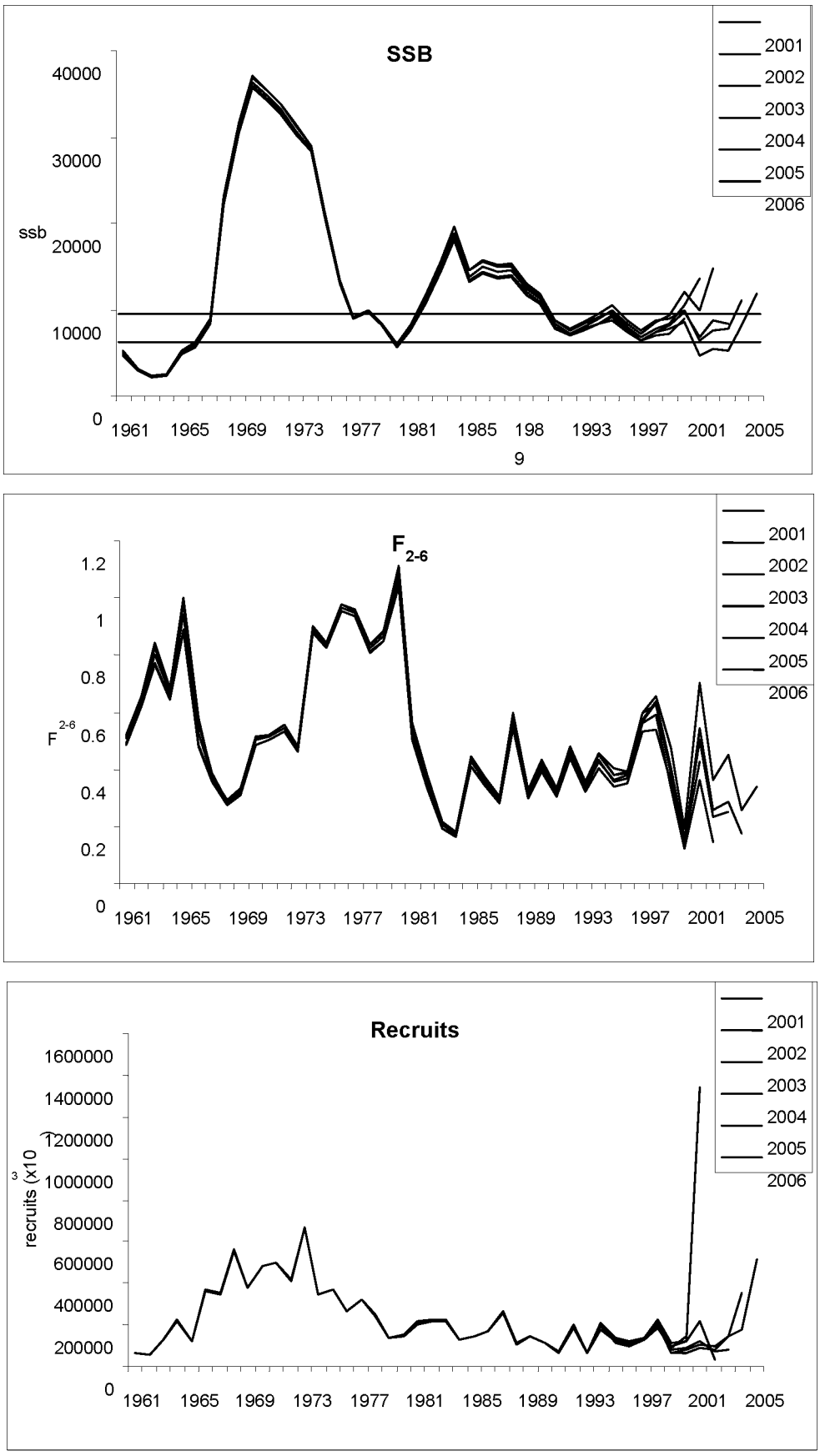


Figure 5.4.15.1 Exploratory assessment of Division VIIaN herring showing a tendency to overestimate SSB and underestimate F. The SSB graph shows the $\mathbf{B}_{pa}$ and $\mathbf{B}_{lim}$ lines for reference.

5.4.16 Celtic Sea and Division VIIj herring

State of 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
Uncertain, but likely at risk of reduced reproductive capacity	unknown	unknown		

The stock size continues to be uncertain, but SSB may be below $\mathbf{B}_{pa}$, and may even be below $\mathbf{B}_{lim}$. The fishery is heavily dependent on incoming cohorts, and older ages are almost absent in the stock. Recent recruitment has been relatively low. Current fishing mortality is very uncertain but may be very high.

Management objectives

The Irish "Celtic Sea Herring Management Advisory Committee" was established to manage the Irish fishery for this herring stock. This Committee manages the Irish quota and implements measures in addition to the EU regulations. The committee has a series of objectives relating to the maintenance of high yield and a consideration to rebuild the stock if necessary to achieve this. ICES considers that now implementing these objectives should be in the form of a rebuilding plan.

Reference points

	ICES considers that:	ICES proposed that:
Precautionary Approach reference points	$\mathbf{B}_{lim}$ is 26 000 t.	$\mathbf{B}_{pa}$ be set at 44 000 t.
	$\mathbf{F}_{lim}$: not defined.	$\mathbf{F}_{pa}$: not defined.

Technical basis

$\mathbf{B}_{lim}$: The lowest stock observed.	$\mathbf{B}_{pa}$: Low probability of low recruitment.
$\mathbf{F}_{lim}$: not defined.	$\mathbf{F}_{pa}$: not defined.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary limits

The current level of SSB is uncertain, but may be below $\mathbf{B}_{pa}$ and possibly even below $\mathbf{B}_{lim}$. There is no short-term forecast on which to base catch advice for 2007. However, given the risk to the stock indicated by weak recent recruitment, no fishing should be allowed until a rebuilding plan is in place. Such a plan should include closed areas to protect recruitment and further reductions in the catches. ICES is prepared to participate in the evaluation of such a plan.

Management considerations

Though the state of the stock is uncertain, SSB is considered to be at a low level, possibly as low as the size when the stock previously collapsed. Given the age structure of the population and the current uncertainty, ICES considers that there is a high risk for reduced stock productivity.

Celtic Sea and Division VIIj herring are assessed on a seasonal basis, the 1 April to 31 March, while TACs are set by the calendar year.

Factors affecting the fisheries and the stock

The stock is exploited by two types of vessels, larger boats with Refrigerated Sea Water (RSW) storage, and smaller dry hold vessels. The smaller vessels are confined to the spawning grounds (VIIaS and VIIg) during the winter period. The RSW vessels target the stock inshore in winter and offshore during the summer feeding phase (VIIg). There has been little fishing in VIIj in recent seasons, and there is evidence that stock abundance in this area is currently low.

The area east of Mine Head was closed from 2001 to December 2003. This closure may have afforded protection to recruiting "first-time spawners" over this period. The strongest year class to enter the fishery in recent years was that which spawned for the first time in 2001/2002. This cohort was dominant in catches from the closed area, when this area was re-opened in 2003. It has subsequently dominated catches throughout the Celtic Sea (though not in Division VIIj).

The collapse of the market for herring roe means that there is no longer the same incentive to discard (slip) catches.

The number of vessels participating in the fishery has decreased in recent years. However, efficiency has increased, especially in the RSW vessels.

The environment

In the Celtic Sea, herring is a key pelagic species. There are indications to suggest increasing salinity and temperature. Considering that Celtic Sea herring is at the extreme of the species range in Europe, in an area of warming sea surface water, productivity might be affected. Weight-at-age has steadily declined since the 1980s.

Scientific basis

Data and methods

The current management regime has resulted in catch data which are thought reasonably reliable. There is an acoustic survey; however, the results are considered uncertain. There is no quantitative information on recruitment. There is no quantitative assessment in 2006.

Uncertainties in assessment and forecast

A tentative assessment was undertaken in 2006, but the results are uncertain. Hence, the levels of SSB and F in the most recent year are indicative of trends only. However, it is clear that there are low abundances of older fish both in the catches and the population. Also, it is clear that SSB has declined since the mid-1990s. In addition, the marked absence of 2-year-old fish is confirmed. In a fishery that is based on only a few age classes, this is a cause for concern as there may be a high risk to the reproductive capacity of the stock from such a series of events.

Comparison with previous assessment and advice

The perception of the stock status this year is similar to last year. There is confirmation that the 2001 year class is weak.

Source of information

Report of the Herring Assessment Working Group for the Area South of 62°N, 14–23 March 2006 (ICES CM 2006/ACFM:20).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings	Discards	ACFM Catch[1]
1987	Precautionary TAC	18	18	18	4.2	27.3
1988	TAC	13	18	17	2.4	19.2
1989	TAC	20	20	18	3.5	22.7
1990	TAC	15	17.5	17	2.5	20.2
1991	TAC (TAC excluding discards)	15 (12.5)	21	21	1.9	23.6
1992	TAC	27	21	19	2.1	23
1993	Precautionary TAC (including discards)	20–24	21	20	1.9	21.1
1994	Precautionary TAC (including discards)	20–24	21	19	1.7	19.1
1995	No specific advice	-	21	18	0.7	19
1996	TAC	9.8	16.5–21[2]	21	3	21.8
1997	If required, precautionary TAC	< 25	22	20.7	0.7	18.8
1998	Catches below 25	< 25	22	20.5	0	20.3
1999	F = 0.4	19	21	19.4	0	18.1
2000	F < 0.3	20	21	18.8	0	18.3
2001	F < 0.34	17.9	20	17.8	0	17.7
2002	F<0.35	11	11	11.3	0	10.5
2003	Substantially less than recent catches	-	13	13	0	12
2004	60% of average catch 1997–2000	11	13	11	-	11
2005	60% of average catch 1997–2000	11	13	8	-	8
2006	Further reduction 60% avg catch 2002–2004	6.7	11			
2007	No fishing should be allowed until a rebuilding plan is in place					

Weights in '000 t.
[1]By calendar year. [2]Revised during 1996 after ACFM May meeting.

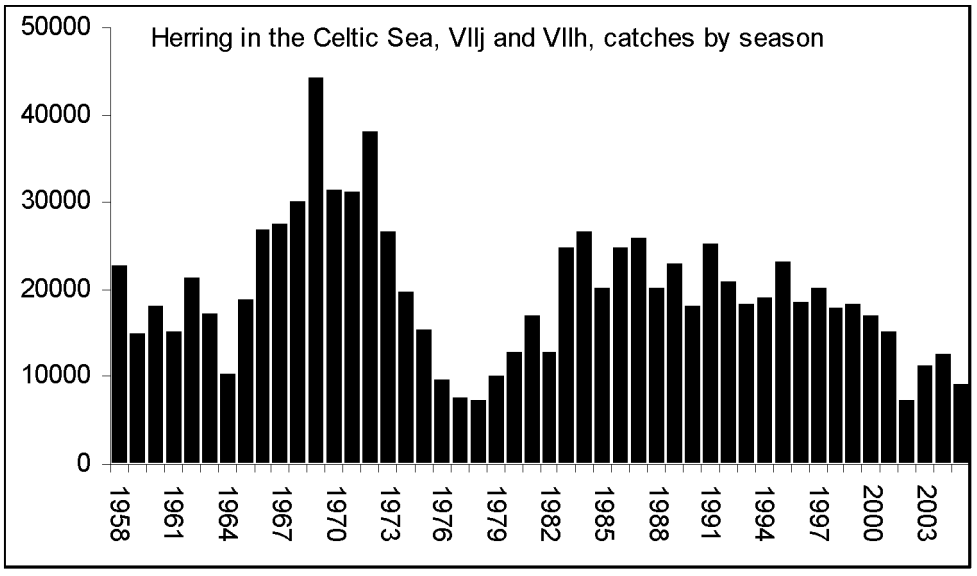


Figure 5.4.16.1 Herring in Celtic Sea and VIIj. Catches by assessment year.

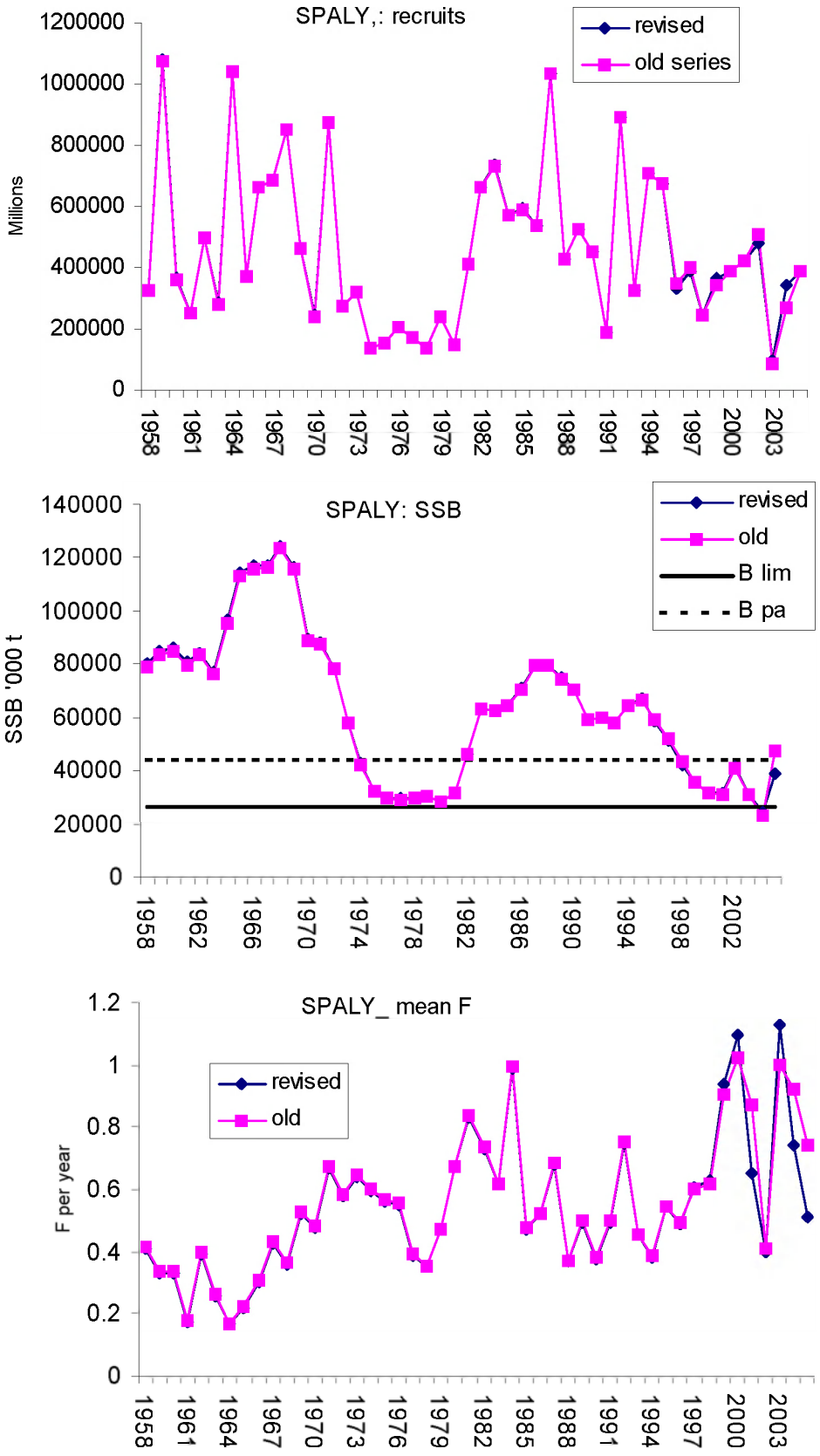


Figure 5.4.16.2 Celtic Sea and VIIj herring. Results of exploratory ICA assessments

Table 5.4.16.1 Celtic Sea and Division VIIh, j and k herring landings by quota year (t), 1988–2004. (Data provided by Working Group members.) These figures may not in all cases correspond to the official statistics and cannot be used for management purposes.

Year	France	Germany	Ireland	Netherlands	U.K.	Unallocated	Discards	Total
1989	+	-	16,000	1,900	-	1,300	3,500	22,700
1990	+	-	15,800	1,000	200	700	2,500	20,200
1991	+	100	19,400	1,600	-	600	1,900	23,600
1992	500	-	18,000	100	+	2,300	2,100	23,000
1993	-	-	19,000	1,300	+	-1,100	1,900	21,100
1994	+	200	17,400	1,300	+	-1,500	1,700	19,100
1995	200	200	18,000	100	+	-200	700	19,000
1996	1,000	0	18,600	1,000	-	-1,800	3,000	21,800
1997	1,300	0	18,000	1,400	-	-2,600	700	18,800
1998	+	-	19,300	1,200	-	-200	-	20,300
1999		200	17,900	1300	+	-1300	-	18,100
2000	573	228	18,038	44	1	-617	-	18,267
2001	1,359	219	17,729	-	-	-1578	-	17,729
2002	734	-	10,550	257	-	-991	-	10,550
2003	800	-	10,875	692	14	-1,506	-	10,875
2004	801	41	11,024	-	-	-801	-	11,065
2005	821	150	8452	799	-	-1770	-	8,452

Table 5.4.16.2. Celtic Sea & Division VIIj herring landings (t) by assessment year (1st April–31st March) 1988/1989–2004/2005. (Data provided by Working Group members.) These figures may not in all cases correspond to the official statistics and cannot be used for management purposes.

Year	France	Germany	Ireland	Netherlands	U.K.	Unallocated	Discards	Total
1989/1990	+	-	15,000	1,900	-	2,600	3,600	23,100
1990/1991	+	-	15,000	1,000	200	700	1,700	18,600
1991/1992	500	100	21,400	1,600	-	-100	2,100	25,600
1992/1993	-	-	18,000	1,300	-	-100	2,000	21,200
1993/1994	-	-	16,600	1,300	+	-1,100	1,800	18,600
1994/1995	+	200	17,400	1,300	+	-1,500	1,900	19,300
1995/1996	200	200	20,000	100	+	-200	3,000	23,300
1996/1997	1,000	-	17,900	1,000	-	-1,800	750	18,800
1997/1998	1,300	-	19,900	1,400	-	-2100	-	20,500
1998/1999	+	-	17,700	1,200	-	-700	-	18,200
1999/2000		200	18,300	1300	+	-1300	-	18,500
2000/2001	573	228	16,962	44	1	-617	-	17,191
2001/2002	-	-	15,236	-	-	-	-	15,236
2002/2003	734	-	7,465	257	-	-991	-	7,465
2003/2004	800	-	11,536	610	14	-1,424	-	11,536
2004/2005	801	41	12,702	-	-	-801	-	12,743
2005/2006	821	150	9,494	799	-	-1770	-	9,494

5.4.17 Herring in Divisions VIa (South) and VIIb,c

State of stock/exploitation:

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Comment
Uncertain	Uncertain	Unknown	No accepted assessment, but SSB likely to be below $\mathbf{B}_{lim}$. F reduced in recent years.

The results of a tentative assessment suggest that the sharp decline in SSB may have stopped. The current level of SSB is uncertain, but likely to be below $\mathbf{B}_{lim}$. There is no evidence that large year classes have recruited to the stock in recent years. Fishing mortality appears to have been reduced due to the reduction in catch; however, F is likely to be above $\mathbf{F}_{pa}$ and may even be above $\mathbf{F}_{lim}$.

Management objectives

The Irish Northwest Pelagic Management Committee manages the Irish fishery for this stock. Management appears to be effective at constraining catches to not exceed the TAC and providing reliable catch data, but it is uncertain if the catch limitations are sufficient to rebuild the stock.

Precautionary Approach reference points

	ICES considers that:	**ICES proposed that:**
Limit and pa reference points	$\mathbf{B}_{lim}$ is 81 000 t.	$\mathbf{B}_{pa}$ be set at 110 000 t.
Limit and pa reference points	$\mathbf{F}_{lim}$ is 0.33.	$\mathbf{F}_{pa}$ be set at 0.22.
Target reference points		

Technical basis:

$\mathbf{B}_{lim}$: Lowest reliable estimated SSB.	$\mathbf{B}_{pa}$: Approximately 1.4 $\mathbf{B}_{lim}$.
$\mathbf{F}_{lim}$: $\mathbf{F}_{loss}$.	$\mathbf{F}_{pa}$: = $\mathbf{F}_{med}$(98).

Exploitation boundaries in relation to precautionary limits

The current catch regime which has been in place since 2000 does not appear to be rebuilding the stock. No fishing should be allowed unless a rebuilding plan is in place. This rebuilding plan should be analyzed scientifically and ICES is prepared to participate in this process. One element of such a recovery plan should consider further reductions in the catch.

Short-term implications

No final assessment was produced and no short-term predictions were possible.

Management considerations

SSB may be stable at an historic low level or declining slightly, though the peak in SSB in the 1980s may have been an isolated event. Fishing mortality appears to have been substantially reduced since 1998. Recruitment since the late eighties has been below average and appears to have declined further since the late nineties.

In the past the quotas were not strictly enforced. Tight enforcement of catch quotas should be continued.

There are two fleets exploiting this stock; the smaller dryhold vessels tend to target the stock more than the larger boats. The main target species for these fleets is mackerel, and herring fishing is somewhat opportunistic in this area.

Factors affecting the fisheries and the stock

Regulations and their effects

Changes to the management of this stock, including provisions of the management plan, have changed the way the fishery is prosecuted in space and time. Enforcement and regulation of the fishery has also improved in recent years.

Changes in fishing technology and fishing patterns

The pattern of this fishery has changed over time. In the early part of the 20th Century the main spawning components were the winter spawners off the north coast, and this was where the main fishery took place. In the 1970s and 1980s the west of Ireland autumn-spawning components were dominant and the fishery was mainly distributed along the coasts of VIIbc and VIaS. More recently the northern grounds have become more important again with most of the catches from VIIb concentrated in the northwest, near to the boundary of VIa south.

Information from the fisheries suggests that the recent dominance of younger fish in the catches may be influenced by changes in targeting by components of the fleet. There is evidence to suggest that in recent years larger boats have prioritised their effort in favour of mackerel, horse mackerel, and blue whiting.

Other factors

The fishery exploits a mixture of autumn- and winter/spring-spawning fish. The winter/spring-spawning component is distributed in the northern part of the area. The main decline in the overall stock appears to have taken place on the autumn-spawning component.

Scientific basis

Data and methods

The acoustic survey time-series was used for the first time this year in exploratory assessments. Exploratory runs showed similar trends in stock development over a range of assumptions.

Uncertainties in assessment and forecast

The acoustic survey series used to tune the exploratory assessment is very short and this contributes to the uncertainty of the assessment. A longer time-series will be required to gain precision in the assessment results.

The perception of stock trends is consistent, even though the most recent estimates of SSB and F are uncertain.

Environment conditions

Herring catch data were analysed in relation to oceanographic variation. Long-term trends in herring catches showed herring abundance decreasing with a warming of the sea surface temperature in the 1930s-1940s. Short-term fluctuations of catches are believed to reflect real fluctuations in herring abundance on a cycle of about 10 years and were correlated with:

- Salinity in western approaches especially in the two winter quarters at a lag period of 3 years;
- SST on the shelf and west off the shelf, especially November, December, and January with a lag period of 3–4 years. Although herring correlated negatively to temperature in the long term, short-term variations were positively correlated.

Comparison with previous assessment and advice

The perception of the state of the stock is not changed from last year. The advice this year is based on the continued lack of recovery of the stock and suggests that further reductions in catches must be considered as part of a recovery plan.

The assessment, although still exploratory for the first year now includes data from an acoustic survey. This is step forward towards a reliable assessment.

Source of information

Report of the Herring Assessment Working Group for the Area South of 62°N, 14–23 March 2006 (ICES CM 2005/ACFM:20).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings	Disc. slip.	ACFM Catch
1987	TAC	18	17	17	-	49
1988	TAC depending on whether 1987 TAC is taken	11–18	14	15	-	29
1989	TAC	15	20	21	1.0	29
1990	TAC depending on whether 1989 TAC is taken	25–27	27.5	28	2.5	44
1991	TAC	< 26	27.5	23	3.4	38
1992	TAC (including discards)	29	28	27	0.1	32
1993	Precautionary TAC (including discards)	29	28	30	0.3	37
1994	Precautionary TAC	28	28	27	0.7	34
1995	Precautionary TAC (including discards)	36	28	27	-	28
1996	If required, precautionary TAC	34	28	25	-	33
1997	Catches below 25	< 25	28	28	0.1	27
1998	Catches below 25	< 25	28	28	-	39
1999	F 70% of F(97)	19	21	18	-	26
2000	F 40% of F(98) =Proposed $\mathbf{F}_{pa}$	14	14	10	-	15
2001	F 40% of F(99) F = 0.2	14	14	13	-	14
2002	No increase in catches	14	14	14	-	13.6
2003	No increase in catches	14	14	14	-	14
2004	No increase in catches	14	14	11	-	12
2005	No increase in catches	14	14	13	-	13
2006	No increase in catches	14	15.4			
2007	No fishing or recovery plan	-				

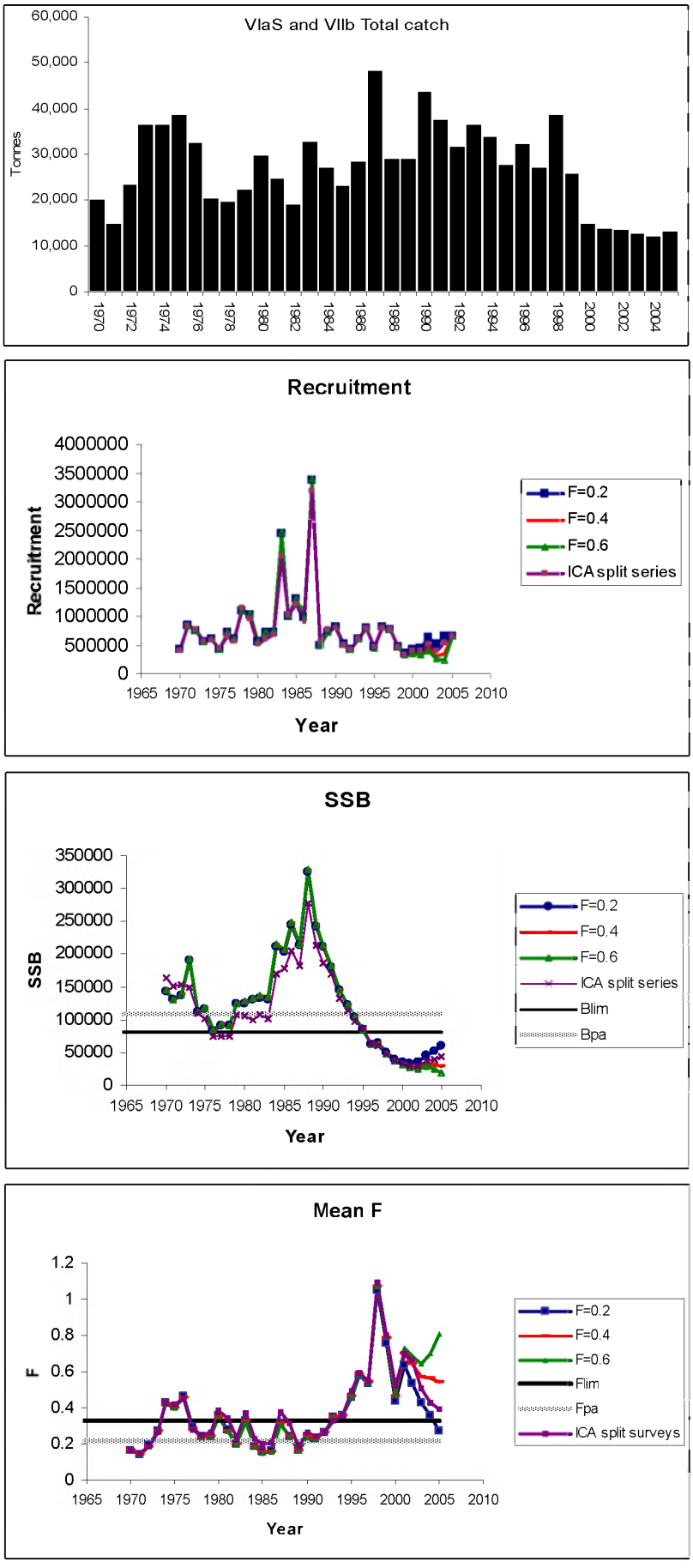


Figure 5.4.17.1 Herring in Divisions VIa (South) and VIIb,c (Landings, recruitment, SSB and Mean fishing mortality) that summaries the exploratory assessment.

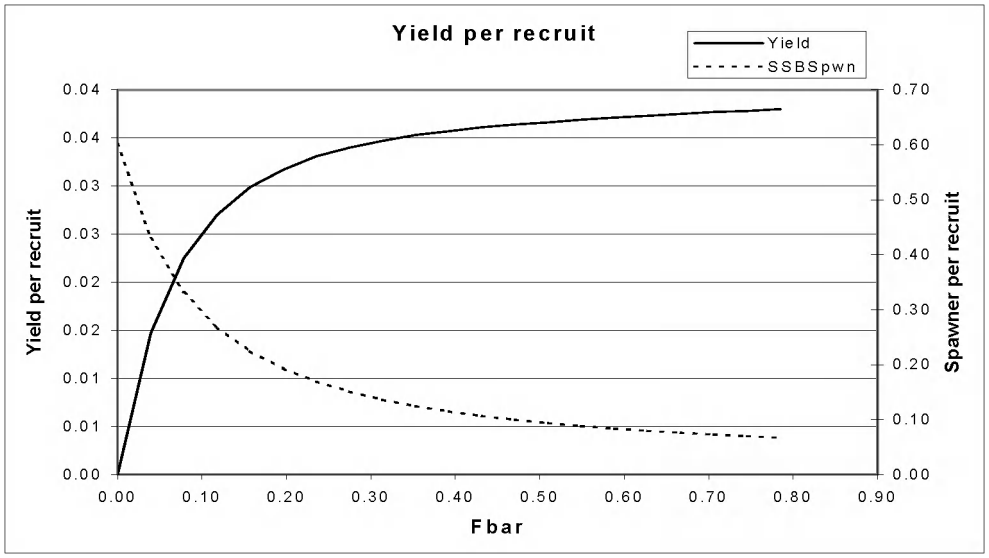


Figure 5.4.17.2 Herring in Divisions VIa (South) and VIIb,c. Yield-per-recruit graph.

5.4.18 Sprat in Divisions VIId,e

State of the stock

The state of the stock is not known as available data are insufficient to carry out an assessment.

Management objectives

There are no explicit management objectives for this stock.

Reference points

Reference points for this stock have not been defined.

Management considerations

Sprat catches are very low and are mainly taken in the second half of the year by the Lyme Bay sprat fishery. The catch has decreased and was 836 t in 2004, being the lowest of the whole time-series.

Ecosystem considerations

There are indications that there may be interactions between herring and sprat biomass. The current situation is unclear and is further complicated by the increasing presence of sardine and anchovy in the area.

Scientific basis

Data and methods

Available data are insufficient to carry out an assessment.

Source of information:

Report of the Herring Assessment Working Group for the Area South of 62°N 14 – 23 March 2006 (ICES CM 2006/ACFM:20).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM Catch
1987	No advice	-	5	2.7
1988	No advice	-	5	5.5
1989	No advice	-	12	3.4
1990	No advice	-	12	2.1
1991	No advice	-	12	2.6
1992	No advice	-	12	1.8
1993	No advice	-	12	1.8
1994	No advice	-	12	3.2
1995	No advice	-	12	1.5
1996	No advice	-	12	1.8
1997	No advice	-	12	1.6
1998	No advice	-	12	2.0
1999	No advice	-	6.3	3.6
2000	No advice	-	12	1.7
2001	No advice	-	12	1.3
2002	No advice	-	12	1.2
2003	No advice	-	9.6	1.4
2004	No advice	-	9.6	0.8
2005	No advice	-	7.7	1.6
2006	No advice	-	6.1	
2007	No advice	-		

Weights in '000 tonnes.

Table 5.4.18.1 Sprat VIId,e. Nominal catches of sprat in VIId,e from 1985-2005.

COUNTRY	1985	1986	1987	1988	1989	1990	1991	1992
Denmark		15	250	2,529	2,092	608		
France	14		23	2	10			35
Netherlands								
UK (Engl.&Wales)	3 771	1 163	2 441	2 944	1 319	1 508	2 567	1 790
Total	3 785	1 178	2 714	5 475	3 421	2 116	2 567	1 825
Country	**1993**	**1994**	**1995**	**1996**	**1997**	**1998***	**1999***	**2000***
Denmark								
France	2	1	0					18
Netherlands							1	1
UK (Engl.&Wales)	1 798	3 177	1 515	1 789	1 621	2 024	3 559	1 692
Total	1 800	3 178	1 515	1 789	1 621	2 024	3 560	1 711
Country	**2001**	**2002**	**2003**	**2004**	**2005**			
Denmark								
France								
Netherlands								
UK (Engl.&Wales)	1 349	1 196	1 377	836	1635			
Total	1 349	1 196	1 377	836	1635			
* Preliminary								

5.4.19 Megrim (*Lepidorhombus whiffiagonis*) in Divisions VIIb-k and 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	Comment
Unknown	Unknown	Unknown	Unknown	

It has not been possible to fully quantify SSB, fishing mortality and recruitment for this stock. However, indications are that landings and SSB have been reasonably stable over the time-series. There are no indications of reduced recruitment.

Management objectives

There are no specific management objectives for this stock.

Reference points

	ICES considers that:	ICES proposed that:
Limit reference points	$\mathbf{B}_{lim}$ is not defined.	$\mathbf{B}_{pa}$ be set at 55 000 t.
	$\mathbf{F}_{lim}$ is 0.44.	$\mathbf{F}_{pa}$ be set at 0.30.
Target reference points		$\mathbf{F}_{y}$ is not defined.

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 3–6	Yield/R	SSB/R
$\mathbf{F}_{max}$	0.269	0.060	0.292
$\mathbf{F}_{0.1}$	0.161	0.056	0.473
$\mathbf{F}_{med}$	0.316	0.060	0.246

Technical basis:

$\mathbf{B}_{lim}$ = Not defined.	$\mathbf{B}_{pa}$ = $\mathbf{B}_{loss}$. There is no evidence of reduced recruitment at the lowest biomass observed and $\mathbf{B}_{pa}$ was therefore set equal to the lowest observed SSB.
$\mathbf{F}_{lim}$ = $\mathbf{F}_{loss}$.	$\mathbf{F}_{pa}$= $\mathbf{F}_{med}$; this implies a less than 45% probability that (SSB_{MT}< $\mathbf{B}_{pa}$).

Single-stock exploitation boundaries

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

The current fishing mortality is uncertain and cannot be evaluated with respect to long-term yield and low risk to SSB.

Exploitation boundaries in relation to precautionary limits

The current stock status is uncertain, but all indicators point to the stock and catches being stable. Therefore ICES recommends that the landings of L. whiffiagonis in 2007 should not exceed the average landings of 2003–2005. This corresponds to 14 200 tonnes.

Management considerations

Megrim is caught in a mixed demersal fishery on anglerfish, hake, and *Nephrops*, both as a targeted fishery and as a valuable bycatch.

Landings in 2004 and 2005 have been well below the agreed TACs. The 2006 TAC was set at 20 425 t, including a 5% contribution of *L. boscii* in the landings for which stock there is no assessment.

Discarding of smaller megrim even above the minimum landing size (MLS) of 20 cm is substantial. Improving the selection pattern should benefit the stock and result in a higher long-term yield.

Factors affecting the fisheries and the stock

The effects of regulations

The MLS of megrim was reduced from 25 to 20 cm length in 2000, to match the selection pattern of the gear. However, high-grading continues for market reasons.

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). These measures appear not to have resulted in a decrease in fishing effort for fleets fishing for megrim.

Changes in fishing technology and fishing patterns

No significant changes have been observed in recent years. There has been an Irish decommissioning scheme, whereby around 40 fishing vessels (~6000 GT, 18 000 kW) have been permanently withdrawn from the Irish fishing fleet and removed from the Register of Sea Fishing Vessels in 2005 and 2006.

Other factors

French trawlers operating in the Celtic Sea and targeting demersal species catch megrim as a bycatch. Spanish fleets have a targeted fishery for megrim and also catch megrim in mixed fisheries for hake, anglerfish, *Nephrops*, and other species. Otter trawlers account for the majority of the Spanish landings from Subarea VII. Most UK landings of megrim are made by beam trawlers fishing in ICES Divisions VIIe,f,g,h. Irish megrim landings are taken largely by multi-purpose vessels fishing in Divisions VIIb,c,g for gadoids, plaice, sole, and anglerfish.

Scientific basis

Data and methods

An age-based assessment was carried out using landings and discards data, calibrated by two commercial CPUE series and two surveys. However, the assessment was not considered to be robust and could not be used for the short-term forecast..

Information from the fishing industry

The fishing industry and scientists met at the national level to discuss information that could be used in the assessments. Additional qualitative information has been provided by the industry in relation to catches and spatial distribution of the fleets.

Uncertainties in assessment and forecast

There are large retrospective revisions in stock trends which cannot be fully explained and the analytical assessment was therefore not considered reliable. The input data for assessment show several deficiencies, including:

- Limited discards data are available in the time-series and filling in of the missing years is problematic because discarding practices in the fisheries are very variable over time;
- Conflicting trends in commercial tuning data;
- Limited survey information, particularly on the strength of the incoming year classes.

Comparison with previous assessment and advice

ICES was not able to provide an analytical assessment this year. This is due to conflicting signals in the commercial fleets used to tune the assessment, leading to large interannual changes in recent stock projections. The survey information does not give a good indication of incoming year-class strength and there are considerable retrospective revisions of recruitment in the stock, making forecasts unreliable.

Given the problems outlined above the basis of the advice has changed to recent average catches.

Source of information

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

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC[1]	ACFM Landings	Disc. slip.	ACFM Catch
1987	Not assessed		-		16.46	17.1	1.7	18.8
1988	Not assessed		-		18.1	17.6	1.7	19.3
1989	Not assessed		-		18.1	19.2	2.6	21.8
1990	Not assessed		-		18.1	14.4	3.3	17.7
1991	No advice		-		18.1	15.1	3.3	18.4
1992	No advice		-		18.1	15.6	3.0	18.6
1993	Within safe biological limits		-		21.46	14.9	3.1	18.0
1994	Within safe biological limits		-		20.33	13.7	2.7	16.4
1995	No particular concern		-		22.59	15.9	3.2	19.1
1996	No long-term gain in increased F		16.6		21.20	15.1	3.0	18.1
1997	No advice		14.3		25.0	14.3	3.1	17.3
1998	No increase in F		15.2		25.0	14.3	5.4	19.7
1999	Reduce F below $\mathbf{F}_{pa}$		14.6[1]		25.0	13.7	3.1	16.9
2000	Reduce F below $\mathbf{F}_{pa}$		<14.2[1]		20.0	15.0	2.3	17.3
2001	Reduce F below $\mathbf{F}_{pa}$		< 14.1[1]		16.8	15.8	1.3	17.1
2002	Reduce F below $\mathbf{F}_{pa}$		< 13.0[1]		14.9	15.9	1.5	17.4
2003	Reduce F below $\mathbf{F}_{pa}$		< 16.1[1]		16.0	15.6	3.1	18.8
2004	Reduce F below $\mathbf{F}_{pa}$		< 20.2[1]		20.2	14.3	4.5	18.8
2005	Reduce F below $\mathbf{F}_{pa}$		< 22.6[1]		21.5	12.7	1.8	14.5
2006	Reduce F below $\mathbf{F}_{pa}$		<13.6		20.4			
2007	Less than average landings 2003–05		< 14.2					

Weights in '000 t.
[1]Includes *L. boscii*.

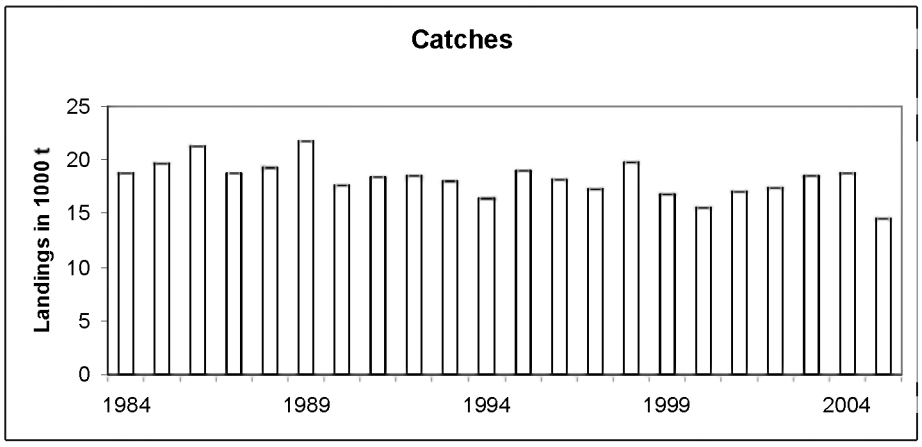


Figure 5.4.19.1 Comparison with previous assessments.

Table 5.4.19.1 Megrim (*L. whiffiagonis*) in Divisions VIIb,c,e-k and VIIIa,b,d. Nominal landings and catches (t) provided by the Working Group.

	Total landings	Total discards	Total catches	Agreed TAC (1)
1984	16659	2169	18828	
1985	17865	1732	19597	
1986	18927	2321	21248	
1987	17114	1705	18819	16460
1988	17577	1725	19302	18100
1989	19233	2582	21815	18100
1990	14371	3284	17655	18100
1991	15094	3282	18376	18100
1992	15600	2988	18588	18100
1993	14929	3108	18037	21460
1994	13685	2700	16385	20330
1995	15862	3206	19068	22590
1996	15109	3026	18135	21200
1997	14230	3066	17296	25000
1998	14345	5371	19716	25000
1999	13715	3135	16850	20000
2000	14485	1033	15517	20000
2001	15806	1275	17081	16800
2002	15988	1466	17454	14900
2003	15414	3147	18561	16000
2004	14300	4511	18811	20200
2005	12712	1831	14542	21500

(1) for both megrim species and VIIa included

5.4.20 Anglerfish in Divisions VIIb–k and VIIIa,b (*Lophius piscatorius and Lophius budegassa*)

State of the stocks

L. piscatorius

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 sustainably	Overexploited	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.

L. budegassa

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 sustainably	Overexploited	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. SSB of both stocks decreased from 1986 until 1993, then increased up to 1995–1996. SSB of *L. budegassa* is at present stable above $\mathbf{B}_{pa}$. SSB for *L. piscatorius* has been above $\mathbf{B}_{pa}$ and increasing since the mid-90s. For both stocks, fishing mortality in most years has been above $\mathbf{F}_{pa}$. In 2005 fishing mortality is estimated to be around $\mathbf{F}_{pa}$ for *L. budegassa* and below $\mathbf{F}_{pa}$ for *L. piscatorius*. For *L. piscatorius*, recent year classes (1999–2002) are above average while for *L. budegassa* the 1999 and 2000 year classes are below average, with 2000 being the lowest observed in the time-series.

Management objectives

There are no explicit management objectives for these stocks.

Reference points

***L. piscatorius*:**

	ICES considers that:	ICES proposed that:
Precautionary Approach reference points	$\mathbf{B}_{lim}$ is undefined.	$\mathbf{B}_{pa}$ = 31 000 t.
	$\mathbf{F}_{lim}$ is 0.33.	$\mathbf{F}_{pa}$ = 0.24.
Target reference points		$\mathbf{F}_{y}$: not defined.

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 3–8	Yield/R	SSB/R
Average last 3 years	0.211	0.905	2.481
$\mathbf{F}_{max}$	0.086	1.084	6.770
$\mathbf{F}_{0.1}$	0.051	1.015	10.149
$\mathbf{F}_{med}$	0.247	0.852	1.986

Candidates for target 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:

$\mathbf{B}_{lim}$: Not defined.	$\mathbf{B}_{pa} = \mathbf{B}_{loss}$. There is no evidence of reduced recruitment at the lowest biomass observed. $\mathbf{B}_{pa}$ is equal to the lowest observed SSB in 1993, as estimated in 2000.
$\mathbf{F}_{lim}$: $\mathbf{F}_{loss}$, the fishing mortality estimated to lead to potential stock collapse.	$\mathbf{F}_{pa}$: $\mathbf{F}_{lim}$ *0.72. This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$, taking into account the uncertainty in the assessment.

***L. budegassa*:**

	ICES considers that:	ICES proposed that:
Limit reference points	$\mathbf{B}_{lim}$ is undefined.	$\mathbf{B}_{pa}$ = 22 000 t.
	$\mathbf{F}_{lim}$ is undefined.	$\mathbf{F}_{pa}$ = 0.23.
Target reference points		$\mathbf{F}_{y}$: Not defined.

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 6–10	Yield/R	SSB/R
Average last 3 years	0.226	0.518	1.864
$\mathbf{F}_{max}$	0.135	0.525	3.23
$\mathbf{F}_{0.1}$	0.086	0.496	4.9007
$\mathbf{F}_{med}$	0.23	0.456	1.551

Candidates for target 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:

$\mathbf{B}_{lim}$= Not defined.	$\mathbf{B}_{pa}$= $\mathbf{B}_{loss}$. There is no evidence of reduced recruitment at the lowest biomass observed (SSB for 1993 as estimated in 2002).
$\mathbf{F}_{lim}$= Not defined.	$\mathbf{F}_{pa} = \mathbf{F}_{med}$ as estimated in 2000. This F is consistent with the proposed $\mathbf{B}_{pa}$.

Single-stock exploitation boundaries

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

For *L. piscatorius* the *status quo* fishing mortality is estimated at 0.21, which is above fishing mortalities that would lead to high long-term yields and low risk of stock depletion ($\mathbf{F}_{0.1}$ = 0.05 and $\mathbf{F}_{max}$ = 0.09). For *L. budegassa* the *status quo* fishing mortality is estimated at 0.23, which is above fishing mortalities that would lead to high long-term yields and low risk of stock depletion ($\mathbf{F}_{0.1}$ = 0.09 and $\mathbf{F}_{max}$ = 0.15). This indicates that long-term yield is expected to increase at fishing mortalities below the historic values.

Exploitation boundaries in relation to precautionary limits

In order to harvest the stock within precautionary limits fishing mortality should be kept below $\mathbf{F}_{pa}$ and SSB should be above $\mathbf{B}_{pa}$ for both species. Fishing at $\mathbf{F}_{pa}$ for *L. budegassa* is equivalent to $\mathbf{F}_{sq}$ and is expected to result in landings of 7600 t, leading to an SSB of 26 800 t in 2008. Given the link between the two species, this corresponds to a fishing mortality of 0.21 for *L. piscatorius*, corresponding to landings of at most 28 400 t in 2007. The predicted SSBs are well above $\mathbf{B}_{pa}$ in all scenarios.

Short-term implications

Outlook for 2007

L. piscatorius: Basis: $\mathbf{F}_{sq}$ = mean F(03–05) = 0.21; R06–07 = GM 1987–2003 = 22 millions; landings (2006) = 28.5; SSB(2007) = 84.1.
L. budegassa: Basis: $\mathbf{F}_{sq}$ = mean F(03–05) = 0.23; R06–07 = GM 1987–2002 = 15 millions; landings (2006) = 7.4; SSB(2006) = 27.1.

The maximum fishing mortality which would be in accordance with precautionary limits (F (precautionary limits)) is 0.24 (*L. piscatorius*), and 0.23 (*L. budegassa*).

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 0.09 (*L. piscatorius*) and 0.16 (*L. budegassa*).

Note: F multipliers on F precautionary limits are not consistent between the two species.

Rationale	TAC (2007)[1]	Basis	Landings *L. piscatorius* (2007)	F (2007)	SSB (2008)	%SSB change [1)]	Basis	Landings *L. budegassa* (2007)	F (2007)	SSB (2008)	%SSB change [1)]	% TAC change [2)]
Zero catch	0	F=0	0	0	111.6	33%	F=0	0	0	33.7	24%	-100%
Target reference point	-	Ftarget or Btarget	-	-	-	-	Ftarget or Btarget	-	-	-	-	-
Status quo	35.9	$\mathbf{F}_{sq}$	28.4	0.21	80.9	-4%	$\mathbf{F}_{sq}$	7.5	0.23	26.8	-1%	6%
High long-term yield		F(long-term yield)					F(long-term yield)					
Agreed management plan	-	TAC(man. plan) * 0.1	-	-	-	-	TAC(man. plan) * 0.1	-	-	-	-	-
	-	TAC(man. plan) * 0.25	-	-	-	-	TAC(man. plan) * 0.25	-	-	-	-	-
	-	TAC(man. plan) * 0.50	-	-	-	-	TAC(man. plan) * 0.50	-	-	-	-	-
	-	TAC(man. plan) * 0.75	-	-	-	-	TAC(man. plan) * 0.75	-	-	-	-	-
	-	TAC(man. plan) * 0.90	-	-	-	-	TAC(man. plan) * 0.90	-	-	-	-	-
	-	TAC(man. plan)	-	-	-	-	TAC(man. plan)	-	-	-	-	-
	-	TAC(man. plan) * 1.1	-	-	-	-	TAC(man. plan) * 1.1	-	-	-	-	-
	-	TAC(man. plan) * 1.25	-	-	-	-	TAC(man. plan) * 1.25	-	-	-	-	-
Precautionary limits	4.5	TAC($\mathbf{F}_{pa}$)* 0.1	3.7	0.02	107.5	28%	TAC($\mathbf{F}_{pa}$)* 0.1	0.8	0.02	32.9	21%	-87%
	11.1	TAC($\mathbf{F}_{pa}$)* 0.25	9.0	0.06	101.7	21%	TAC($\mathbf{F}_{pa}$)* 0.25	2.1	0.06	31.8	17%	-67%
	21.2	TAC($\mathbf{F}_{pa}$)* 0.5	17.3	0.12	92.8	10%	TAC($\mathbf{F}_{pa}$)* 0.5	4.0	0.12	30.0	10%	-37%
	30.5	TAC($\mathbf{F}_{pa}$)* 0.75	24.8	0.18	84.8	1%	TAC($\mathbf{F}_{pa}$)* 0.75	5.9	0.17	28.3	4%	-10%
	35.8	TAC($\mathbf{F}_{pa}$)* 0.90	29.0	0.22	80.3	-5%	TAC($\mathbf{F}_{pa}$)* 0.90	6.9	0.21	27.3	0%	6%
	39.1	$\mathbf{F}_{pa}$	31.6	0.24	77.4	-8%	$\mathbf{F}_{pa}$	7.6	0.23	26.6	-2%	16%
	42.3	TAC($\mathbf{F}_{pa}$)* 1.1	34.2	0.26	74.7	-11%	TAC($\mathbf{F}_{pa}$)* 1.1	8.3	0.25	26.0	-4%	25%
	47.0	TAC($\mathbf{F}_{pa}$)* 1.25	37.9	0.30	70.8	-16%	TAC($\mathbf{F}_{pa}$)* 1.25	9.2	0.29	25.1	-7%	39%
Mixed fisheries	-	Coupling with [critical stock]; $\mathbf{F}_{sq}$ * yy	-	-	-	-	Coupling with [critical stock]; $\mathbf{F}_{sq}$ * yy	-	-	-	-	-

Weights in thousand tonnes.

[1)] SSB 2008 relative to SSB 2007.

[2)] TAC 2007 relative to TAC 2006.

Shaded scenarios are not considered consistent with the precautionary approach.

Management considerations

L. piscatorius and *L. budegassa* are both caught on the same grounds and by the same fleets and are usually not separated by species in landings, and the fishing mortalities are linked. Both species show similar trends in stock trajectories. So far the stocks have developed synchronously; if this changes in the future they should be managed separately.

Management measures for both species must be considered together and in conjunction with other species caught in these fisheries (sole, cod, rays, megrim, *Nephrops*, and hake).

There are two separate TACs for these stocks: in Subarea VII and in Divisions VIIIa,b,d,e. The assessment is carried out for a smaller area (Divisions VIIb–k and VIIIa,b) than the management area and will thus be a underestimate of the overall stock size. However, the assessment covers the majority of the area as recent landings in Division VIIa have been relatively small compared to the total TAC.

The majority of the anglerfish catch consists of young fish. An improvement of the selection pattern is expected to give a higher long-term yield.

Factors affecting the fisheries and the stock

The effects of regulations

There is no minimal landing size for anglerfish but an EU Council Regulation (No. 2406/96), laying down common marketing standards for certain fishery products fixes a minimum weight of 500 g for anglerfish. When the minimum landing size does not fit with the selective properties of the gears, this is expected to lead to discarding of undersized fish.

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). These measures have not resulted in a decrease in fishing effort for fleets fishing for anglerfish.

The quota has been restrictive for some fleets and substantial underreporting of landings is known to have occurred. Information from the Irish fishery indicates that underreporting of total landings has been a problem in recent years due to restrictive individual vessel quotas. In 2005 specific anglerfish licences were introduced in Ireland to improve compliance. There has been an increased enforcement on anglerfish quotas in 2006.

Changes in fishing technology and fishing patterns

No significant changes in recent years.

The environment

The spawning of the *Lophius* species is very particular, with eggs extruded in a buoyant, gelatinous ribbon that may measure more than 10 m. This particular spawning pattern results in a highly clumped distribution of eggs and newly emerged larvae. Although this could result in recruitment being sensitive to environmental variations, this has not been observed.

Other factors

Anglerfish are an important component of mixed fisheries taking hake, megrim, sole, cod, plaice, and *Nephrops*. A trawl fishery by Spanish and French vessels developed in the Celtic Sea and Bay of Biscay in the 1970s, and overall annual landings may have attained 35–40 000 t by the early 1980s. Landings decreased between 1981 and 1993; since 2000, landings have shown an increasing trend. France and Spain together still report more than 75% of the total landings of both species combined. The remainder is taken by the UK and Ireland (around 10% each) and Belgium (less than 5%).

Otter-trawls (the main gear used by French, Spanish, and Irish vessels) currently take about 80% of the total landings of *L. piscatorius*, while around 60% of the UK landings are taken by beam trawlers and gillnetters. Over 95% of the total international landings of *L. budegassa* are taken by otter trawlers. There has been an expansion of the French gillnet fishery in the last decade in the Celtic Sea and in the north of the Bay of Biscay, mainly by vessels landing in Spain and fishing in medium to deep waters. Otter-trawling in medium and deep water in Subarea VII appears to have declined,

even though the increasing use of twin trawls by French vessels may have increased significantly the overall efficiency of the French fleet.

Scientific basis

Data and methods

Age-based (XSA) assessments for each species separately are based on landings, one survey, and four (*L. piscatorius*) or five (*L. budegassa*) commercial CPUE series.

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. Some CPUE time-series have been provided by the fishing industry. Qualitative information has also been provided and has contributed to the assessment process.

The UK Fisheries Science Partnership report on anglerfish was made available to the WG as a Working Document.

Uncertainties in assessment and forecast

Retrospective patterns exist in the absolute estimates of SSB, recruitment, and F. For *L. piscatorius* there is a clear underestimation of SSB and overestimation of fishing mortality in recent years. For *L. budegassa*, the historical pattern is uncertain in the overall level of stock size. The recruitment estimates of the most recent years appear to be very uncertain.

The main factors contributing to the uncertainties for these stocks are:

- Stock definition is problematic.
- Discards are not included in the assessment; discards are known to be partly dependent on market conditions and TAC restrictions and not just a proportion of the catch.
- The catch information has not been corrected for the substantial underreporting of landings.
- There are conflicting signals in the commercial CPUE series which could be caused by different targeting behaviour (changes in spatial and temporal fishing patterns).

Comparison with previous assessment and advice

For *L. piscatorius* fishing mortality and recent recruitments are revised downward and SSB upward, and for *L. budegassa* the usual downward revision of recent recruitment has been reversed for the year classes 2001 and 2002, while F and SSB trends are similar.

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 Single-Stock Exploitation Boundaries	Predicted catch corresp. To advice	Agreed TAC[1,2]	ACFM Landings[2]	Landings of *L. Piscat.*	Landings of *L. Budeg.*
1987	Not assessed		-		39.08	29.5	21.9	7.6
1988	Not assessed		-		42.99	28.5	20.1	8.4
1989	Not assessed		-		42.99	30.0	20.5	9.5
1990	Not assessed		-		42.99	29.4	19.8	9.6
1991	No advice		-		42.99	25.1	16.2	8.8
1992	No advice		-		42.99	21.1	12.8	8.3
1993	Concern about *L. Pisc.* SSB decrease		-		25.1	20.1	13.5	6.7
1994	SSB decreasing, still inside safe biological limits		-		23.9	21.9	16.1	5.8
1995	No increase in F		20.0		23.2	26.8	19.7	7.1
1996	No increase in F		30.3		30.4	30.2	22.1	8.1
1997	No increase in F		34.3		34.3	29.8	21.7	8.1
1998	No increase in F		33.0		34.3	28.2	19.6	8.6
1999	No increase in F		32.9		34.3	24.5	17.2	7.3
2000	At least 20% decrease in F		< 22.3		29.6	22.0[3]	14.9[3]	7.1[3]
2001	Reduce F below $\mathbf{F}_{pa}$		< 27.6		27.6	22.2[3]	16.5[3]	5.7[3]
2002	Reduce F below $\mathbf{F}_{pa}$		< 19.9		23.7	26.7[3]	20.1[3]	6.5[3]
2003	At least 30% decrease in F		< 16.4		21.0[4]	31.7	23.6	8.1
2004	At least 10% decrease in F		< 26.7		26.7	34.9	27.3	7.6
2005	Maintain F below $\mathbf{F}_{pa}$		< 37.8		31.2	32.1	24.7	7.4
2006	Maintain F below $\mathbf{F}_{pa}$		<33.9		34.0			
2007	Maintain F below $\mathbf{F}_{pa}$		<36.0					

Weights in '000 t.
[1] Includes Division VIIa and Divisions VIIId,e.
[2] Applies to both species.
[3]Revised.
[4]TAC was changed during 2003 from 19 400 t to 21 000 t following fast-track advice from ICES.

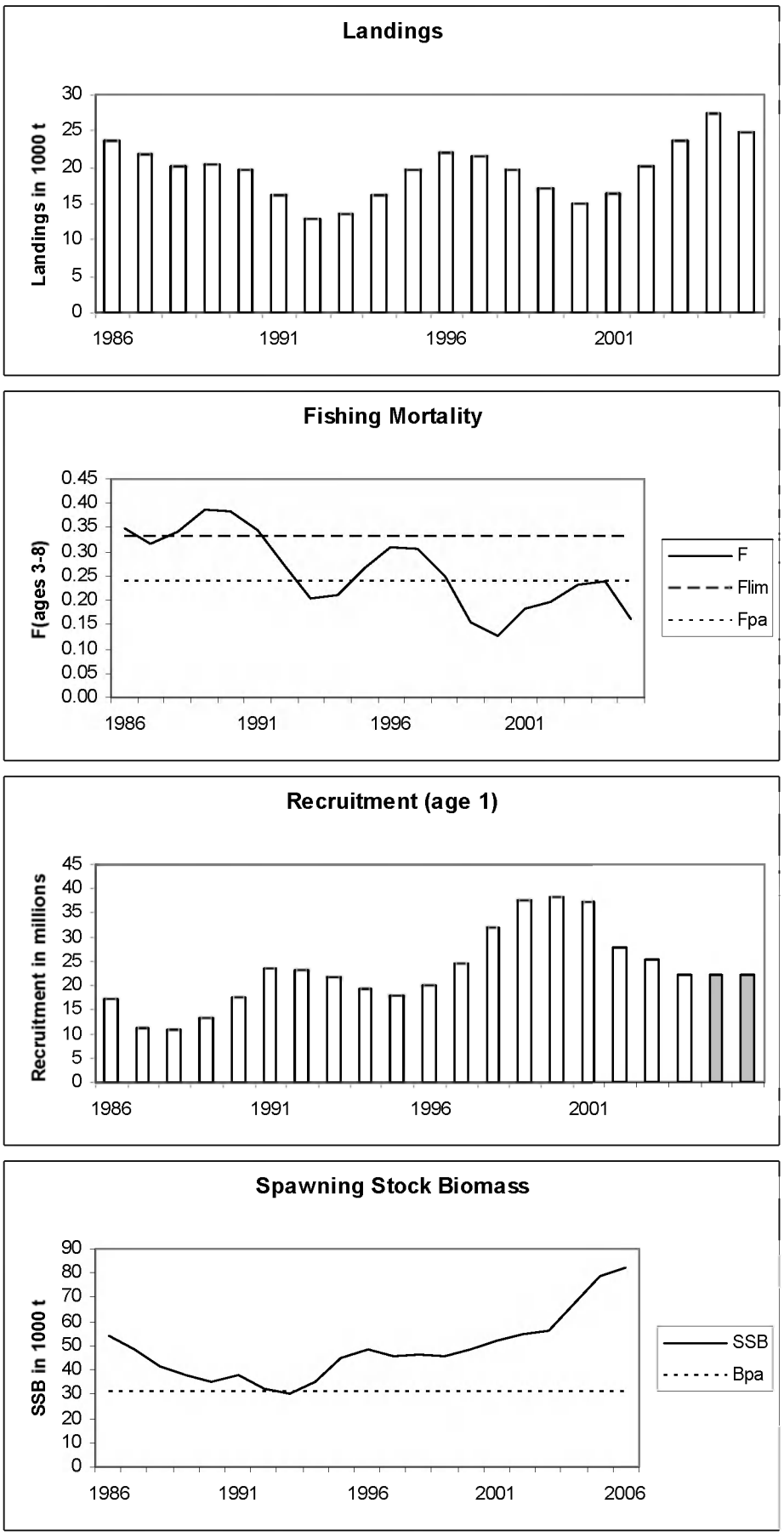
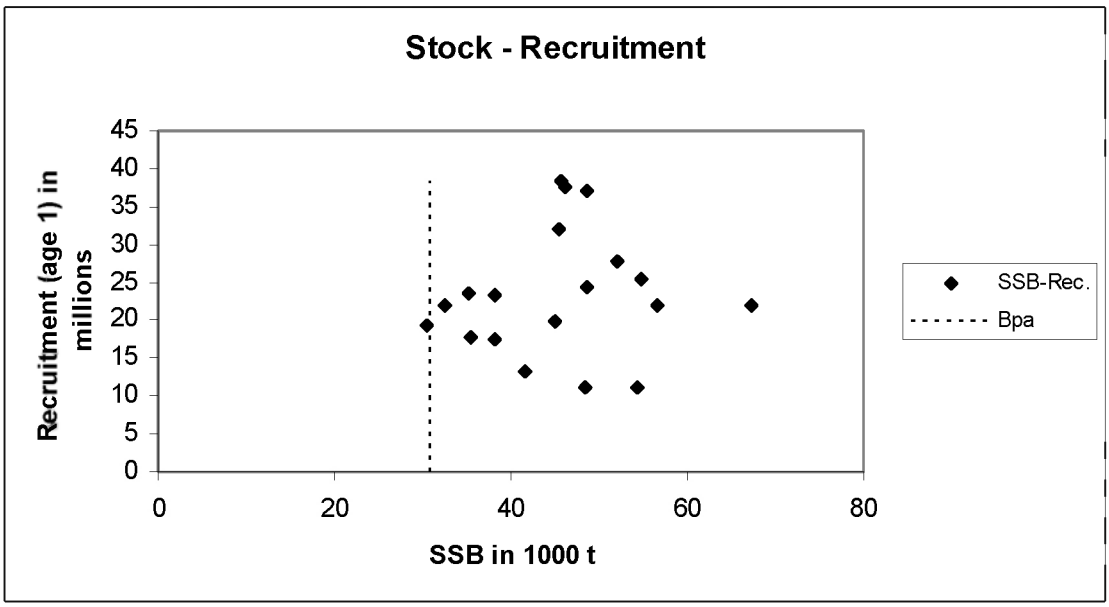
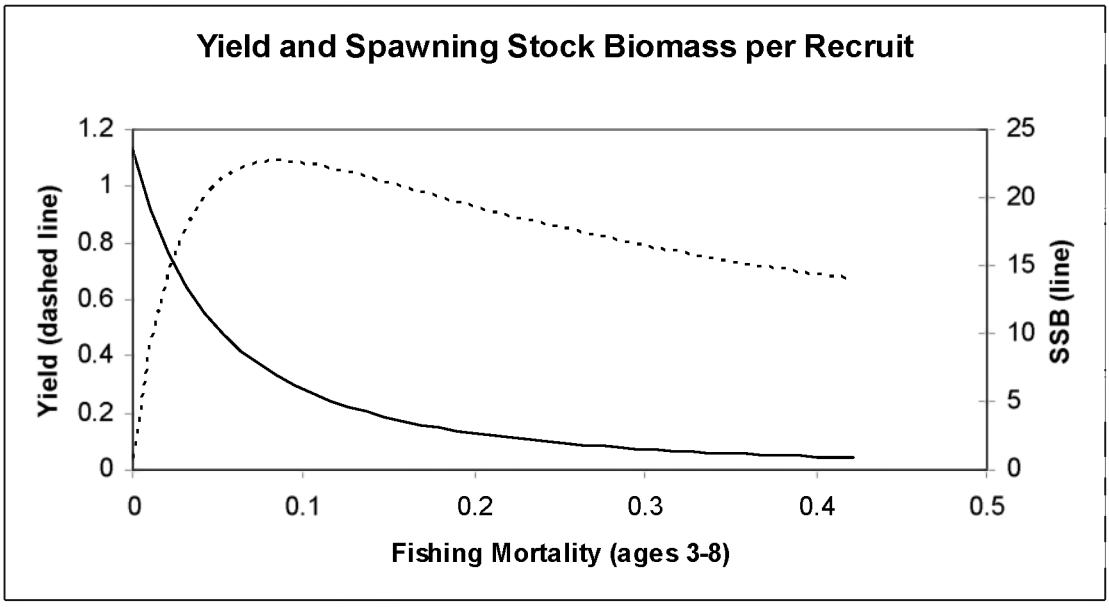


Figure 5.4.20.1 Anglerfish (*L. piscatorius*) in Divisions VIIb–k and VIIIa,b,d,e. Landings, fishing mortality, recruitment and SSB.





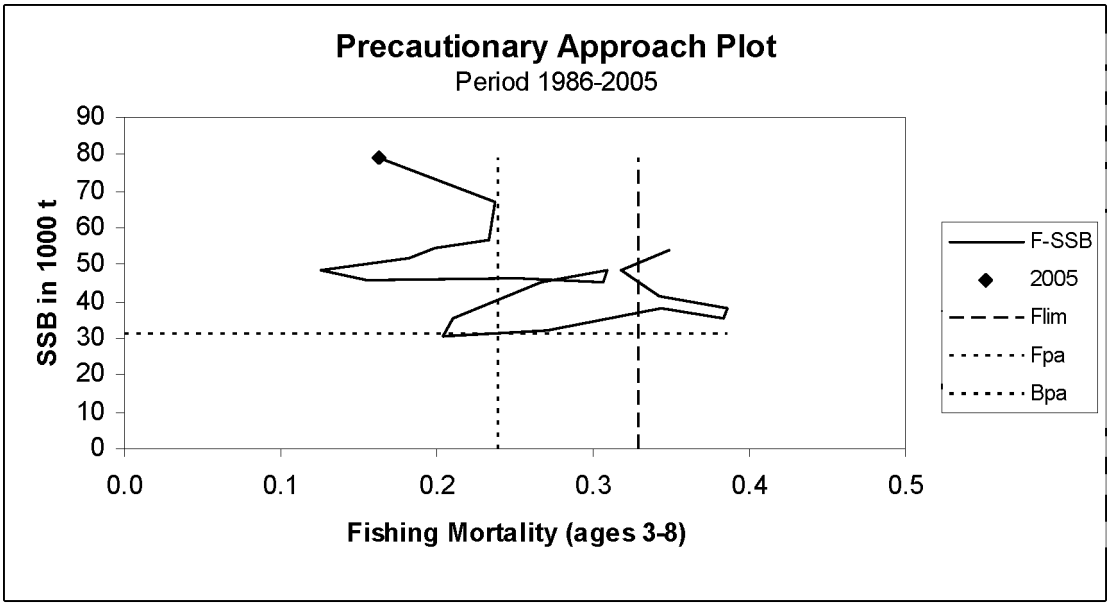


Figure 5.4.20.2 Anglerfish (*L. piscatorius*) in Divisions VIIb–k and VIIIa,b,d,e. Stock and recruitment; Yield and SSB per recruit.

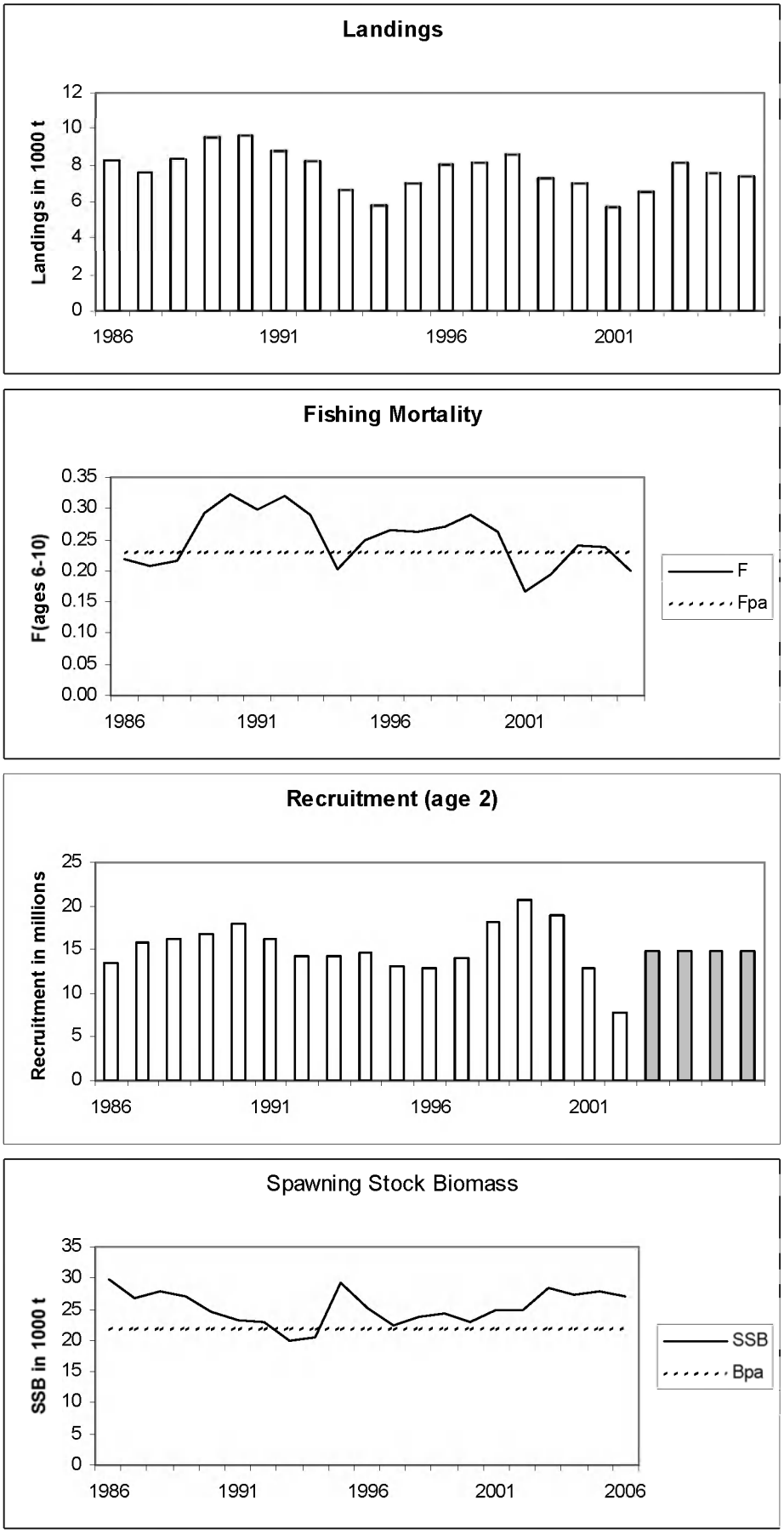
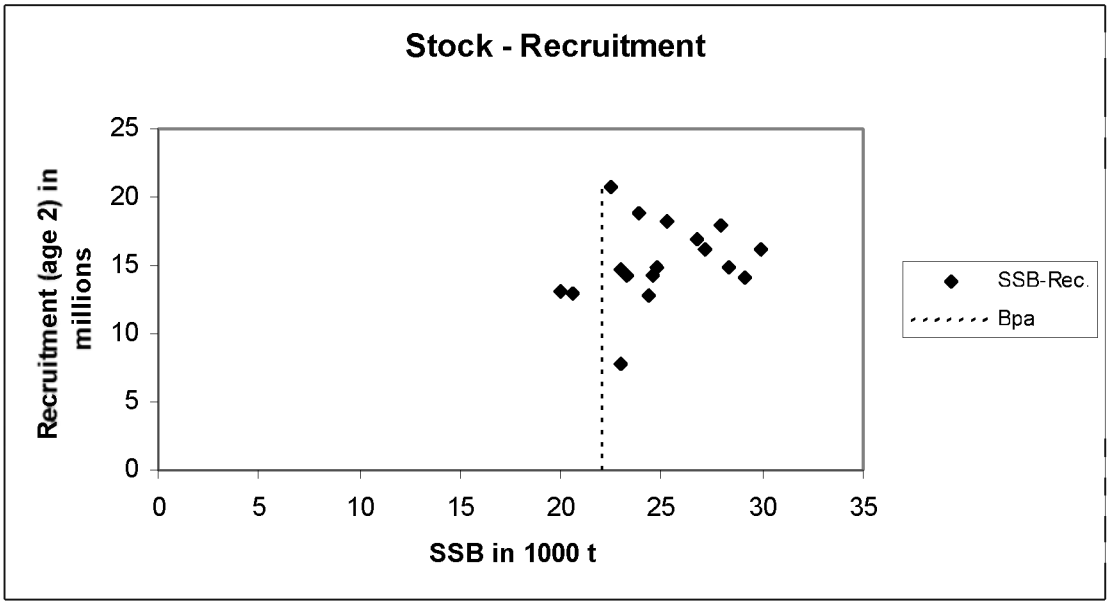
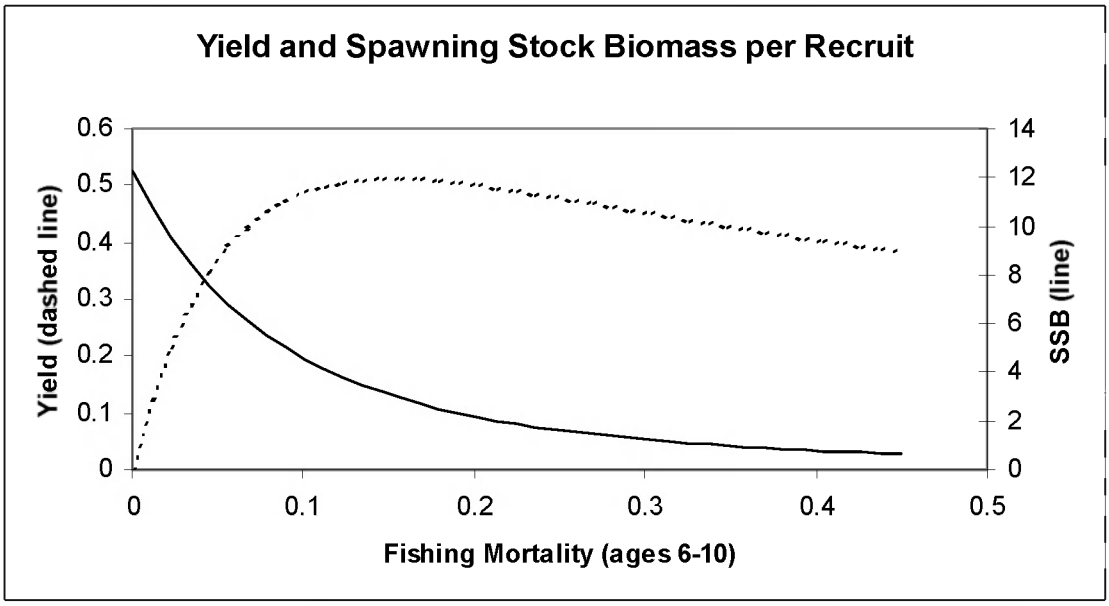


Figure 5.4.20.3 Anglerfish (*L. budegassa*) in Divisions VIIb–k and VIIIa,b,d,e. Landings, fishing mortality, recruitment and SSB





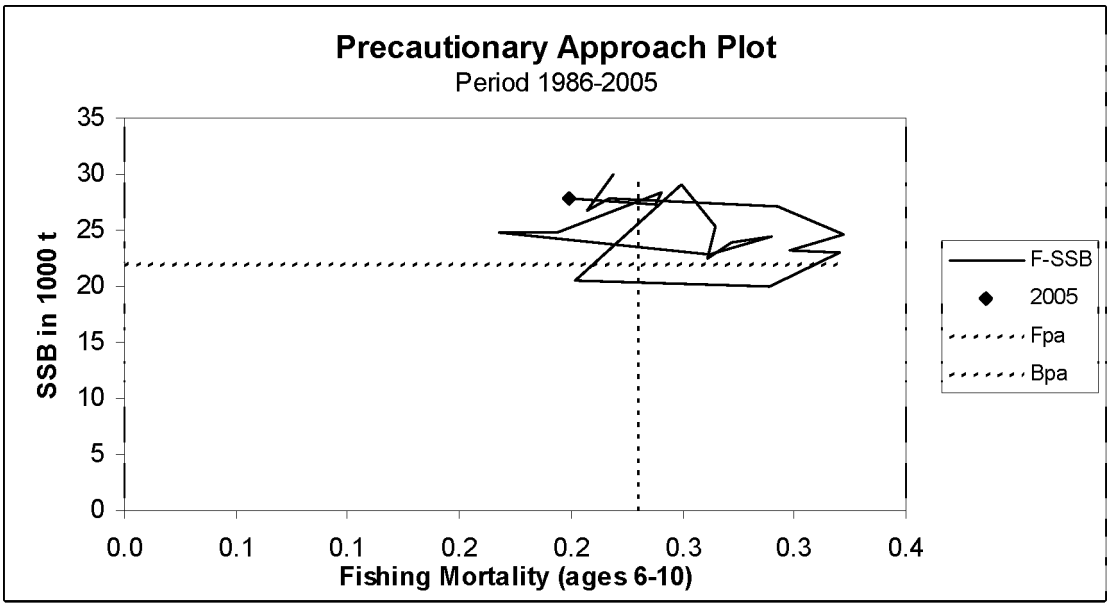


Figure 5.4.20.4 Anglerfish (*L. budegassa*) in Divisions VIIb–k and VIIIa,b,d,e. Stock and recruitment; Yield and SSB per recruit.

Table 5.4.20.1 **Anglerfish (L. piscatorius) in Divisions VIIb-k and VIIIa,b,d.**
Landings in tonnes by Fishery Unit

	VIIb,c,e-k						VIIIa,b,d				
Year	Gill-Net (Unit 3)	Medium/Deep Trawl (Unit 4)	Shallow Trawl (Unit 5)	Beam Trawl (Unit 6)	Shallow/medium Neph.Trawl (Unit 8)	Other	Neph.Trawl (Unit 9)	Shallow Trawl (Unit 10)	Medium/Deep Trawl (Unit 14)	Unallocated	TOTAL VII +VIII
1986	429	13781	2877	1437	1021		746	720	2657		23666
1987	560	11414	2900	1520	787		1035	542	3152		21909
1988	643	9812	3105	1814	774		927	534	2487		20095
1989	781	8448	5259	2342	754		673	444	1772		20474
1990	1021	8787	3950	1736	880		410	391	2578		19753
1991	1752	7565	2806	1196	752		284	218	1657		16229
1992	1773	6254	1489	1052	887		254	166	942		12818
1993	1742	5776	2125	1281	969		360	278	950		13481
1994	1377	7344	2595	1523	1236		261	198	1586		16120
1995	1915	8461	3195	1805	1242		501	429	1954	228	19730
1996	2244	9796	2637	2189	1149	138	441	379	2229	938	22141
1997	2538	9225	2945	2031	964	39	429	376	2045	1068	21660
1998	3398	8714	2138	1722	812	3	397	149	1699	542	19572
1999	2912	8343	2257	1407	743	19	97	117	1292	0	17186
2000	2299	7340	1853	1457	838	5	100	84	949	0	14925
2001	1806	7978	2243	1982	866	17	136	75	1405	0	16508
2002	2731	9679	2644	1836	922	5	223	88	2002	0	20130
2003	3087	11957	2622	1978	925	81	377	124	2440	0	23591
2004	3982	12773	3055	2454	869	14	461	180	3523	0	27313
2005*	4771	11192	2396	2385	571	7	322	152	2925	58	24778

* preliminary

Table 5.4.20.2 Anglerfish in Division VIIa. Nominal catch in tonnes.

	Belgium	France	Ireland	Isle of Man	Netherlands	UK - Eng+Wales+N.Irl.	UK - England & Wales	UK - N. Ireland	UK - Scotland	Total
1973	94	260			2		174	432	4	966
1974	99	910			1		135	273	5	1423
1975	118	593			6		118	272	7	1114
1976	85	188	5		7		117	327	13	742
1977	45	128	21		1		75	228	15	513
1978	68	119	40		1		74	236	14	552
1979	78	117	78	33	1		78	217	22	624
1980	71	91	143	21	9		90	227	25	677
1981	102	142	223	24	6		131	288	17	933
1982	197	99	291	35	8		168	409	31	1238
1983	379	66	668	27	2		128	368	15	1653
1984	153	135	837	50	69		125	373	30	1772
1985	149	167	791	21			109	265	34	1536
1986	140	200	579	16			80	264	36	1315
1987	111	134	522	22			104	244	45	1182
1988	52	134	417	9			209	356	42	1219
1989	130		1418	27		889			421	2885
1990	103		87	36		560			443	1229
1991	28		80	32		326			137	603
1992	61	97	103			444			146	851
1993	65	94	450	16		491			321	1437
1994	139	111	385	22		309			115	1081
1995	177	99	541	27		342			117	1303
1996	109	52	540	34	2	366			68	1171
1997	115	35	759	27	10	355			22	1323
1998	103	41	424	28	2	287			17	902
1999	63		196	9	1	263			10	542
2000	60	41	227	5	2	166			9	510
2001	128	61	213	2		190			19	613
2002	171	53	200	1		228			20	673
2003	175	48	189			209			18	639
2004	143	28	183	3		198			52	607
2005	103		171			158			2	434

Table 5.4.20.3 Anglerfish (*L. piscatorius*) in Divisions VIIb–k and VIIIa,b,d,e.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3–8
1986	17137	54219	23666	0.3486
1987	11234	48522	21909	0.3176
1988	11069	41531	20095	0.3423
1989	13357	38148	20474	0.3854
1990	17553	35287	19753	0.3835
1991	23674	38234	16229	0.3433
1992	23224	32447	12818	0.2710
1993	21945	30477	13481	0.2041
1994	19216	35398	16120	0.2105
1995	17802	45010	19730	0.2664
1996	19940	48558	22141	0.3087
1997	24444	45368	21660	0.3065
1998	31931	46144	19572	0.2512
1999	37577	45676	17186	0.1550
2000	38408	48715	14925	0.1261
2001	37148	52042	16508	0.1820
2002	27821	54714	20130	0.1981
2003	25333	56597	23591	0.2328
2004	22081	67360	27313	0.2376
2005	22086	78989	24778	0.1622
2006	22086	82348		
Average	23098	48847	19604	0.2616

Table 5.4.20.4 ***Lophius budegassa in Divisions VIIb-k and VIIIa,b,d***
Landings in tonnes by Fishery Unit

	VIIb,c,e-k						VIIIa,b,d				
Year	Gill-Net (Unit 3+13)	Medium/ Deep Trawl (Unit 4)	Shallow Trawl (Unit 5)	Beam Trawl (Unit 6)	Shallow/ medium Neph.Trawl (Unit 8)	Other	Neph.Trawl (Unit 9)	Shallow Trawl (Unit 10)	Medium/ Deep Trawl (Unit 14)	Unallocated	TOTAL VII+VIII
1986	23	5126	348	540	406	0	443	150	1181	0	8217
1987	30	3493	696	462	434	0	483	116	1904	0	7619
1988	34	4072	1095	751	394	0	435	102	1498	0	8382
1989	40	4398	976	1217	515	0	446	112	1829	0	9533
1990	53	4818	631	905	653	0	550	156	1865	0	9632
1991	88	4414	921	384	507	0	475	117	1933	0	8840
1992	90	4808	301	305	594	0	459	191	1518	0	8266
1993	93	3415	429	405	399	0	433	101	1385	0	6659
1994	70	2935	265	209	540	0	232	49	1515	0	5814
1995	110	3963	455	159	617	0	312	62	1286	90	7053
1996	118	4587	477	245	524	28	374	109	1239	392	8092
1997	134	4836	602	132	474	9	313	17	1128	471	8114
1998	179	5565	246	230	288	1	258	72	1454	305	8599
1999	16	4872	115	285	319	0	146	76	1496	0	7325
2000	68	4675	187	261	267	0	136	36	1407	0	7037
2001	36	3761	107	260	301	0	114	28	1080	0	5688
2002	31	4354	151	251	386	0	102	12	1247	0	6534
2003	79	5647	320	346	362	5	155	32	1189	0	8134
2004**	107	4720	265	349	394	0	259	8	1489	0	7590
2005**	68	4763	160	411	314	0	220	52	1426	14	7428

* revised
** preliminary

Table 5.4.20.5 Anglerfish (*L. budegassa*) in Divisions VIIb–k and VIIIa,b,d,e.

Year	Recruitment Age 2 thousands	SSB tonnes	Landings tonnes	Mean F Ages 6–10
1986	13482	29920	8217	0.2188
1987	15777	26779	7619	0.2070
1988	16161	27945	8382	0.2170
1989	16893	27147	9533	0.2927
1990	17970	24591	9632	0.3223
1991	16193	23301	8840	0.2982
1992	14197	22967	8266	0.3200
1993	14337	19972	6659	0.2889
1994	14695	20617	5814	0.2016
1995	13116	29180	7053	0.2492
1996	12937	25283	8092	0.2650
1997	14157	22441	8114	0.2616
1998	18224	23898	8599	0.2720
1999	20682	24395	7325	0.2897
2000	18854	22927	7037	0.2624
2001	12827	24808	5688	0.1674
2002	7759	24787	6534	0.1936
2003	14879	28339	8134	0.2407
2004	14879	27346	7590	0.2378
2005	14879	27885	7428	0.1988
2006	14879	27199		
Average	15132	25320	7728	0.2502

5.4.21 Cod in Division VIa (West of Scotland)

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
Reduced reproductive capacity	Harvested unsustainably	Overexploited	Not defined	SSB is estimated to be at an historical low level. The level of fishing mortality is estimated to be high and probably above $\mathbf{F}_{lim}$.

The spawning stock biomass is at an all time low, but the rate of exploitation is uncertain and probably high. The survey SSB estimates indicate that the stock has been declining and is presently at an historical low. Recruitment estimates indicate a decline in recruitment in the last decade, correlated with a decline in the spawning stock to the lowest levels observed. Recruitment since 2003 has been the weakest in the time-series.

Management objectives

The European Commission has enacted a Council Regulation ((EC) No. 423/2004) which establishes measures for the recovery of cod stocks:

For stocks above $\mathbf{B}_{lim}$, the harvest control rule (HCR) requires:

1) *setting a TAC that achieves a 30% increase in the SSB from one year to the next,*
2) *limiting annual changes in TAC to ± 15% (except in the first year of application), and,*
3) *a rate of fishing mortality that does not exceed* $\boldsymbol{F}_{pa}$.

For stocks below $\boldsymbol{B}_{lim}$ *the Regulation specifies that:*

1) *conditions 1-3 will apply when they are expected to result in an increase in SSB above* $\boldsymbol{B}_{lim}$ *in the year of application,*
2) *a TAC will be set lower than that calculated under conditions 1-3 when the application of conditions 1-3 is not expected to result in an increase in SSB above* $\boldsymbol{B}_{lim}$ *in the year of application.*

ICES has previously concluded that a precautionary recovery plan must include an adaptive element implying that fisheries for cod remain closed until an initial recovery of the cod SSB has been proven. An initial 3-year closure would be required to increase SSB above $\mathbf{B}_{lim}$ with high probability. Such an element of zero catch is not included in the existing plan. ICES therefore considers the recovery plan not to be consistent with the precautionary approach.

Reference points

	ICES considers that:	ICES proposes that:
Limit reference points	$\mathbf{B}_{lim}$ is 14 000 t.	$\mathbf{B}_{pa}$ be set at 22 000 t.
	$\mathbf{F}_{lim}$ is 0.8.	$\mathbf{F}_{pa}$ be set at 0.6.
Target reference points		$\mathbf{F}_{y}$ not determined.

Yield and spawning biomass per Recruit (from 2004 Assessment, assuming the selection pattern at that time)
F-reference points:

	Fish Mort Ages 2–5	Yield/R	SSB/R
$\mathbf{F}_{max}$	0.191	1.138	8.637
$\mathbf{F}_{0.1}$	0.132	1.088	11.440

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 spawning stock estimated in previous assessments.	$\mathbf{B}_{pa}$: This is considered to be the minimum SSB required to ensure a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty of assessments. This also corresponds with the lowest range of SSB during the earlier, more productive historical period.
$\mathbf{F}_{lim}$: Fishing mortalities above this have historically led to stock decline.	$\mathbf{F}_{pa}$: This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$.

Single-stock exploitation boundaries

Exploitation boundaries in relation to existing management plans

Due to the uncertainty in the level of fishing mortality, ICES is not in a position to give quantitative forecasts. In addition the management plan is not explicit about the level of reduction in the catch when the stock is below $\mathbf{B}_{lim}$. Simulations show that fishing should be closed for 3 years in order to bring SSB above $\mathbf{B}_{lim}$.

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

There will be no gain in the long-term yield by having fishing mortalities above $\mathbf{F}_{max}$ (0.19). Fishing at such lower mortalities would lead to higher SSB and, therefore, lower risks of fishing outside precautionary limits.

Exploitation boundaries in relation to precautionary limits

Given the very low SSB estimates, the high fishing mortalities and low recruitment in this stock, ICES advises zero catch of cod in 2007.

Conclusion on exploitation boundaries

As the recovery plan for this stock is considered to be consistent with the precautionary approach only when the fishery is closed for an initial period, and as this is congruent with the advice in relation to precautionary limits, ICES advises a zero catch of cod in 2007.

Management considerations

Management of cod fisheries must deal with the combined effects of assessment bias (of which unreliable catch data are a major contributing factor) and the inability of management to control catch. As long as these two interrelated conditions persist and substantial effort is permitted for fisheries catching cod, rebuilding cannot be achieved. Survey information shows that the total removal of cod in Division VIa may have been underestimated in the past decade relative to earlier periods. In an attempt to remove bias in the assessment a catch-at-age model was used that ignored landings and discard data from 1995 onwards, relying on survey data for this later period. It is, however, considered that mortality estimates arising from an assessment heavily or wholly based on survey data are poorly estimated and therefore noisy and sensitive to survey catchability. In contrast, historical trends in spawning biomass and recruitment appear to be robust measures of stock dynamics.

The advised measures are required if the cod stock is to reach a level where it can regain historic productivity.

As cod is taken in mixed demersal fisheries, following the advice will likely result in having to greatly reduce harvesting of other stocks, particularly haddock, whiting, and *Nephrops*. Management needs to take this into account.

Effort data 1998–2005 from UK vessels (one of the main countries fishing in the area) suggests that overall, effort has declined in recent years in Area VIa, and that declines in particular categories have not been compensated for by rises in other categories. Larger-meshed whitefish demersal trawls were the most important gears in Division VIa prior to 2002, but since then there has been a marked decline in KW-days by this category. This is principally explained by the recent, significant decommissioning schemes in the UK. Single-rig *Nephrops* trawls in the 70- to 99-mm mesh category are the other major gears in use and effort by these seems to have been maintained at a fairly stable level throughout the time-series. Numerous other gears generally make small contributions to the overall effort, and the pattern in most of these has either been a downward trend (e.g. seine nets and midwater trawls) or fluctuation without trend (e.g. fixed nets).

Time and area closures for particular fisheries may be tools for rebuilding this stock. The consequence of displacing effort, caused by the closures, needs to be considered in determining the role of such measures in the recovery plan.

Management plan evaluations

The management plan was evaluated and SSB recovery to above $\mathbf{B}_{pa}$ is expected to occur by about 2015. The result of the evaluation depends on a large number of assumptions, e.g. fishing mortality at zero implemented without errors. However, there are reports of significant non-reported landings, and as a consequence the current implementation of the TAC system is not able to regulate fishing mortality. Unless recovery measures are able to restrict the fishery they cannot be considered precautionary.

The plan depends primarily on annual estimates of SSB in relation to $\mathbf{B}_{pa}$ but also on estimates of fishing mortality relative to $\mathbf{F}_{pa}$. While SSB appears to be estimated well by this assessment, the fishing mortality is less well known and aspects of the management plan relating to maximum fishing mortality levels may be difficult to implement.

Factors affecting the fisheries and the stock

The effects of regulations

The fishery is managed by a TAC that does not seem to be restricting catches.

Several regulations have been introduced for West of Scotland in recent years. These regulations and their impact on the fisheries have been discussed in detail in the overview. Emergency EU measures were established in the first half of 2001 and led to short-term area closures in the north of the Division and, on a smaller scale, in the Clyde Sea area. These closures were intended to allow as many cod as possible to spawn. The Clyde closure has continued in all subsequent years under national UK legislation. Various derogations were introduced for gears not targeting cod. A new closed area was implemented west of Scotland in 2004 (EC Reg. No. 2287/2003).

The proportion of discarded fish has been high. In 2002 and 2003 regulations were implemented to improve the exploitation pattern of cod. It is not clear if it is possible to evaluate potential impacts of these measures to the stock and fishery.

Increases in cod-end mesh sizes have been introduced into the fishery to improve selectivity. The increase in minimum mesh size from 100 to 120 mm in 2001/2002 (before the introduction of effort regulation 27/2005) partly caused a shift to 80-mm mesh sizes in the mixed fishery trawls, due to the loss of valuable *Nephrops* catch. Catch composition regulations for this mesh size may have resulted in increased discarding and high grading.

The regulation is complemented by a system of fishing effort limitation. This is done by adjustment to the number of fishing days for various vessel categories deploying gears with various mesh sizes. The introduction of effort regulation has effectively further encouraged vessel operators to reduce mesh size and shift to other fisheries, particularly *Nephrops* trawling, in order to gain more days at sea. It is not possible to evaluate whether the mesh size changes and effort limitations may have benefited cod without information on the level of adherence to catch composition regulations required when using smaller mesh sizes.

However, the continued decline in the stock indicates that these measures alone have not proven sufficient to rebuild the stock to precautionary levels. Detailed analysis of the impact of such regulations is not possible until data of sufficient quality become available.

Changes in fishing technology and fishing patterns

From mid-September 2003 to mid-July 2004 the Irish trawl fishery off Greencastle, Co. Donegal that traditionally targets juvenile cod was closed. The closure was instigated by the local fishing industry to allow an assessment of seasonal closure as a potential management measure. The fishing industry again called for and received a statutory instrument closing the fishery from November 2004 until mid-February 2005 and again November 2005 until mid-February 2006. Most of the cod catch is normally taken in the fourth quarter. During 2000–2002 50% of the Irish catch weight of cod in Division VIa (61% by number) was taken in the fourth quarter. The closure is expected to have reduced the Irish fishing mortality on cod that would otherwise have occurred in 2003, 2004, and 2005.

Scientific basis

Data and methods

A catch-at-age model using catch data up to 1994 tuned by survey data and utilizing survey information alone from 1995 onward was used to evaluate trends in spawning stock biomass and recruitment. Trends in SSB are similar to results from a model based on survey data alone.

Uncertainties in assessment and forecast

Some changes have been made to the survey design in the past, but surveys are considered to provide an indicator of long-term stock trends.

Comparison with previous assessment and advice

The last analytical assessment was undertaken in 2003 based on a catch-at-age model using estimates of landings-at-age, discards-at-age, and survey CPUE data. No analytical assessment was carried out for this stock in 2004 or 2005. This year's assessment is based on a catch-at-age model using catch data up to 1994 tuned by survey data and survey information alone from 1995 onwards. Because of large uncertainties in mean F estimates no attempt was made to generate forecasts from this model. The perception of the state of the stock remains unchanged compared to 2003 and subsequent years. The advice this year is the same as last year.

Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 9–18 May 2006 (ICES CM 2006/ACFM:30).

Year	ICES advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC[1]	Official landings	ACFM Landings
1987	Reduce F towards $\mathbf{F}_{max}$		18.0		22.0	19.2	19.0
1988	No increase in F; TAC		16.0		18.4	19.2	20.4
1989	80% of F(87); TAC		16.0		18.4	15.4	17.2
1990	80% of F(88); TAC		15.0		16.0	11.8	12.2
1991	70% of effort (89)		-		16.0	10.6	10.9[2]
1992	70% of effort (89)		-		13.5	9.0	9.7[3]
1993	70% of effort (89)		-		14.0	10.5	11.8[3]
1994	30% reduction in effort		-		13.0	9.1	10.8[3]
1995	Significant reduction in effort		-		13.0	9.7	9.6[3]
1996	Significant reduction in effort		-		13.0	9.6	9.4
1997	Significant reduction in effort		-		14.0	7.0	7.0
1998	20% reduction in F		9.5[5]		11.0	5.7	5.7
1999	F reduced to below $\mathbf{F}_{pa}$		<9.7[5]		11.8	4.3	4.2
2000	Recovery plan, 60% reduction in F		<4.2		7.48	2.8[4]	3.0
2001	Lowest possible F, recovery plan		-		3.7	2.5	2.3
2002	Recovery plan or lowest possible F		-		4.6	2.0	2.1
2003	Closure		-		1.81	1.3	n/a
2004		Zero catch	[6]	0	0.85	0.6	n/a
2005		Zero catch	[6]		0.72	0.5	n/a
2006		Zero catch	[6]		0.613		
2007		Zero catch	[6]	0			

Weights in '000 t.
[1]TAC is for the whole of Subareas Vb1, VI, XII and XIV.
[2]Not including misreporting.
[3]Including ACFM estimates of misreporting.
[4]Incomplete data.
[5]For VIa only.
[6] Single-stock boundaries and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

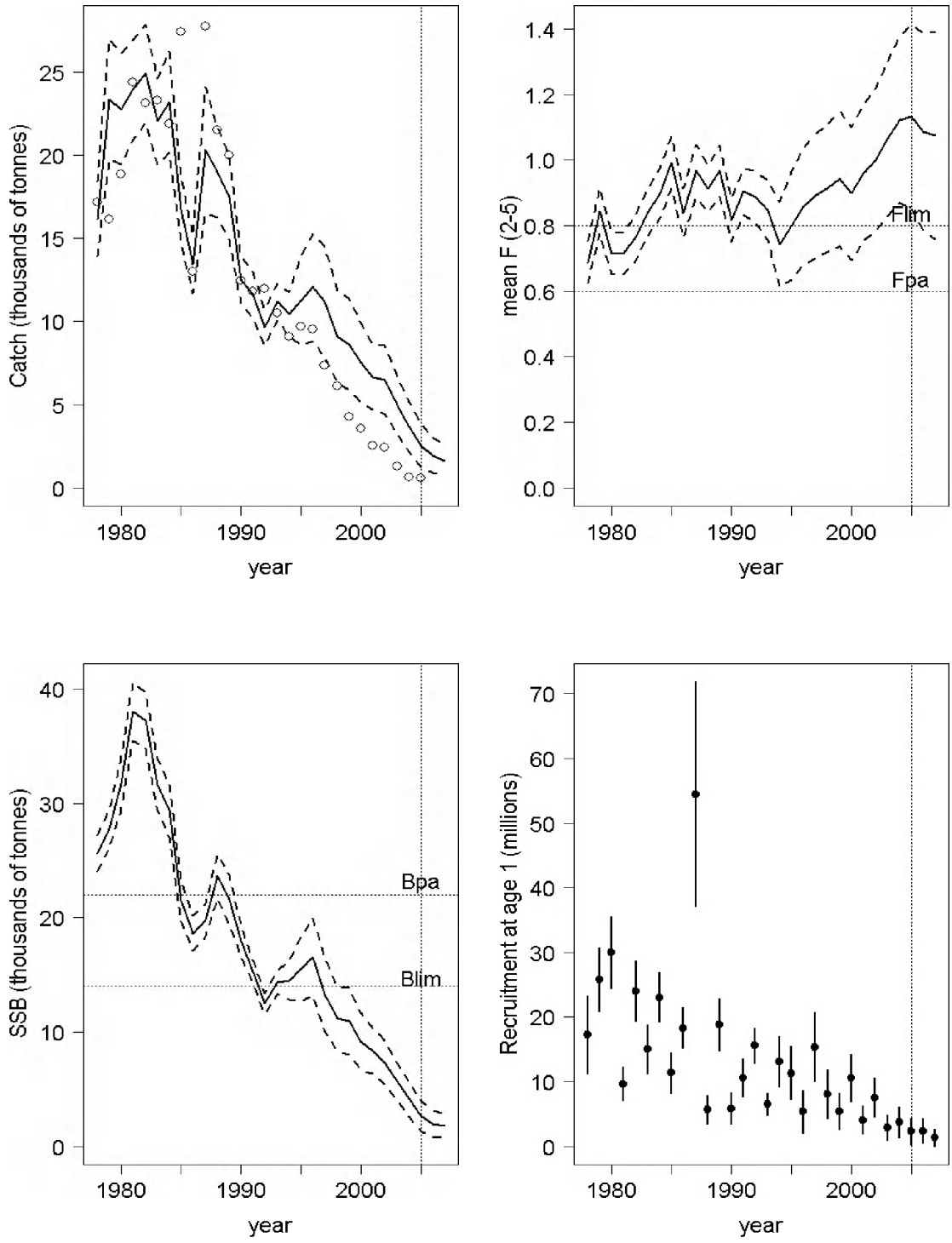


Figure 5.4.21.1 Cod in Division VIa. Summary plot of final TSA assessment run.

Table 5.4.21.1 Cod in Division VIa. Official catch statistics in 1985–2005, as reported to ICES.

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Belgium	48	88	33	44	28	-	6	-	22	1	2	+	11	1	+	+	2	+			
Denmark	-	-	4	1	3	2	2	3	2	+	4	2	-	-	+	-	-	-			
Faroe Islands	-	-	-	11	26	-	-	-	-	-	-	-	-	-	-	-	-	-		2	0
France	7,411	5,096	5,044	7,669	3,640	2,220	2,503	1,957	3,047	2,488	2,533	2,253	956	714*	842*[2]	236	391	208	172	91	79
Germany	66	53	12	25	281	586	60	5	94	100	18	63	5	6	8	6	4	+	+		
Ireland	2,564	1,704	2,442	2,551	1,642	1,200	761	761	645	825	1,054	1,286	708	478	223	357	319	210	120	34	17
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-		
Norway	204	174	77	186	207	150	40	171	72	51	61	137	36	36	79	114*	40*	88	46	10	
Spain	28	-	-	-	85	-	-	-	-	-	16	+	6	42	45	14	3	11	3		
UK (E., W., N.I.)	260	160	444	230	278	230	511	577	524	419	450	457	779	474	381	280	138	195	79	46	
UK (Scotland)	8,032	4,251	11,143	8,465	9,236	7,389	6,751	5,543	6,069	5,247	5,522	5,382	4,489	3,919	2,711	2,057	1,544	1,519	879	413	
UK																					403
Total landings	18,613	11,526	19,199	19,182	15,426	11,777	10,634	9,017	10,475	9,131	9,660	9,580	6,992	5,671	4,289	2,767	2,439	2,231	1,299	596	499

* Preliminary.

5.4.22 Cod in Division VIb (Rockall)

State of the stock

There have been no investigations and no catches in 2005.

5.4.23 Haddock in Division VIa (West of Scotland)

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	Risk of being harvested unsustainably	Overexploited	Not defined	

Based on the most recent estimate of SSB and fishing mortality ICES classifies the stock as having full reproductive capacity. The estimate of fishing mortality is uncertain, but is estimated above $\mathbf{F}_{pa}$ in most years since 1987. F has declined in recent years. SSB varied around $\mathbf{B}_{pa}$ during the 1990s. The very strong 1999 year class has caused SSB to increase from a level near the historic low in 2000 to above $\mathbf{B}_{pa}$ since 2001. More recent year classes, 2003 to 2005 year classes, are estimated to be low.

Management objectives

There are no explicit management objectives for this stock.

Reference points

	ICES considers that:	ICES proposes that:
Limit reference points	$\mathbf{B}_{lim}$ is 22 000 t.	$\mathbf{B}_{pa}$ be set at 30 000 t.
	$\mathbf{F}_{lim}$ is not defined.	$\mathbf{F}_{pa}$ be set at 0.5.
Target reference points		$\mathbf{F}_{y}$ not determined.

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 2–6	Yield/R	SSB/R
Average last 3 years	0.493	0.076	0.342
$\mathbf{F}_{max}$	0.176	0.110	0.919
$\mathbf{F}_{0.1}$	0.118	0.105	1.210
$\mathbf{F}_{med}$	0.425	0.084	0.402

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 spawning stock estimated in previous assessments.	$\mathbf{B}_{pa}$ = $\mathbf{B}_{lim}$ * 1.4. This is considered to be the minimum SSB required to have a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty of assessments.
$\mathbf{F}_{lim}$ is not defined.	$\mathbf{F}_{pa}$: The F below which there is a high probability of avoiding SSB<$\mathbf{B}_{pa}$ in the long term.

Single-stock exploitation boundaries

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

The current estimated fishing mortality is uncertain, but is likely to be well above $\mathbf{F}_{max}$. There will be no gain to the long-term yield by having fishing mortalities above $\mathbf{F}_{max}$ (0.29). Fishing at such lower mortalities would lead to higher SSB and, therefore, lower risks of fishing outside precautionary limits.

Exploitation boundaries in relation to precautionary limits

In order to maintain SSB above $\mathbf{B}_{pa}$ in 2008, ICES recommends a reduction in fishing mortality to less than 0.44. This corresponds to landings less than 7200 t in 2007.

Short-term implications

Outlook for 2007

Basis: F(2006) = $\mathbf{F}_{sq}$ = mean F(age 3–5) = 0.49; R(1978–2005) GM = 108.5 million; SSB(2007) = 29.3 kt; SSB(2008) = 28.7 kt; landings (2006) = 9.3 kt.

The maximum fishing mortality which would be in accordance with precautionary limits (F (precautionary limits)) is 0.5.

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 not defined.

Rationale	TAC(2007) [1] kt	Basis	F(2007)	SSB(2008) kt	%SSB change[2]	%TAC change[3]
Zero catch		F=0	0			
Status quo	7.79	$\mathbf{F}_{sq}$	0.49	28.7	-2	0
High long-term yield	5.3	F(long-term yield)	0.295	33.7	15	-32
Status quo	3.58	$\mathbf{F}_{sq}$ *0.4	0.20	36.8	26	-54
	5.12	$\mathbf{F}_{sq}$ *0.6	0.30	33.8	15	-34
	6.52	$\mathbf{F}_{sq}$ *0.8	0.39	31.1	6	-17
	7.79	$\mathbf{F}_{sq}$ *1	0.49	28.7	-2	0
	8.93	$\mathbf{F}_{sq}$ *1.2	0.59	26.4	-10	14
Precautionary limits	1.9	TAC($\mathbf{F}_{pa}$) *0.2	0.10	39.9	36	-76
	3.7	TAC($\mathbf{F}_{pa}$) *0.4	0.20	36.6	25	-53
	5.3	TAC($\mathbf{F}_{pa}$) *0.6	0.30	33.7	15	-32
	6.7	TAC($\mathbf{F}_{pa}$) *0.8	0.40	30.9	5	-14
	7.2	TAC($\mathbf{F}_{pa}$)*0.87	0.436	30.0	2	-8
	8.0	TAC($\mathbf{F}_{pa}$) *1.0	0.50	28.7	-2	2
	8.1	$\mathbf{F}_{sq}$ = $\mathbf{F}_{pa}$ *1.014	0.507	28.3	-3	4
	9.2	TAC($\mathbf{F}_{pa}$) *1.2	0.60	26.1	-11	18
	10.2	TAC($\mathbf{F}_{pa}$) *1.4	0.70	24.1	-18	31

All weights in thousand tonnes.

[1] It is assumed that the TAC will be implemented and that the landings in 2006 therefore correspond to the TAC.

[2] SSB 2008 relative to SSB 2007.

[3] TAC 2007 relative to TAC 2006.

Shaded scenarios are not considered consistent with the precautionary approach.

Management considerations

There have been several technical conservation measures introduced in the demersal fishery in Division VIa in recent years. These will have affected selectivity for haddock. There have also been a number of decommissioning rounds in the Scottish fleet, which will have reduced effective effort. The effect of recent effort regulations also still needs to be ascertained. Management for haddock will be strongly linked to that for cod for which a recovery plan is currently in force.

In 2005, Ireland introduced a decommissioning scheme aimed at removing around 6000 GT/18 000 kW from the Irish fleet. This stems from the two Whitefish Renewal Schemes, which introduced around 32 new vessels into the Irish fleet. The decommissioning scheme is targeted at demersal and scallop vessels over 18 m. The scheme is split into three rounds, with around 8 vessels already scrapped as part of the first phase and a total of 44 vessels due to be scrapped by the end of 2006. These changes in fleet structure are likely to have an impact on CPUE in this component of the data.

Special attention needs to be given to considering the sporadic nature of the haddock recruitment and how to manage periods of low recruitment interspersed with large, occasional pulses. In recent years over 50% of the total catch in weight has been discarded, so restricting landings alone may not achieve the necessary increase in SSB. Recent recruitment has been poor.

There are reports of significant non-reported landings and therefore a TAC system may not be able to restrict fishing. The conflicting signals in the survey and the catch-at-age information indicate that there is unaccounted removal from the system. The problem does not appear to be as severe as for whiting and cod, but this has not been fully evaluated.

Factors affecting the fisheries and the stock

The effects of regulations

The fishery is regulated by a TAC that does not, however, seem to be restricting catches.

The increase in minimum mesh size from 100 to 120 mm in 2001/2002 (before the introduction of effort regulation 27/2005) partly caused a shift to 80-mm mesh sizes in the mixed fishery trawls due to the loss of valuable *Nephrops* catch. Poorer selectivity at this mesh size may have resulted in increased discarding and high grading.

With the introduction of effort regulation, vessel operators have effectively been further encouraged to reduce mesh size and shift to other fisheries, particularly *Nephrops* trawling, in order to gain more days at sea. It is not possible to evaluate whether the mesh size changes and effort limitations may have benefited haddock without information on the level of adherence to catch composition regulations required when using smaller mesh sizes.

Changes in fishing technology and fishing patterns

Haddock in Division VIa are caught mainly by Scottish trawlers. Since 1976, Scottish heavy trawl and seine effort has declined, whilst that of light trawlers (shorter than 90 feet) has generally increased.

Other factors

Haddock in Division VIa are fully exploited from age group 3, and also reach full maturity at that age. Immature fish are subject to comparatively high fishing mortality, and comprise a large fraction of the discarded catch. High fishing mortality on immature haddock increases the susceptibility of the stock to overexploitation.

Scientific basis

Data and methods

The analytical age-based assessment is based on landings-at-age data, discard-at-age data, and indices from research vessel surveys. Due to uncertainties in landings quantity, catch data 1995–2005 were not used in the assessment.

Uncertainties in assessment and forecast

Survey information indicates an increase in unaccounted removal from this stock. Absolute biomass estimation may thus be biased, but it is not known to what extent. The relatively high SSB in recent years implies that the unaccounted catches have not caused harm to the stock in recent years.

Since effort data are unreliable (due to effort reporting not being mandatory in logbooks) commercial CPUE data are not used as tuning inputs.

Weights-at-age have shown a declining trend in this stock. The predictions conducted here provide guidance on the likely trajectories of stock biomass under various mortality scenarios. The shape of these trajectories also depends on the input weights-at-age. In the predictions carried out here the weights-at-age in 2006 were predicted from a simple linear model applied to the weight-at-age of each year class. Although other more complex options (e.g. the von Bertalanffy model) might also be contemplated, the simple linear models seem to fit the data reasonably well for the age ranges considered.

Comparison with previous assessment and advice

The perception of the state of the stock from this year's assessment does not differ from that obtained last year, and the basis for the single-stock fishery advice is the same as last year.

Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 9–18 May 2006 (ICES CM 2006/ACFM:30).

Year	ICES Advice	Single-Stock Exploitation Boundaries	Predicted catch corresp. to advice	Predicted catch corresp. to Single-Stock Exploitation Boundaries	Agreed TAC[1]	Official Landings	ACFM Landings	Discard Slip.	ACFM Catch
1987	Reduce F towards $\mathbf{F}_{max}$		20.0		32.0	27	27.0	16.2	43.2
1988	No increase in F; TAC		25.0		35.0	21	21.1	10.2	31.3
1989	80% of F(87); TAC		15.0		35.0	24	16.7	3.2	19.9
1990	80% of F(88); TAC		14.0		24.0	13	10.1	5.4	15.5
1991	70% of effort (89)		-		15.2	10	10.6	9.2	19.8
1992	70% of effort (89)		-		12.5	7	11.4[2]	9.4[2]	20.8[2]
1993	70% of effort (89)		-		17.6	13	19.1[2]	16.9[2]	36.0[2]
1994	30% reduction in effort		-		16.0	9	14.2[2]	11.2[2]	25.4[2]
1995	Significant reduction in effort		-		21.0	13	12.4	8.8	21.2
1996	Significant reduction in effort		-		22.9	13	13.4	11.8	25.3
1997	Significant reduction in effort		-		20.0	13	12.9	6.6	19.5
1998	No increase in F		20.8[3]		25.7	14	14.4	5.7	20.1
1999	F reduced to $\mathbf{F}_{pa}$		14.3[3]		19.0	11	10.4	5.1	15.6
2000	Maintain F below $\mathbf{F}_{pa}$		<14.9[3]		19.0	7	6.9	8.2	15.2
2001	Reduce F below $\mathbf{F}_{pa}$		<11.2[3]		13.9	7	6.7	7.2	14.0
2002	Reduce F below $\mathbf{F}_{pa}$		<14.1[3]		14.1	7	6.7	8.6	15.2
2003	No cod catches		-		8.7	4.9	5.3	4.2	9.6
2004	[4]	$\mathbf{F}_{pa}$		12.2	6.5	3.0	n/a	n/a	n/a
2005	[4]	¾* $\mathbf{F}_{pa}$		7.6	7.6	3.2	n/a	n/a	n/a
2006	[4]	0.7* $\mathbf{F}_{pa}$		8.0	7.81				
2007		0.87* $\mathbf{F}_{pa}$		7.2					

All weights in thousand tonnes.
[1]TAC is set for Divisions VIa and VIb (plus Vb1, XII & XIV), combined with restrictions on the quantity that can be taken in VIa from 1990.
[2]Adjusted for misreporting.
[3]For VIa only.
[4]Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

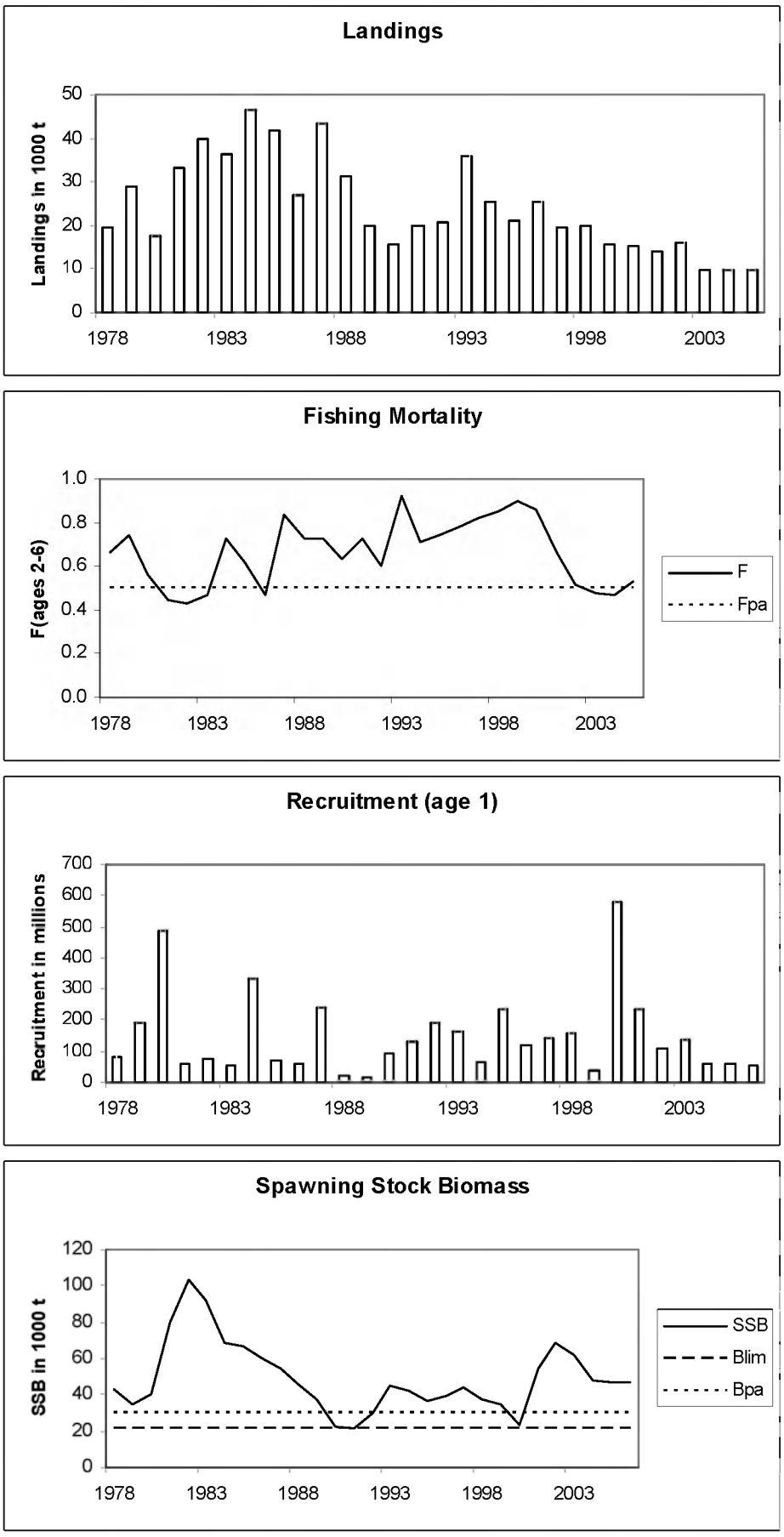
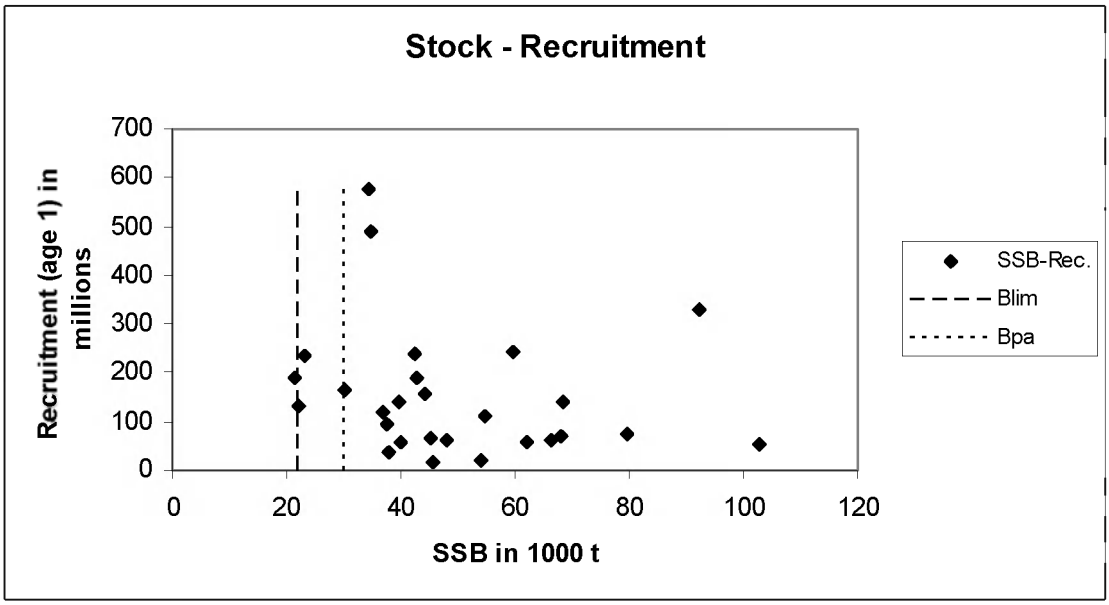
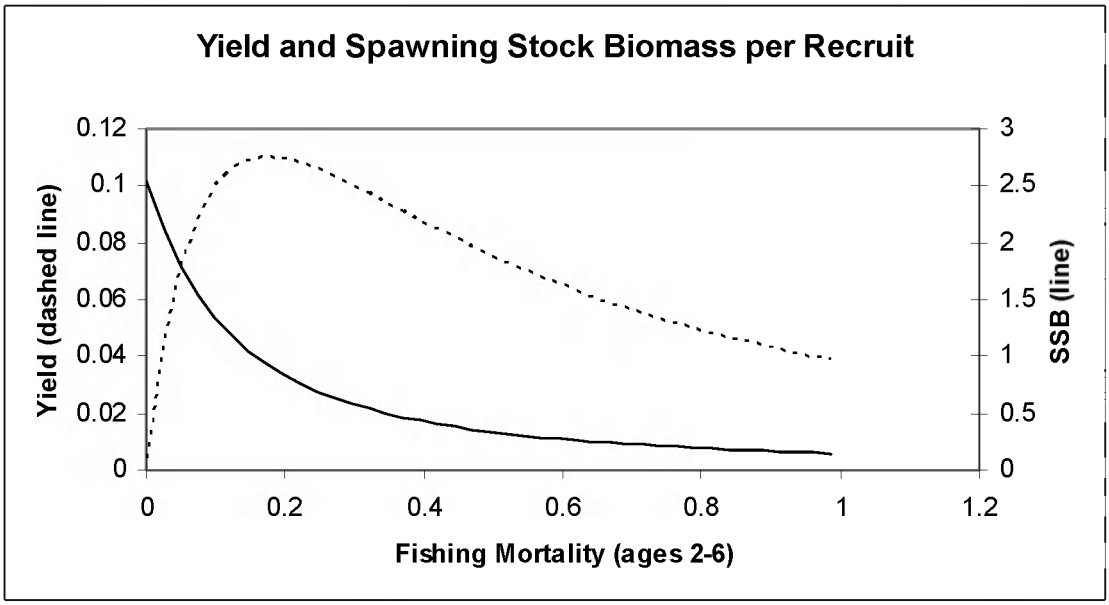


Figure 5.4.23.1 Haddock in Division VIa (West of Scotland). Landings, fishing mortality, recruitment and SSB..





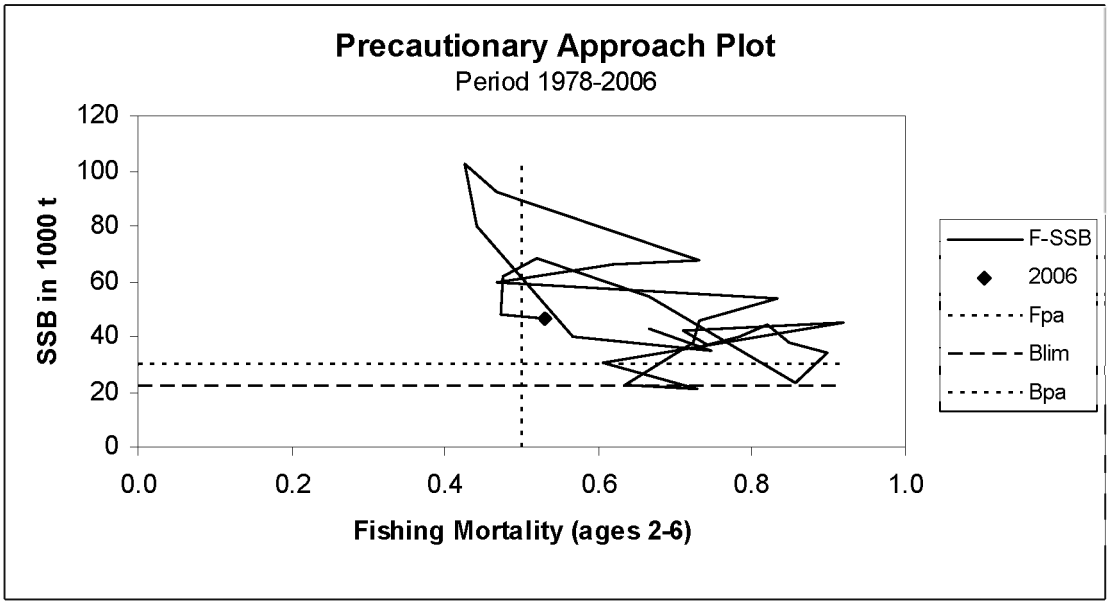


Figure 5.4.23.2 Haddock in Division VIa (West of Scotland). Stock and recruitment; Yield and SSB per recruit.

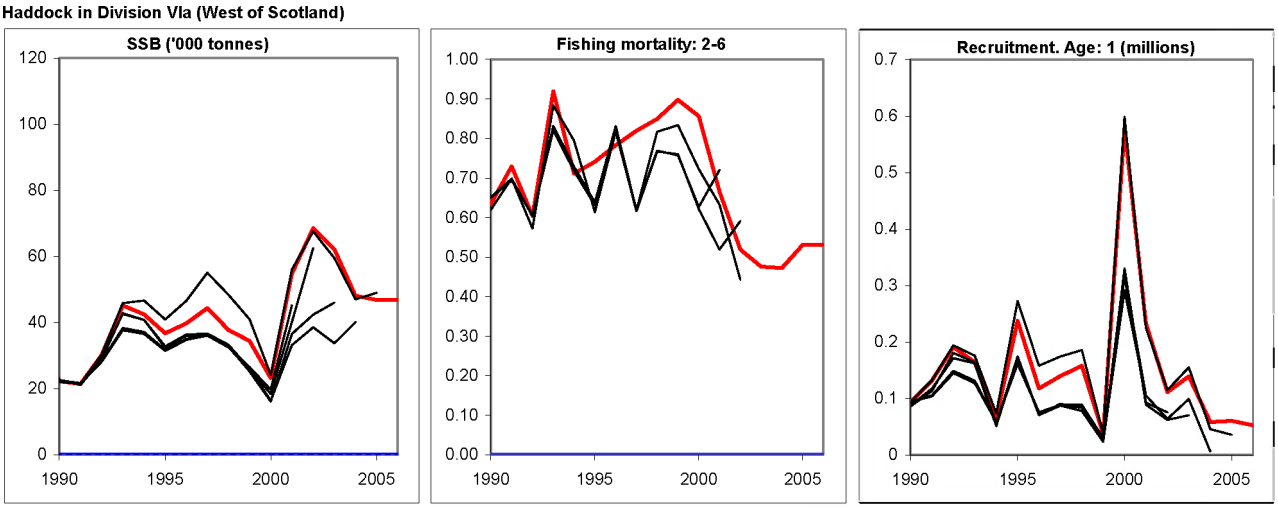


Figure 5.4.23.3 Haddock in Division VIa. Historical performance of the assessment (SSB, fishing mortality, and recruitment).

Table 5.4.23.1 Haddock in Division VIa. Nominal catch (tonnes) of haddock, 1986–2005, as officially reported to ICES.

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005[1]
Belgium	-	29	8	9	-	9	1	7	1	+	1	3	2	2	1	2	+	+		+
Denmark	+	+	+	+	+	+	1	1	-	1	1	-	+	-	-	-	-	+	-	
Faroe Islands	1	-	-	13	-	1	-	-	-	-	-	-	-	-	n/a	n/a			4	
France	4,956	5,456	3,001	1,335[1,2]	863[1,2]	761[1,2]	761	1,132	753	671	445	270	394[1]	788	282	160	151	183	173	233
Germany	25	21	4	4	15	1	2	9	19	14	2	1	1	2	1	1	+	-		+
Ireland	2,026	2,628	2,731	2,171	773	710	700	911	746	1,406	1,399	1447	1,352	1054	677	744	672	497	194	n/a
Norway	45	13	54	74	46	12	72	40	7	13	16[1]	21[1]	28	18	70	32	30	23	4	21
Spain	-	-	-	-	-	-	-	-	-	-	-	-	2	4	9	4	4	5		
UK (E & W)[3]	222	425	114	235	164	137	132	155	254	322	448	493	458	315	199	201	237			
UK (N. Ireland)	1	1	35								...	...	…	...	…	…	…			
UK (Scotland)	12,955	18,503	15,151		10,964	8,434	5,263	10,423	7,421	10,367	10,790	10,352	12,125	8,630	5,933	5,886				
UK (total)				19,940													6,225	4,688	3,002	2,972
Netherlands																			1	
Total	20,385	27,076	21,098	23,781	12,825	10,065	6,932	12,678	9,201	12,794	13,102	12,587	14,360	10,813	7,163	7,030	7,113	4,884	3,007	3,227

[1]Preliminary.
[2]Includes Divisions Vb(EC) and VIb.
[3]1989–2002 N. Ireland included with England and Wales.
n/a = Not available.

Table 5.4.23.2 Haddock in Division VIa (West of Scotland).

Year	Recruitment Age 1 thousands	SSB tonnes	Landings and discards tonnes	Mean F Ages 2-6
1978	79683	42803	19512.33	0.66686
1979	189519	34714	28847.42	0.74570
1980	488046	39902	17478.24	0.56632
1981	58754	79821	33306.129	0.44196
1982	74726	102690	39680.84	0.42628
1983	53197	92226	36286.98	0.46802
1984	331166	67976	46364.32	0.72994
1985	71881	66265	41835.879	0.61988
1986	61665	59626	26926.23	0.46704
1987	240984	54091	43222	0.83366
1988	20887	45778	31301	0.73000
1989	17640	37537	19871.09	0.72300
1990	93284	22278	15542	0.63494
1991	132189	21425	19752	0.72944
1992	191313	30186	20751.59	0.60452
1993	164271	45147	35971	0.92000
1994	65774	42470	25435	0.71108
1995	237603	36760	21167	0.74118
1996	117892	39741	25290	0.78306
1997	139786	44370	19489	0.81934
1998	158005	37804	20114	0.84952
1999	37694	34433	15559	0.89794
2000	578504	23260	15156	0.85666
2001	233082	54831	13979	0.66598
2002	111494	68521	16025	0.51918
2003	139304	62167	9575	0.47608
2004	58322	48124	7664	0.47220
2005	60499	46873	6903	0.53100
2006	n/a	46873	n/a	n/a
Average	146889	49265	23695	0.66075

n/a = not available.

5.4.24 Haddock in Division VIb (Rockall)

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 sustainably	Overexploited	Not defined	

Spawning biomass levels have increased in recent years as a result of the 2000 and 2001 year classes. SSB in 2005 is estimated to be above $\mathbf{B}_{pa}$. Fishing mortality has been high throughout the available time-series, but appears to have declined in 2005.

Management objectives

In consultation with the Russian Federation, a recovery plan has been proposed by the EC. However, now that the stock has recovered to $\mathbf{B}_{pa}$, a management plan should be proposed and evaluated for this stock.

Reference points

	ICES considers that:	ICES proposes that:
Limit reference points	$\mathbf{B}_{lim}$ is 6000 t.	$\mathbf{B}_{pa}$ be set at 9000 t.
	$\mathbf{F}_{lim}$ is not defined.	$\mathbf{F}_{pa}$ be set at 0.4.

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 2–5	Yield/R	SSB/R
Average last 3 years	0.65	0.17	0.23
$\mathbf{F}_{0.1}$	0.18	0.15	0.75
$\mathbf{F}_{med}$	0.43	0.17	0.35

A candidate for target reference point which is consistent with taking high long-term yields and achieving a low risk of depleting the productive potential of the stock may be around $\mathbf{F}_{0.1}$ (0.18). $\mathbf{F}_{max}$ is undefined due to a flat-topped Y/R.

Technical basis:

$\mathbf{B}_{lim}$ = $\mathbf{B}_{loss}$, the lowest observed spawning stock estimated in previous assessments.	$\mathbf{B}_{pa}$ = $\mathbf{B}_{lim}$ * 1.4. This is considered to be the minimum SSB required to have a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty of assessments.
$\mathbf{F}_{lim}$ is not defined due to uninformative stock recruitment data.	$\mathbf{F}_{pa}$: This F is adopted by analogy with other haddock stocks as the F that provides a small probability that SSB will fall below $\mathbf{B}_{pa}$ in the long term.

Single-stock exploitation boundaries

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

Target reference points have not been agreed for this stock. There is no gain in yield by having a target above $\mathbf{F}_{0.1}$ (0.18).

Exploitation boundaries in relation to precautionary limits

Fishing mortality should be less than $\mathbf{F}_{pa}$, corresponding to catches less than 7100 t in 2007.

Short-term implications

Outlook for 2007

Basis: F(2006) = $\mathbf{F}_{sq}$ = F(05) =0.39; R = GM 91–03 = 70 385 million; SSB(2006) = 16 840 t; SSB(2007) =15 680 t; catch (2006) = 6765 t.

Rationale	TAC(2007)	Basis	F(2007)	SSB(2008)
Zero catch	0	F=0	0	29500
High long-term yield	3514	F(0.1)	0.18	25741
	1585	$\mathbf{F}_{sq}$ *0.2	0.078	27789
	3062	$\mathbf{F}_{sq}$ *0.4	0.155	26220
	4439	$\mathbf{F}_{sq}$ *0.6	0.233	24766
	5726	$\mathbf{F}_{sq}$ *0.8	0.310	23415
	6929	$\mathbf{F}_{sq}$	0.388	22159
	7110	$\mathbf{F}_{pa}$	0.40	21968
	8055	$\mathbf{F}_{sq}$ *1.2	0.465	20990
	9112	$\mathbf{F}_{sq}$ *1.4	0.543	19901
	10103	$\mathbf{F}_{sq}$ *1.6	0.620	18886
	11036	$\mathbf{F}_{sq}$ *1.8	0.698	17938

Shaded scenarios are not considered consistent with the precautionary approach.

Management considerations

An international TAC applicable only to Division VIb, including international waters, would improve prospects for sustainability in the fishery in Division VIb. Previous to 2004, the EU TAC was set as a total for Division VI, with a limit on how much of the catch could be taken in Division VIa. Since 2004, TACs have set a specific limit for the EU fleets operating in Division VIb. In addition, part of Division VIb has since 1999 been in international waters where non-EU vessels are not subject to TAC. This allows for an unregulated fishery in the Rockall area.

However, the application of TACs implies that there is a simple relationship between recorded landings and effort exerted, and TACs are therefore likely to be effective only if the fishery strictly adheres to them. Such assumptions are unlikely to be true for Rockall haddock, especially when coupled with ways of evading TACs (e.g. misreporting). Also, the catches are not closely linked to the TACs because of high grading and discarding. Control is difficult because the fishery takes place in remote areas and some fleets process catches at sea. Therefore, effort regulation should be considered as a means of controlling fishing mortality on Rockall haddock.

Haddock is taken in a mixed fishery that currently includes substantial catches of blue whiting and non-assessed species such as grey gurnard.

There is a need for an internationally agreed management plan. Such a plan should involve extensive collaboration between stakeholders, scientists, and management authorities in both the design and the monitoring of conservation measures.

Factors affecting the fisheries and the stock

The effects of regulations

Following the NEAFC agreement in March 2001, an area of the NEAFC zone around Rockall was closed to fishing. Effort in the rectangle containing the closure declined following the closure coming into effect. There was also a decline in UK effort across the bank as a whole at this time, but an increase of effort in other areas of Division VIb. The most recent assessment of the stock shows an upturn in spawning biomass, but it is difficult to determine what contribution has been made by the efforts to protect juveniles in the closed area.

Scientific basis

Data and methods

Information about age composition in the landings is incomplete. The total catch composition has been estimated, but it is not possible to validate these estimates. Survey estimates are available from 1988–2003. In 2004–2005 new data on

biology and distribution were obtained, a trawl acoustic survey was carried out, and the biomass of haddock from the Rockall Bank was estimated.

Uncertainties in assessment and forecast

The survey covers only part of the currently known distributional area of haddock. The survey index may thus in part reflect changes in the distributional pattern, and not only in stock dynamics. An annual survey covering the whole of the distributional area may improve assessment of the stock status.

There is an urgent requirement for well-designed scientific monitoring programmes capable of delivering accurate data on trends in abundance and composition of the fish fauna throughout the area, in a form that can support the development and implementation of a management plan for Rockall Bank.

Comparison with previous assessment and advice

Last year, the assessment was only indicative of trends. The improved quality and documentation of the input data (especially the catch data) allowed an analytical assessment this year, although the assessment is still considered to be uncertain. The strong 2001 year class was not fully taken into account in the advice last year due to uncertainty about its strength. Data for 2005 confirm that the 2001 year class is strong and that it now contributes significantly to SSB. This, in combination with a decrease in fishing mortality in 2005, has changed the perception of the stock substantially and resulted in an increase in recommended catch.

Sources of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 9–18 May 2006 (ICES CM 2006/ACFM:30).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC[1]	Official Landings	ACFM Landings
1987	Precautionary TAC		10.0			8.0	8.4
1988	Precautionary TAC		10.0			7.6	7.9
1989	*Status quo* F; TAC		18.0			6.6	6.7
1990	Precautionary TAC		5.5			8.2	3.9
1991	Precautionary TAC		5.5			5.9	5.7
1992	Precautionary TAC		3.8			4.5	5.3
1993	80% of F(91)		3.0			4.1	4.8
1994	If required, precautionary TAC		-			3.7	5.7[2]
1995	No long-term gain in increasing F		5.1[3]			5.5	5.6
1996	No long-term gains in increasing F		6.9[3]			6.8	7.1
1997	No advice given		4.9[3]			5.2	5.2
1998	No increase in F		4.9			5.1	4.5
1999	Reduce F below $\mathbf{F}_{pa}$		3.8			6.0	5.1
2000	Reduce F below $\mathbf{F}_{pa}$		< 3.5			5.7[4]	5.3[5]
2001	Reduce F below $\mathbf{F}_{pa}$		< 2.7			2.3[4]	2.0[5]
2002	Reduce F below 0.2		<1.3			3.0	3.3
2003	Lowest possible F		-			6.1	6.2
2004	[6]	Lowest possible catch		-	0.702*	6.3	6.4
2005	[6]	Lowest possible catch			0.702*	5.2	5.2
2006	[6]	Lowest possible catch			0.597*		
2007	Reduce F below $\mathbf{F}_{pa}$		<7.11				

Weights in '000 t.

[1]TAC is set for Divisions VIa and VIb (plus Vb1, XII & XIV), combined with restrictions on the quantity that can be taken in VIa from 1990.

[2]Including misreporting.

[3]Landings at *status quo* F.

[4]Incomplete data.

[5]Russian data adjusted to exclude fish below MLS of 30 cm.

[6]Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

* Agreed EU TAC for VIb, XII, and XIV.

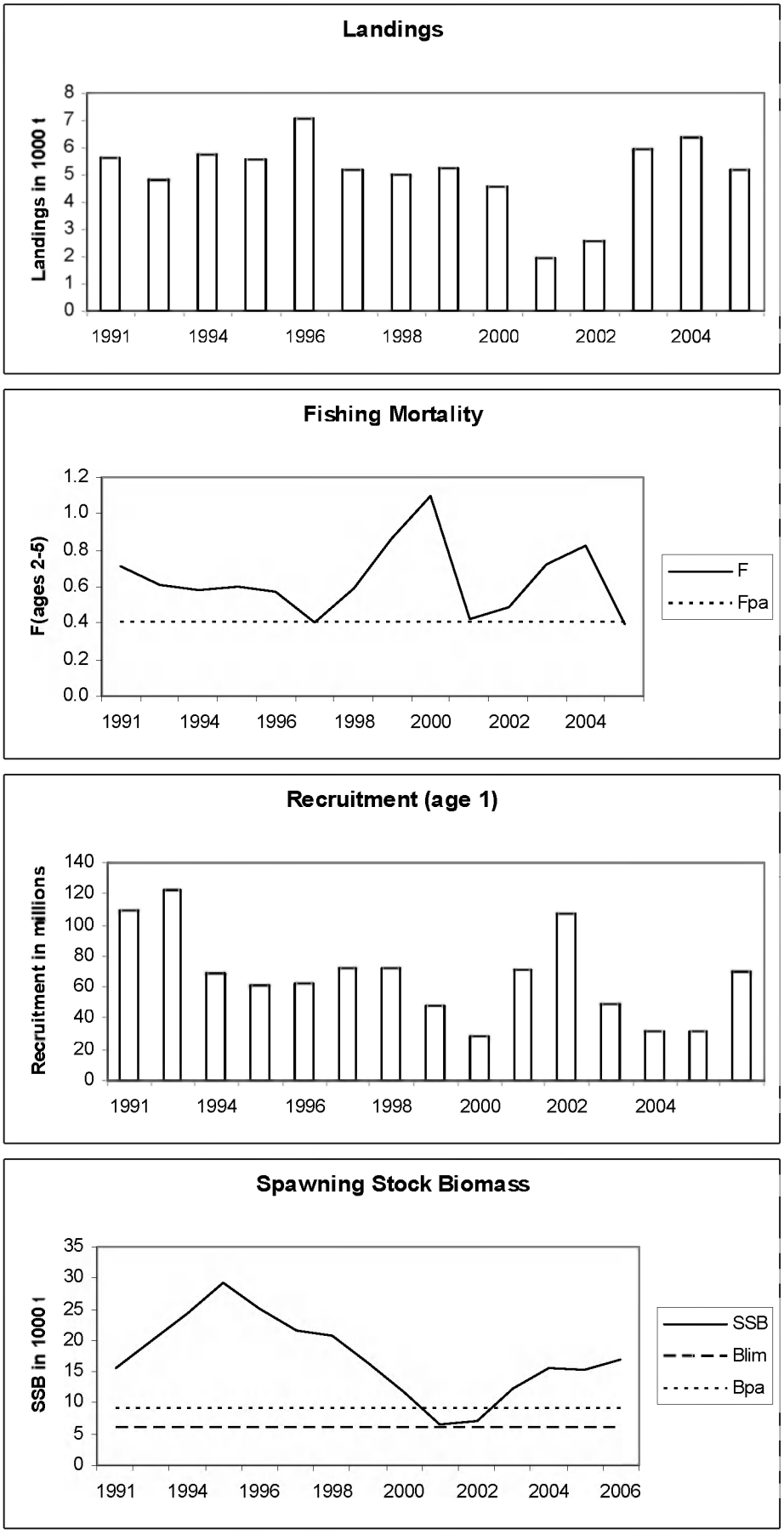
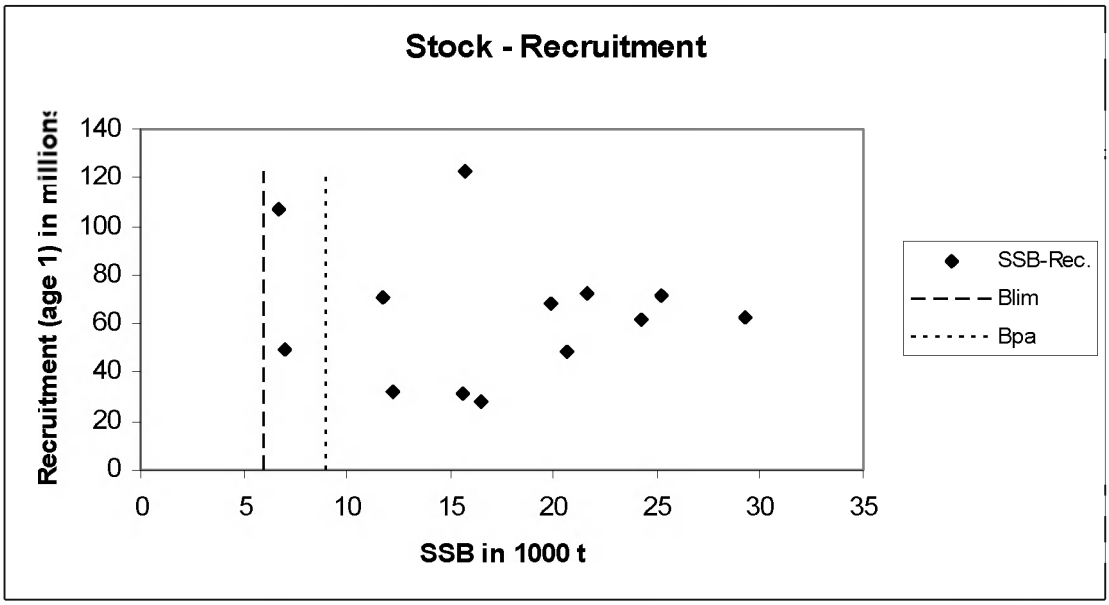
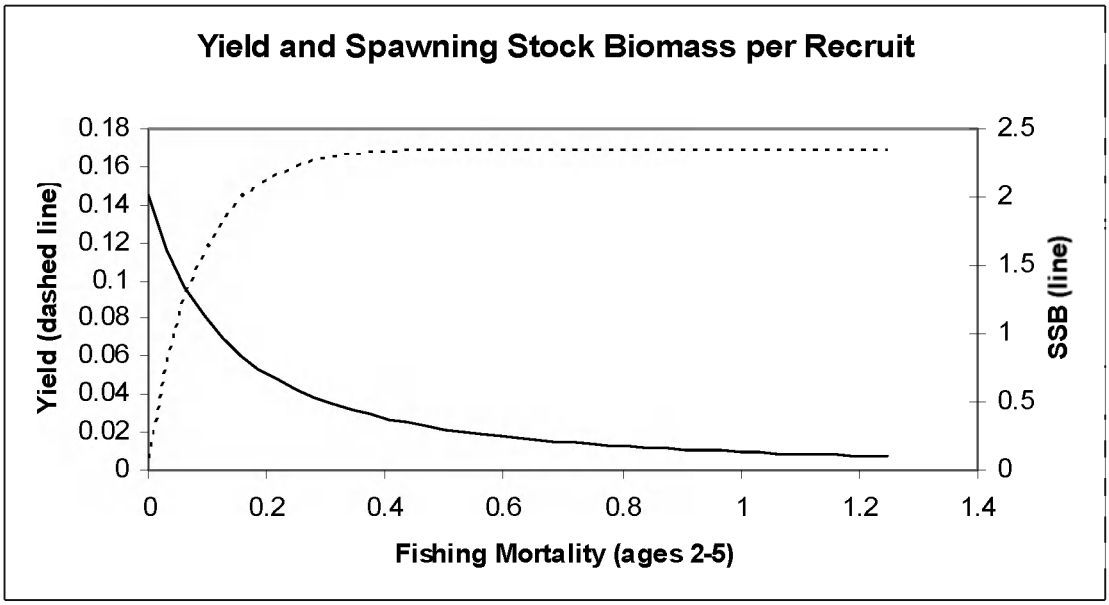


Figure 5.4.24.1 Haddock in Division VIb (Rockall). Landings, fishing mortality, recruitment and SSB.





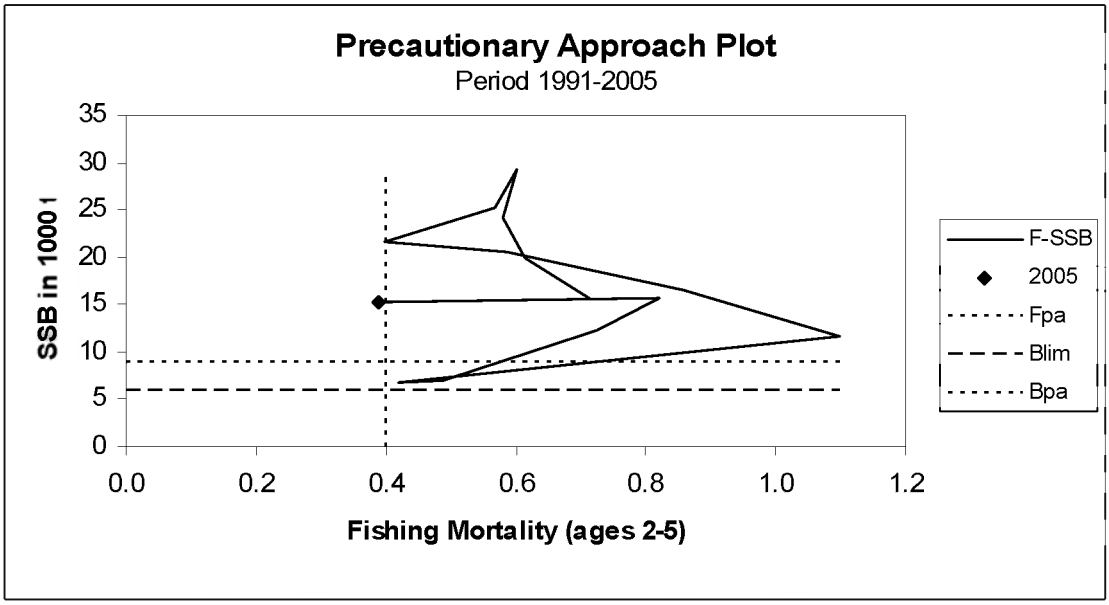


Figure 5.4.24.2 Haddock in Division VIb (Rockall). Stock and recruitment; Yield and SSB per recruit.

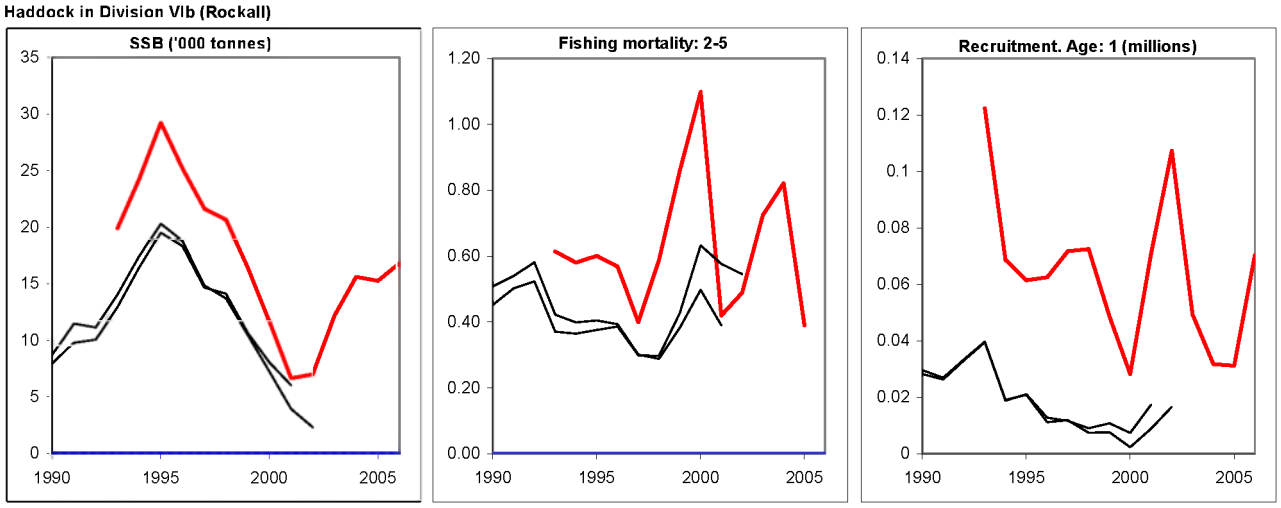


Figure 5.4.24.3 Haddock in Division VIb. Historical performance of the assessment (SSB, fishing mortality, and recruitment).

Table 5.4.24.1. Nominal catch (tonnes) of HADDOCK in Division VIb, 1989–2005, as officially reported to ICES.

COUNTRY	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003[1]	2004[1]	2005[1]
Faroe Islands	-	-	-	-	-	-	-	-	-	-	-	n/a	n/a				
France	…[2]	…[2]	…[2]	…[2]	…[2]	…[2]	…[2]	-	-	-*		5	2*	+	1		
Germany, Fed. Rep.	1	-	-	-	-	-	-	-	-	-	-	-	-				
Iceland	-	-	-	-	-	-	-	-	+	-	167	-	-	-			
Ireland	-	620	640	571	692	956	677	747	895	704	1,021	824	357	206	169	19[5]	105
Norway	47	38	69	47	68	75	29	24	24	40	61	152*	70*	49	60	32	2
Portugal	-	-	-	-	-	-	-	-	-	4	-	-	-				
Russian Federation	-	-	-	-	-	-	-	-	-	-	458	2,154	630	1,630	4.237	5,844	4708
Spain	337	178	187	51	-	-	28	1	22	21	25	47	51	7	19		
UK (E, W & NI)	272	238	165	74	308	169	318	293	165	561	288	36	-	-	56		
UK (Scotland)	5,986	7,139	4,792	3,777	3,045	2,535	4,439	5,753	4,114	3,768	3,970	2,470	1,205	1,145[3]	1.606	411[3]	375[3]
United Kingdom																	
Total	6,643	8,213	5,853	4,520	4,113	3,735	5,491	6,818	5,220	5,098	5,990	5,688	2,315	3,037	6.148	6,306	
Unallocated catch	85	-4,329	-198	800	671	1,998	-379	-543	-591	-599	-851	-357	-279	299	94	139	1
WG estimate	6,728	3,884	5,655	5,320	4,784	5,733	5,112	6,275	4,629	4,499	5,139	5,331[4]	2,036[4]	3,336[4]	6.242[4]	6,445	5,191

[1]Preliminary.
[2]Included in Division VIa.
[3]Includes UK England, Wales and NI landings.
[4]Includes the total Russian catch.
[5] Nonofficial.
n/a = Not available.

Table 5.4.24.2 Haddock in Division VIb (Rockall).

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 2-5
1991	109837	15675	5655	0.7123
1993	122439	19922	4784	0.6139
1994	68667	24284	5733	0.5802
1995	61483	29257	5587	0.6009
1996	62520	25191	7075	0.5680
1997	71767	21664	5166	0.3993
1998	72492	20673	4984	0.5876
1999	48633	16466	5221	0.8585
2000	28217	11710	4558	1.0983
2001	70709	6682	1918	0.4197
2002	107341	7015	2571	0.4889
2003	49377	12201	5961	0.7241
2004	31747	15616	6400	0.8216
2005	31236	15261	5191	0.3897
2006	70385	16839		
Average	67123	17230	5057	0.6331

5.4.25 Whiting in Division VIa (West of Scotland)

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
Unknown	Unknown	Unknown	Not defined	The state of the stock is unknown, but all indicators point towards the stock being at an historical low.

Long-term information on the historical yield and catch composition all indicate that the present stock size is low. A survey-based assessment covering the more recent period indicates that the stock is at its lowest level over this time period. Total mortality is at the highest level over the time period.

Management objectives

There are no explicit management objectives for this stock.

Reference points

	ICES considers that:	ICES proposes that:
Limit reference points	$\mathbf{B}_{lim}$ is 16 000 t.	$\mathbf{B}_{pa}$ be set at 22 000 t.
	$\mathbf{F}_{lim}$ is 1.0.	$\mathbf{F}_{pa}$ be set at 0.6.
Target reference points		$\mathbf{F}_{y}$ not defined.

Technical basis:

$\mathbf{B}_{lim} = \mathbf{B}_{loss}$(1998), the lowest observed spawning stock estimated in previous assessments.	$\mathbf{B}_{pa} = \mathbf{B}_{lim} * 1.4$. This is considered to be the minimum SSB required to have a high probability of maintaining SSB above $\mathbf{B}_{lim}$, taking into account the uncertainty of assessments.
$\mathbf{F}_{lim}$ is the fishing mortality above which stock decline has been observed.	$\mathbf{F}_{pa} = 0.6 * \mathbf{F}_{lim}$. This F is considered to have a high probability of avoiding $\mathbf{F}_{lim}$.

The advice is based on information from abundance surveys. In the past the reference points have been estimated using a different basis such that they cannot be compared.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary limits

Given that SSB is estimated at the lowest observed level and total mortality at the highest level over the time period, catches in 2007 should be reduced to the lowest possible level.

Management considerations

There are strong indications that management control is not effective in limiting the catch. Survey information shows that the total removal of whiting in Division VIa may be underestimated in the past decade relative to earlier periods. The effect of the fishery on the stock has therefore been evaluated in relative terms, and advice on absolute levels of future catches is not possible.

The proportion of fish discarded is very high and appears to have increased in recent years. Approximately half of the annual catch weight comprises undersized or low-value whiting which are discarded. Measures to reduce discards and to improve the exploitation pattern would be beneficial to the stock and to the fishery.

Effort data 1998–2005 from UK vessels (one of the main countries fishing in the area) suggests that overall, effort has declined in recent years in Area VIa, and that declines in particular categories have not been compensated for by rises in other categories. Larger-meshed whitefish demersal trawls were the most important gears in VIa prior to 2002, but since then there has been a marked decline in KW days by this category. This is principally explained by the recent, significant decommissioning schemes in the UK. Single-rig *Nephrops* trawls in the 70- to 99-mm mesh category are the other major gears in use and effort by these seems to have been maintained at a fairly stable level throughout the time-

series. Numerous other gears make generally small contributions to the overall effort and the pattern in most of these has either been a downward trend (e.g. seine nets and midwater trawls) or fluctuation without trend (e.g. fixed nets).

The last accepted assessment in 2003 indicated a decrease in SSB by a factor 5 from the 1980s to the 1990s.

Factors affecting the fisheries and the stock

The effects of regulations

The fishery is regulated by a TAC that does not, however, seem to restrict catches.

The more widespread use of 110-mm mesh nets in 2002 as well as the requirement to fit square mesh panels to certain towed gears since late 2000, may have temporarily improved the selection pattern for whiting. However, the increase in minimum mesh size from 100 to 120 mm in 2001/2002 (before the introduction of effort regulation 27/2005) partly caused a shift to 80-mm mesh sizes in the mixed fishery trawls, due to the loss of valuable *Nephrops* catches. Poorer selectivity at this mesh size may have resulted in increased discarding and high grading.

With the introduction of effort regulation, vessel operators have effectively been further encouraged to reduce mesh size and shift to other fisheries, particularly *Nephrops* trawling, in order to gain more days at sea. It is not possible to evaluate whether the mesh size changes and effort limitations may have benefited whiting without information on the level of adherence to catch composition regulations required when using smaller mesh sizes.

The continued decline in the stock indicates that these measures alone have not proven sufficient to rebuild the stock to precautionary levels. Detailed analysis of the impact of the regulations will not be possible until data of sufficient quality become available.

Changes in fishing technology and fishing patterns

Whiting in Division VIa are caught mainly by Scottish trawlers. There has been a reduction in trawl and seine effort, but with a more moderate reduction by *Nephrops* trawlers. At present a higher proportion of the overall effort is by relatively small-meshed trawls. There has been a tendency to shift from the use of heavy groundgear (like rockhopper) to lighter groundgear.

Scientific basis

Data and methods

A survey-based assessment was used to evaluate trends in SSB and recruitment.

Uncertainties in assessment and forecast

Some changes have been made to the survey design in the past, but surveys are considered to be a reasonable indicator of long-term stock trend. Jumps in survey indices are observed in occasional years. Survey information indicates an increase in unaccounted removal from this stock. Absolute biomass estimates from landings may thus be biased, but it is not known to what extent. Thus, an analytical catch-at-age assessment is not acceptable as a basis for management advice. Advice has therefore been conditioned to the survey-based assessment patterns. The decrease in survey biomass in recent years implies that the unaccounted catch is causing harm to the stock.

Comparison with previous assessment and advice

The assessment and advice are based on survey information and are consistent with last year's advice.

Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 9–18 May 2006 (ICES CM 2006/ACFM:30).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Catch corresponding to single-stock boundaries	Agreed TAC[1]	Official Landings	ACFM Landings	Discards slip	ACFM catch
1987	No increase in F		15.0		16.4	12.4	11.5	6.9	18.4
1988	No increase in F; TAC		15.0		16.4	11.9	11.4	11.8	23.1
1989	No increase in F; TAC		13.0		16.4	7.7	7.5	4.1	11.6
1990	No increase in F; TAC		11.0		11.0	6.0	5.6	4.4	10.0
1991	70% of effort (89)		-		9.0	6.9	6.7	5.3	12.0
1992	70% of effort (89)		-		7.5	6.0	6.0	9.4	15.4
1993	70% of effort (89)		-		8.7	6.8	6.9	8.5	15.4
1994	30% reduction in effort		-		6.8	5.8	5.9	8.9	14.8
1995	Significant reduction in effort		-		6.8	6.3	6.1	7.6	13.7
1996	Significant reduction in effort		-		10.0	6.6	7.2	6.9	14.1
1997	Significant reduction in effort		-		13.0	6.2	6.3	4.9	11.2
1998	No increase in F		6.5		9.0	4.7	4.6	5.8	10.5
1999	Reduce F below $\mathbf{F}_{pa}$		4.3		6.3	4.7	4.6	3.1	7.7
2000	Reduce F below $\mathbf{F}_{pa}$		<4.3		4.3	3.2	3.0	6.7	9.7
2001	Reduce F below $\mathbf{F}_{pa}$		<4.2		4.0	2.5	2.4	2.4	4.9
2002	SSB>$\mathbf{B}_{pa}$ in short term		<2.0		3.5	1.7	n/a	n/a	n/a
2003	No cod catches		-		2.0	1.3	n/a	n/a	n/a
2004	[2]	SSB>$\mathbf{B}_{pa}$ in the short term	[2]	<2.1	1.6	0.8	n/a	n/a	n/a
2005	Exploitation not allowed to increase			<1.6	1.6	0.18	n/a	n/a	n/a
2006	Lowest possible level			-	1.36				
2007	Lowest possible level			-					

Weights in '000 t.
[1]TAC is set for Divisions VIa and VIb combined.
[2]Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.
n/a = not available.

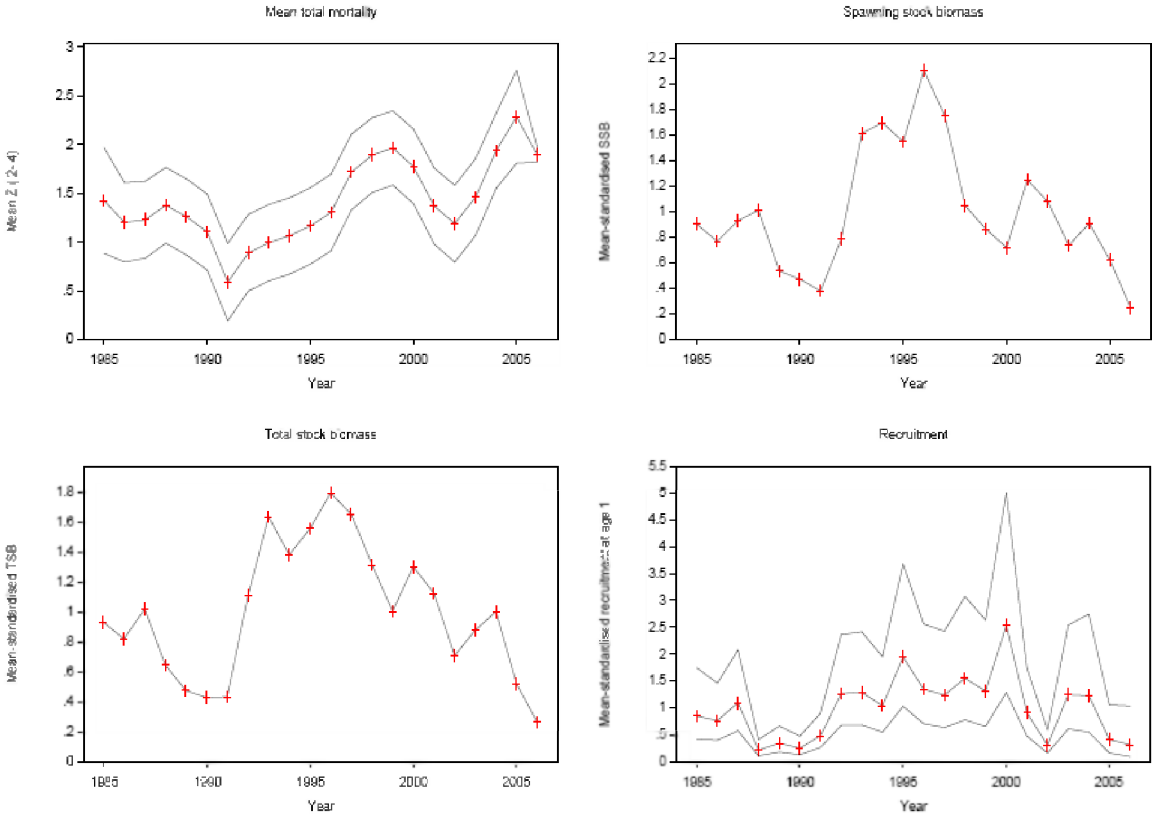


Figure 5.4.25.1

Table 5.4.25.1 Nominal catch (t) of WHITING in Division VIa, 1989–2005, as officially reported to ICES.

COUNTRY	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005[1]
Belgium	1	-	+	-	+	+	+	-	1	1	+	+	-		-		
Denmark	1	+	3	1	1	+	+	+	+	-	-	-	-		0	0	
France	199[1,2]	180	352[1,2]	105	149	191	362	202	108	82	300	48	52	21	11	6	6
Germany	+	+	+	1	1	+	-	+	-	-	+	-	-	+	+		+
Ireland	1,315	977	1,200	1,377	1,192	1,213	1,448	1,182	977	952	1,121	793	764	577	568	356	
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Spain	-	-	-	-	-	-	1	-	1	2	+	-	2	n/a	n/a		
UK (E&W)[3]	44	50	218	196	184	233	204	237	453	251	210	104	71	73	35	13	
UK (N.I.)	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…		
UK (Scot.)	6,109	4,819	5,135	4,330	5,224	4,149	4,263	5,021	4,638	3,369	3,046	2,258	1,654	1,064	751	444	
UK (total)																	169
Total landings	7,669	6,026	6,908	6,010	6,751	5,786	6,278	6,642	6,178	4,657	4,677	3,203	2,543	1,735	1,365	819	175

[1]Preliminary.
[2]Includes Divisions Vb (EC) and VIb.
[3]1989–2001 N. Ireland included with England and Wales.
n/a = Not available.

5.4.26 Whiting in Division VIb (Rockall)

State of the stock

Landings of whiting from Division VIb are negligible. No assessment has been carried out on this stock.

Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 9–18 May 2006 (ICES CM 2006/ACFM:30).

5.4.27 Saithe in Subarea VI (West of Scotland and Rockall)

This stock has now been combined with Saithe in Subarea IV (North Sea), Division IIIa (Skagerrak), and Subarea VI (West of Scotland and Rockall) and can be found in Volume 6 – 6.4.12.

5.4.28 Megrim in Subarea VI (West of Scotland and Rockall)

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
Unknown	Unknown	Unknown	Unknown	

The available information is inadequate to evaluate spawning stock or fishing mortality relative to risk, so the state of the stock is unknown. Landings show a declining trend since 1996.

Management objectives

No explicit management objectives have been set for this stock.

Reference points

No precautionary reference points have been defined for this stock.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary limits

Catches in 2007 should be no more than the recent (2002–2004) landings of about 2100 t. This includes landings in Division VIa and VIb and unallocated landings in Subarea IV.

Management considerations

Although the international megrim landings in recent years have been below the precautionary TAC, some national quotas are restrictive and this may have led to underreporting of catches.

Area misreporting has been prevalent as megrim catches were misreported from Subarea VI into Subarea IV, due to restrictive quotas for anglerfish (i.e. vessels targeting anglerfish misreported all landings including megrim from Subarea VI into Subarea IV). In order to avoid misreporting by area, the TAC should include Subarea IV.

In the past, management of the megrim stock has been linked to that for anglerfish on the assumption that landings were correlated in the fishery. It was assumed that the anglerfish management would also constrain fishing mortality on megrim. This may no longer be true. Due to recent changes in the fishing pattern; the dynamics of the species are probably not linked.

The minimum landing size (MLS) of megrim was reduced in January 2000 to 20 cm (EC Regulation No. 850/98). The catch is routinely high graded and large numbers of fish continue to be discarded above this MLS.

Factors affecting the fisheries and the stock

The effects of regulations

New effort regulations provided an incentive for some vessels previously using >100-mm mesh in otter trawls to switch to smaller-mesh gears to obtain the right to more days-at-sea. This would also require these vessels to be targeting either *Nephrops* or anglerfish, megrim, and whiting with various catch and bycatch composition limits according to EC Regulation No. 850/98. No detailed information was available to quantify how many vessels have switched to using smaller meshes as a result of effort regulation as this information is not reliably recorded in logbook information for some countries.

Changes in fishing technology and fishing patterns

There have been recent changes to the UK Scottish fleets with decommissioning schemes removing 96 of the 298 demersal trawlers (mesh sizes >= 100 mm) between 2001 and 2004. This will have affected the effort, but due to uncertainty in the effort statistics it is not known to what extent effort has been reduced. The Irish fleet in Division VIa has also been reduced substantially and now the majority of the reported landings are made by only 12 vessels. In the case of the Irish fleet a large number of older vessels have been replaced by fewer modern whitefish vessels as part of a

national whitefish renewal scheme. There has also been an Irish decommissioning scheme, whereby around 40 fishing vessels (~6000 GT, 18 000 kW) have been permanently withdrawn from the Irish fishing fleet and removed from the Register of Sea Fishing Vessels in 2005 and 2006.

No information is available on changes in the French and Spanish fleets operating in this area.

Scientific basis

Data and methods

The stock was evaluated using information on landing compositions provided by Scotland and catch compositions provided by Ireland.

The quality of the available landings data, specifically the area misreporting and lack of effort and CPUE data for the main fleet in the fishery, severely hampers the ability of ICES to carry out an assessment for this stock. For stocks like megrim and anglerfish on the northern shelf, there is a general need for improved spatio-temporal resolution of commercial catch and effort data.

At the moment no survey series adequately covers this stock. Scottish and Irish groundfish surveys catch low numbers of megrim due to unsuitable gear and survey design. In addition, the Irish GFS survey series consists of only two years.

Uncertainties in assessment and forecast

The quality of the landing statistics is unknown, and discard information and CPUEs from the main fleet are lacking. The surveys only cover a limited range of the known distribution of the stock and are not suitable for a survey-based assessment/forecast approach.

Comparison with previous assessment and advice

This year and last year there was no analytical assessment for this stock and the management advice was based on average landings. ICES has serious concerns about the accuracy of the landings data which are area misreported and underreported for this stock, but the advice is still based on maintaining recent landings.

Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 9–18 May 2006 (ICES CM 2006/ACFM:30).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC[1]	Official Landings[2]	ACFM Landings[3]
1987	Not assessed		-		4.4	3.9	-
1988	Not assessed		-		4.84	4.5	-
1989	Not assessed		-		4.84	2.7	-
1990	Not assessed		-		4.84	2.7	3.7
1991	No advice		-		4.84	3.2	3.7
1992	No advice		-		4.84	3.2	4.8
1993	No long-term gain in increased F		-		4.84	3.0	4.3
1994	No long-term gain in increased F		-		4.84	3.0	4.3
1995	No advice		-		4.84	3.3	4.6
1996	No advice		-		4.84	2.9	5.3
1997	No advice		-		4.84	2.8	4.6
1998	Adequate catch controls		-		4.84	2.7	4.2
1999	Maintain current TAC		4.84		4.84	2.5	3.8
2000	Maintain current TAC		4.84		4.84	2.4	3.6
2001	Maintain current TAC		4.84		4.36	2.4	3.3
2002	Maintain current TAC		4.36		4.36	1.6	2.3
2003	Maintain current TAC		4.36		4.36	1.7	2.3
2004	[4]	Reduce TAC to recent landings		3.60	3.60	1.5	1.8
2005	[4]	Reduce TAC to recent landings		2.3	2.88	n/a	n/a
2006	[4]	Reduce TAC to recent landings		2.3	2.88		
2007		Reduce TAC to recent landings		2.1			

Weights in '000 t.
[1] Vb(EC), VI, XII and XIV.
[2] VIa and VIb.
[3] Landings in VIa and VIb and unallocated landings from IV. Landings in Vb (EC), XII, and XIV are negligible.
[4] Single-stock boundaries and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.
n/a = not available.

Table 5.4.28.1 MEGRIM in Subarea VI: Nominal catch (t) of Megrim West of Scotland and Rockall, as officially reported to ICES and WG best estimates of landings.

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Belgium	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	-
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
France	398	455	504	517	408	618	462	192	172	0	135	252	79	92	50	36
Ireland	317	260	317	329	304	535	460	438	433	438	417	509	280	344	278	-
Netherlands	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	-
Spain	91	48	25	7	1	24	22	87	111	83	98	92	89	98	45	-
UK - Eng+Wales+N.Irl.	25	167	392	298	327	322	156	123	65	42	20	7	14	13	117	-
UK – Scotland	1093	1223	887	896	866	952	944	954	841	831	754	770	643	558	469	-
UK																442
Offical Total	1924	2154	2125	2047	1907	2451	2044	1795	1622	1394	1424	1630	1105	1105	959	
Unallocated	286	278	424	674	786	1047	2010	1477	1083	1254	823	843	723	537	n/a	n/a
As used by WG	2210	2432	2549	2721	2693	3498	4054	3272	2705	2648	2247	2473	1828	1642	1328	561
Area Mispreported landings	339	338	466	735	871	1126	2062	1556	1156	1066	868	829	731	544	421	n/a

Megrim in Division VIb (Rockall)

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
France	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0.1
Ireland	196	240	139	128	176	117	124	141	218	127	167	176	87	83	43	-
Spain	363	587	683	594	574	520	515	628	549	404	427	370	120	93	71	-
UK - Eng+Wales+N.Irl.	19	14	53	56	38	27	92	76	116	57	57	42	41	74	42	-
UK - England & Wales	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
UK – Scotland	226	204	198	147	258	152	112	164	208	278	309	236	207	382	372	-
UK																266
Offical Total	804	1045	1073	925	1046	816	843	1009	1091	866	964	824	455	632	528	
As used by WG	804	1045	1073	925	1046	816	843	1009	1091	866	964	825	456	632.04	457	n/a

Total Megrim in Sub-area VI (West of Scotland and Rockall)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Offical Total	2728	3199	3198	2972	2953	3267	2887	2804	2713	2260	2388	2454	1560	1737	1487	
As used by WG	3014	3477	3622	3646	3739	4314	4897	4281	3796	3514	3211	3298	2284	2274	1785	n/a

n/a = not available for allow calculation of the value due to limited or absent data.

5.4.29 Anglerfish in Division IIa (Norwegian Sea), Division IIIa (Kattegat and Skagerrak), Subarea IV (North Sea), and Subarea VI (West of Scotland and Rockall) (*Lophius piscatorius* and *L. budegassa*)

Two species occur in these areas, *Lophius piscatorius* and *L. budegassa*, although catches are almost exclusively of the former.

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	

There are major uncertainties about catch and effort data for anglerfish, as well as limited knowledge about population dynamics and distribution. The available information is inadequate to evaluate spawning stock or fishing mortality relative to risk. Official landings have declined substantially since the mid-1990s. The development of commercial CPUE from a logbook and observer data study in Subarea IV and Division VIa have shown that the stock is not in decline in recent years. The mean size of landed anglerfish from trawl landings from Division VIa shows no trend over the last ten years, while a decrease in mean size was evident for the gillnet landings from Division IIa in the most recent years.

Management objectives

There are no explicit management objectives for this stock; the European Community and Norway are currently discussing the joint management of this shared stock.

Reference points

ICES considers that:	ICES proposes that:
There is currently no biological basis for defining $\mathbf{B}_{lim}$ or $\mathbf{F}_{lim}$.	$\mathbf{F}_{35\%SPR}$ = 0.30 be chosen as $\mathbf{F}_{pa}$. This fishing mortality corresponds to 35% of the unfished SSB/R. It is considered to be an approximation of $\mathbf{F}_{MSY}$.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary considerations

The available information is inadequate to evaluate spawning stock or fishing mortality relative to precautionary reference points. The effort in fisheries that catch anglerfish should not be allowed to increase and the fishery must be accompanied by mandatory programmes to collect catch and effort data on both target and bycatch fish.

Management considerations

Recent TAC history

For a number of years, anglerfish in Subareas VI, XII, XIV and Division Vb (EU zone) were subjected to a precautionary TAC (8600 t) based on average landings in earlier years. In 2002 the TAC was set at 4770 t and was further reduced to 3180 t in 2003 and 2004. The TAC for 2005 has been increased to 4686 t.

No TAC was set in Subarea IV prior to 1998. Landings in excess of the TAC in other areas were likely to be misreported into the North Sea. A precautionary TAC for North Sea anglerfish was introduced in 1999 in line with recent catch levels from the North Sea which included a substantial amount misreported from Subarea VI.

In light of the significant amount of non-reported landings the official statistics for 2003–2005 are considered to be not representative of actual landings. There is also significant area misreporting from West of Scotland and Skagerrak into the North Sea.

Estimates which account for area misreporting indicate that the percentage of the catch taken in Division IIIa and Subarea IV, and in Divisions VIa & VIb in the years 1993–2002 average 60% and 40%, respectively. In previous years,

these proportions have been used to allocate TAC between these areas. However, given the concerns about the veracity of the recent reported landings data, such proportionate splitting may no longer be appropriate.

Mixed fishery considerations

Recent attempts at actually defining anglerfish fisheries have shown that the vast majority of the catch of anglerfish stems from mixed fisheries, catching sole, saithe, plaice, megrim, *Nephrops*, haddock, and cod, amongst others, with the landings of anglerfish actually being a relatively low percentage of the total. Optional effort restrictions aiming at a recovery of these other species will have a side-effect for the anglerfish too, but a shift from anglerfish-poor areas to anglerfish-rich areas might annihilate this effect. However, the statistical analysis of Scottish observer data did not show evidence for such shifts in the recent past.

Ghost fishing and discarding of fish not suitable for consumption due to long soaking times are known to be problems within some offshore gillnetting carried out by "flag-vessels" targeting anglerfish in Subareas VI and VII.

Actions required

ACFM suggested in 2005 that a TAC regulation, such as that currently implemented, is not adequate to regulate fishing mortality within sustainable limits. Furthermore, it was implicit in the inadequate landings and effort data that a reliable estimation of $\mathbf{F}_{sq}$ would also be impossible, as such a TAC would continue to result in misreporting. ICES considers that the most productive way forward would be a two-stage approach.

The first stage would be to substantially improve the quality and quantity of data collected on the fishery while maintaining exploitation at its current level. This was the basis of ICES recommendation in 2004 to allow the fishery to continue with the current effort (inasmuch as this can be determined – see above). This process was begun with the implementation of a Scottish tally book scheme. The programme also included the development of a targeted, industry collaboration trawl survey which started in 2005, and which will be repeated in 2006. This first stage of data collection is expected to take at least five years to establish useable time-series of fisheries-dependent and -independent data.

The second stage would then be launched to use these data to examine alternative management approaches and harvest control rules appropriate to this fishery in a fashion similar to that used elsewhere. Should evidence appear of a decline in the state of the stock during this period of data collection appropriate management measures may be initiated.

In the context of the two-stage approach, ICES recommended

- A detailed and stringent programme, including the mandatory reporting of both catch and effort data in logbooks should be established in all countries fishing for anglerfish to ensure high quality effort and landings data.
- Small-sized anglerfish are known to be discarded. Routine sampling schemes should be implemented in order to estimate levels of discarding.
- Female anglerfish reach 50% maturity at a length of about 90 cm. A high proportion of anglerfish catches consist of small anglerfish. Technical measures improving the selectivity of gears used in these fisheries should be implemented.

It is not yet clear to what extent these measures have been put in place.

Factors affecting the fisheries and the stock

Until the mid-1980s, anglerfish was taken mainly as a by-catch in bottom trawl groundfish fisheries. Restrictive TACs for other species in Division VIa led to increased fishing pressure on anglerfish in that area, where they are now caught in a targeted anglerfish fishery and as a by-catch in other demersal fisheries, including roundfish fisheries in Division VIa, the haddock fishery on Rockall Bank, *Nephrops* fisheries, and fisheries in deeper waters. In the North Sea, anglerfish are caught as a by-catch in demersal fisheries, *Nephrops* and *Pandalus* fisheries in the northern and eastern parts of the North Sea, the Fladen Ground, and the Norwegian Deeps. In the Norwegian Deeps anglerfish has also been targeted by some demersal trawlers. A Norwegian large-mesh gillnet fishery targeting fish above 60–65 cm has been developed along the Norwegian coast since the early 1990s.

The fishery has expanded into deeper waters, areas believed to have been a refuge for adult anglerfish, and this new fishery therefore increases the vulnerability of the stock to overexploitation. Immature fish are subjected to exploitation for a number of years prior to first maturity.

The effects of regulations

In 2005 the TAC was raised to take misreporting practices into account, but it is not known to what extent this has resolved the misreporting problems in this fishery. Legislation that came into action at the start of 2006 on registration of buyers and sellers in Scotland should make it more difficult to make unreported landings of this (and other) species. This is unlikely to have any major impact on area misreporting.

In 2005 specific anglerfish licenses were introduced in Ireland aiming to improve compliance. There has been an increased enforcement on anglerfish quotas in 2006.

Other factors

The key features of the species' life history in relation to its exploitation are the location of the main spawning areas in relation to the exploited areas, and whether or not there is any systematic migration of younger fish back into the deeper waters to spawn. At present, despite the large increase in catches, there is no apparent contraction in distribution; fish are still recruiting to relatively inshore areas such as the Moray Firth and along the Norwegian coast in the northern North Sea. The fact that spawning appears to occur largely in deep water off the edge of the continental shelf may offer the stocks some degree of refuge. It is therefore likely that the current expansion of the fisheries into deeper water will have a negative effect on the stocks.

The distribution of anglerfish in the North Sea, Kattegat, and Skagerrak is associated with the distribution to the West of Scotland (Divisions VIa and VIb). It is likely that catches from these areas come from the same biological stock. Genetic studies have found no evidence of separate stocks and particle-tracking studies have indicated interchange of larvae between areas.

Scientific basis

Data and methods

Information on catch-at-length distribution is available from Scottish market sampling covering Divisions VIa, VIb, and IVa. Irish length–frequency data are also available for the West of Scotland (Division VIa). Danish length samples of landings covering mainly Division IVa are available from 2002. The Norwegian sampling-at-sea by the coast guard began in 2003 and covers also the eastern part of Division IVa. Catch and corresponding effort data based on official Danish logbook records covering the fisheries where anglerfish are caught were presented to ICES from 2005. It is hoped that together with UK data they could provide useful information on stock development. Logbook information from the Norwegian or French fisheries is not yet available.

Information from the fishing industry

Personal logbook information from Scottish vessels was made available to scientists during 2004 and 2005 but could not be incorporated in the assessment because data mostly covered only a short time period. These logbooks also showed contradictions in the trends, particularly in recent years. A new tallybook scheme has been implemented as part of a long-term process to provide detailed information on the temporal and spatial distribution of catch rates in the Scottish fishery. An analysis of observer data presented this year indicated increasing LPUE.

Uncertainties in assessments and forecasts

Although historical catches for the combined area are believed to have been adequately estimated there is uncertainty in the recent level of landings due to misreporting; these data can therefore not be used as the basis for stock assessment. There are inconsistencies in the survey data and traditional groundfish surveys do not appear to be useful indicators of anglerfish stock abundance. The weakness in the recruitment index and the problems in landings data would suggest that previous assessments may also be unreliable.

A targeted survey has begun in 2005 and will be continued. So far it has not been possible to fully include the results into the assessment.

There is considerable uncertainty in the biology and stock structure of anglerfish.

Comparison with previous assessment and advice

Analytical assessments have not been made since 2003. This year's advice is similar to last years.

Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 9–18 May 2006 (ICES CM 2006/ACFM:30).

Subarea IV – North Sea

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. To advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	Official landings	ACFM Landings
1990	Not assessed	-	-	-	-	10.6	9.5
1991	Not assessed	-	-	-	-	11.8	10.6
1992	Not assessed	-	-	-	-	13.3	11.7
1993	Not assessed	-	-	-	-	15.5	13.1
1994	Not assessed	-	-	-	-	18.2	15.4
1995	Not assessed	-	-	-	-	20.9	15.8
1996	Not assessed	-	-	-	-	27.3	16.2
1997	Not assessed	-	-	-	-	25.8	18.2
1998	Not assessed	-	-	-	22.1	19.0	14.0
1999	Not assessed	-	-	-	22.1	14.9	11.7
2000	40% reduction in catches	-	<9.7	-	17.66	14.0	11.6
2001	2/3 of the catches in 1973–1990	-	5.7	-	14.13	14.7	12.7
2002	2/3 of the catches in 1973–1990	-	5.7	-	10.50	12.3	10.3
2003	Reduce F below F_{pa}	-	<6.7[2]	-	7.0	9.3	8.3
2004	[1]	Reduce F below F_{pa}		<8.8	7.0	9.7	9.0
2005	**1**	No effort increase		-	10.31	9.4	
2006	[1]	No effort increase		-	10.31		
2007	[1]	No effort increase					

Weights in '000 t.
[1]Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.
[2]Advice for Division IIIa, Subarea IV, and Subarea VIa combined.

Subarea VI – West of Scotland and Rockall

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. To advice	Predicted catch correspondi ng to single-stock boundaries	Agreed TAC[1]	Official landings	ACFM landings[2]
1987	Not assessed		-		7.8	5.2	5.6
1988	Not assessed		-		8.6	7.7	7.7
1989	Not assessed		-		8.6	6.0	7.3
1990	Not assessed		-		8.6	6.4	6.6
1991	No advice		-		8.6	6.0	6.3
1992	No advice		-		8.6	6.6	9.2
1993	No long-term gain in increased F		-		8.6	6.2	10.1
1994	No long-term gain in increased F		-		8.6	6.0	8.8
1995	A precautionary TAC not exceeding recent catch levels		-		8.6	7.2	12.3
1996	A precautionary TAC not exceeding recent catch levels		-		8.6	7.0	18.2
1997	Reduction in fishing effort		-		8.6	6.2	13.7
1998	Reduction in fishing effort		-		8.6	5.4	10.6
1999	Reduce fishing effort, effective implementation of the TAC		-		8.6	5.3	8.4
2000	40% reduction in catches		<7.4		8.0	4.4	7.5
2001	2/3 of the catches in 1973-1990		4.3		6.4	4.0	5.9
2002	2/3 of the catches in 1973-1990		4.3		4.8	3.0	4.8
2003	Reduce F below $\mathbf{F}_{pa}$		<6.7[3]		3.18	3.0	4.1
2004	[4]	Reduce F below $\mathbf{F}_{pa}$		[4]	3.18	1.2	3.3
2005		No effort increase		-	4.69	3.8*	
2006		No effort increase		-	4.69		
2007		No effort increase					

Weights in '000 t.
[1]Vb(EC), VI, XII, and XIV.
[2]Division VIa only.
[3]Advice for Division IIIa, Subarea IV, and Subarea VIa combined.
[4]Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.
*Preliminary (Not all countries included).

Division IIIa, Subarea IV, and Subarea VI combined

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. To advice	Predicted catch correspondi ng to single-stock boundaries	Agreed TAC[1]	Official landings	ACFM landings[2]
2003	Reduce F below F_{pa}		<6.7		10.2	12.3	n/a
2004	[2]	Reduce F below F_{pa}	[2]	<8.8	10.2	10.9	n/a
2005		No effort increase	[2]	-	15.0	13.5	
2006		No effort increase	[2]	-			
2007		No effort increase					

Weights in '000 t.
[1]IV, IIa (EC), Vb(EC), VI, XII, and XIV
[2] Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.
n/a = not available.

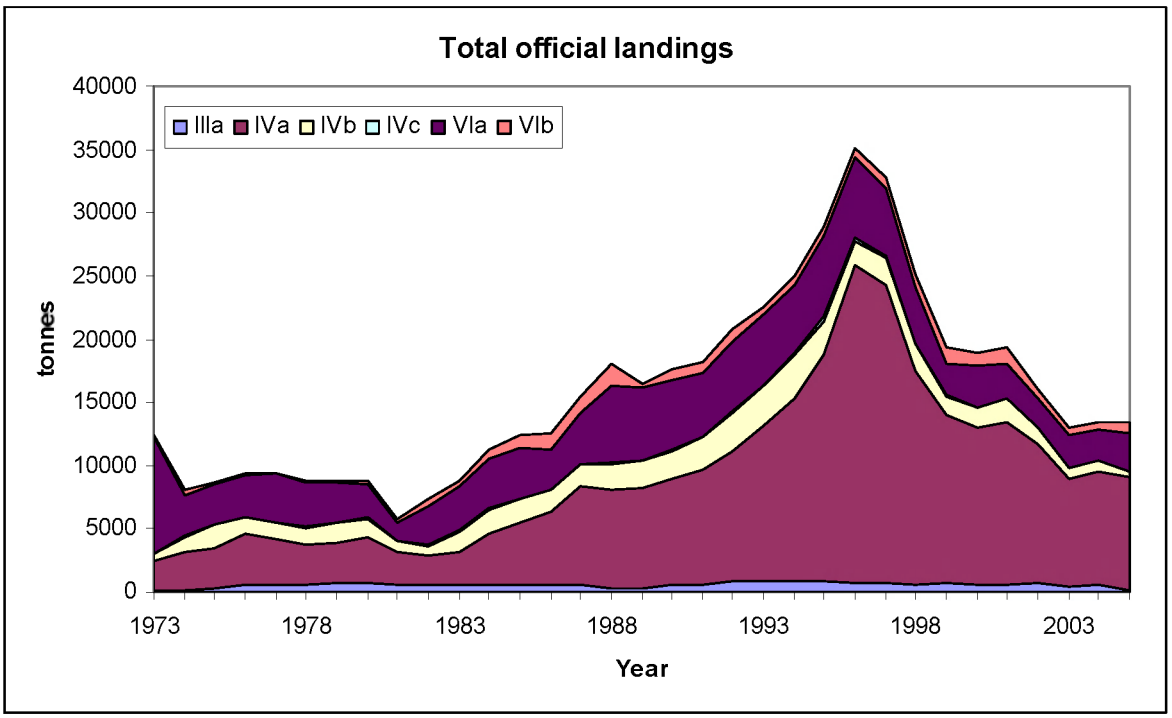


Figure 5.4.29.1 Trend in international landings of anglerfish per fishing area (as officially reported to landings).

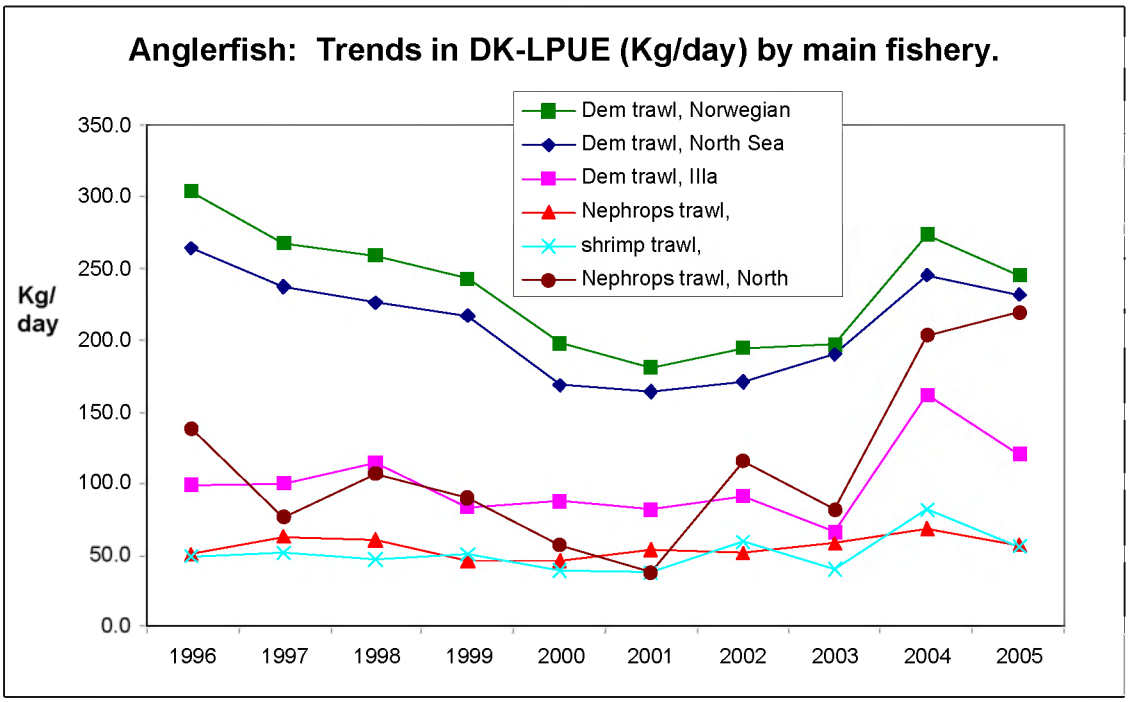


Figure 5.4.29.2 Anglerfish in the North Sea & Division IIIa. Logbook estimates of Danish LPUE by fishery.

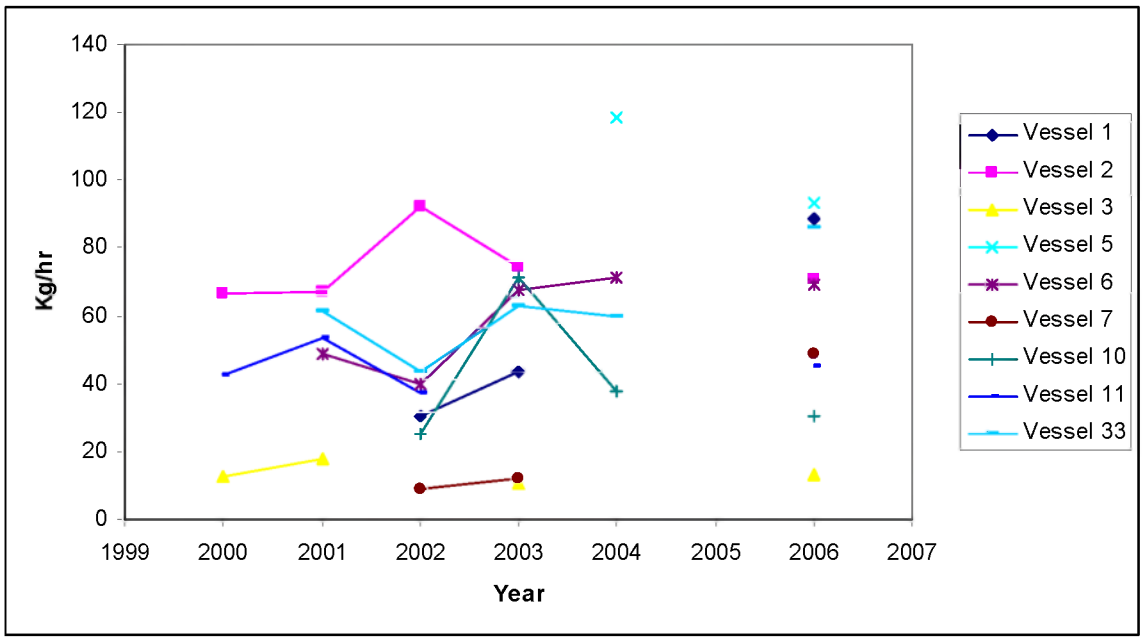


Figure 5.4.29.3 Anglerfish on the Northern Shelf. Mean first quarter catch rates (Kg/hr) from vessels provided both diary data and participating in the tallybook scheme. Information for 2006 is incomplete and data for 2005 have not been supplied.

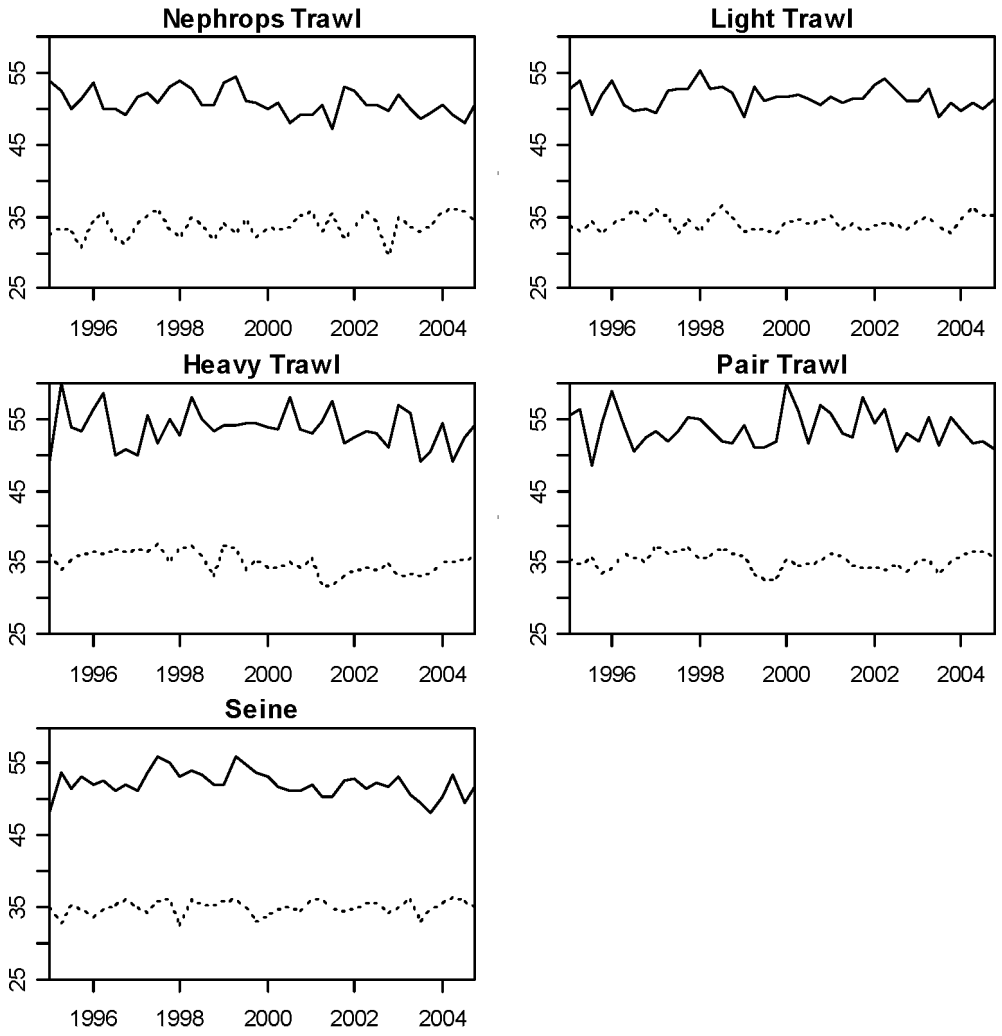


Figure 5.4.29.4 Trends in mean length of small (<40 cm) and large (>=40 cm) anglerfish from the Scottish market sampling data by gear category.

Table 5.4.29.1 Anglerfish in Subarea VI. Nominal landings (t) as officially reported to ICES.

Anglerfish in Division VIa (West of Scotland)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005*)
Belgium	3	2	9	6	5	+	5	2	-	-	-	-	-	-	
Denmark	1	3	4	5	10	4	1	2	1	-	-	.	-	-	
Faroe Is.														2	2
France	1,910	2,308	2,467	2,382	2,648	2,899	2,058	1,634	.	1,132	943	739	1,212	1,191	1,193
Germany	1	2	60	67	77	35	72	137	50	39	11	3	27	39	
Ireland	250	403	428	303	720	717	625	749	617	515	475	304	322	219	
Netherlands	-	-	-	-	-	-	27	1	-	-	-	.	.	.	
Norway	6	14	8	6	4	4	1	3	1	3	2	1	-	-	1
Spain	7	11	8	1	37	33	63	86	53	82	70	101	196	110	
UK(E,W&NI)	270	351	223	370	320	201	156	119	60	44	40	32	31	30	
UK(Scot.)	2,613	2,385	2,346	2,133	2533	2,515	2,322	1,773	1,688	1,496	1,119	1,100	705	862	
UK (total)															1754
Total	5,061	5,479	5,553	5,273	6,354	6,408	5,330	4,506	2,470	3,311	2,660	2,280	2,493	2,453	2,950
Unallocated	296	2,638	3,816	2,766	5,112	11,148	7,506	5,234	3,799	3,114	2,068	1,882	985	1,938	
As used by WG	5,357	8,117	9,369	8,039	11,466	17,556	12,836	9,740	6,269	6,425	4,728	4,162	3,478	4,391	

*) Preliminary
[1]Includes VIb.

Anglerfish in Division VIb (Rockall)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005*)
Estonia														+	
Faroe Is.	-	2	-	-	-	15	4	2	2		1				
France	-	-	29	-	-	-	1	1	…[1]	48	192	43	191	175	221
Germany	-	-	103	73	83	78	177	132	144	119	67	35	64	66	
Ireland	272	417	96	135	133	90	139	130	75	81	134	51	26	13	
Norway	18	10	17	24	14	11	4	6	5	11	5	3	6	5	4
Portugal	-	-	-	-	-	-	-	+	429	20	18	8	4	19	
Russia	-	-	-	-	-	-	-	-	-	-	1	-	-		2
Spain	333	263	178	214	296	196	171	252	291	149	327	128	59	43	
UK(E,W&NI)	99	173	76	50	105	144	247	188	111	272	197	133	133	54	
UK(Scot)	201	224	182	281	199	68	156	189	344	374	367	317	160	294	
UK (total)															671
Total	923	1,089	681	777	830	602	899	900	1401	1074	1309	718	643	669	898
Unallocated									-9	17	-178	-47	145	121	
As used by WG	923	1,089	681	777	830	602	899	900	1392	1091	1131	671	788	790	

*)Preliminary. [1]Included in VIa.

Total Anglerfish in Sub-area VI (West of Scotland and Rockall)

YEAR	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005*
Total official	5,984	6,568	6,234	6,050	7,184	7,010	6,229	5,406	3,871	4,385	3,969	2,998	3,136	3,122	3,848
Total ICES	6,280	9,206	10,050	8,816	12,296	18,158	13,735	10,640	9,475	7,516	5,875	4,832	4,126	3,296	

*Preliminary.

Table 5.4.29.2 Nominal catch (t) of ANGLERFISH in the North Sea, 1991–2005, as officially reported to ICES.

Northern North Sea (IVa)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005 **)
Belgium	2	9	3	3	2	8	4	1	5	12	-	8	1	.	
Denmark	1,245	1265	946	1,157	732	1,239	1,155	1,024	1,128	1,087	1,289	1,308	1,523	1,538	*)
Faroes	1	-	10	18	20	-	15	10	6	.	2	-	3	11	7
France	124	151	69	28	18	7	7	3	.	8	9	8	8	8	4
Germany	71	68	100	84	613	292	601	873	454	182	95	95	65	20	
Netherlands	23	44	78	38	13	25	12	-	15	12	3	8	9	38	
Norway	587	635	1,224	1,318	657	821	672	954	1,219	1,182	1,212	928	771	999	880
Sweden	14	7	7	7	2	1	2	8	8	78	44	56	8	6	4
UK(E,W&NI)	129	143	160	169	176	439	2,174	668	781	218	183	98	104	83	…
UK (Scot)	7,039	7,887	9,712	11,683	15,658	22,344	18,783	13,319	9,710	9,559	10,024	8,539	6,033	6,284	…
UK (total)															8,108
Total	9,235	10,209	12,309	14,505	17,891	25,176	23,421	16,859	13,321	12,326	12,861	11,040	8,524	8,987	9,003

*) Official Danish landings for 2005 were not available but provided by Danish scientists.
**) Preliminary
[1]Includes IVb,c.

Central North Sea (IVb)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005**)
Belgium	357	538	558	713	579	287	336	371	270	449	579	435	180	260	207
Denmark	345	421	346	350	295	225	334	432	368	260	251	255	191	274	*)
Faroes	-	-	2	-	-	-	-	-	-	-		9			
France	-	1	-	2	-	-	-	-*	…[2*]	-	-	-	-		+
Germany	4	2	13	15	10	9	18	19	9	14	9	17	11	11	
Ireland													1		
Netherlands	285	356	467	510	335	159	237	223	141	141	123	62	42	25	
Norway	17	4	3	11	15	29	6	13	17	9	15	10	13	22	16
Sweden	-	-	-	3	2	1	3	3	4	3	2	9	2	1	3
UK(E,W&NI)	669	998	1,285	1,277	919	662	664	603	364	423	475	236	167	120	…
UK (Scotland)	845	733	469	564	472	475	574	424	344	318	378	210	241	138	…
UK (total)															205
Total	2,522	3,053	3,144	3,447	2,627	1,847	2,172	2,088	1,517	1,617	1,832	1,243	848	851	431

*) Official Danish landings for 2005 were not available but provided by Danish scientists.
**) Preliminary
[1]Includes 2 tonnes reported as Sub-area IV.
[2]Included in IVa.

Southern North Sea (IVc)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005**)
Belgium	13	12	34	37	26	28	17	17	11	15	15	16	9	5	4
Denmark	2	-	-	-	-	-	-	+	+	+	+	+	+	+	*)
France	-	-	-	-	-	-	-	10	-	+	-	+	-		+
Germany	-	-	-	-	-	-	-	-	-	+	-	+	+		
Netherlands	5	10	14	20	15	17	11	15	10	15	6	5	1	-	
Norway	-	-	-	-	+	-	-	-	+	-	+	-	-*	-	
UK(E&W&NI)	6	17	18	136	361	256	131	36	3	1	+	+	10	3	…
UK (Scotland)	-	-	-	17	-	3	1	+	+	+	+	+	-	7	…
															+
Total	26	39	66	210	402	304	160	78	24	31	21	21	20	15	4

*) Official Danish landings for 2005 were not available but provided by Danish scientists.
**) Preliminary
[1]Included in IVa.

Total North Sea

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005*)
Total	11,783	13,301	15,519	18,162	20,920	27,327	25,753	19,025	14,862	13,974	14,714	12,304	9,392	9,853	9,438
WG estimate	10,566	11,728	13,078	15,432	15,794	16,240	18,217	14,027	11,719	11,564	12,677	10,334	8,273	9,027	
Unallocated	-1,217	-1,573	-2,441	-2,730	-5,126	-11,087	-7,536	-4,998	-3,143	-2,410	-2,037	-1,970	-1,119	-826	

*) Preliminary

Table 5.4.29.3 Nominal catch (t) of Anglerfish in Division IIIa, 1991–2005, as officially reported to ICES.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005**)
Belgium	15	48	34	21	35	-	-	-	-	-	-	.	.	.	
Denmark	493	658	565	459	312	367	550	415	362	377	375	369	215	311	*)
Germany	-	-	1	-	-	1	1	1	2	1	-	1	-	1	
Netherlands							-	-	-	-	-	.	3	.	
Norway	64	170	154	263	440	309	186	177	260	197	200	242	187	130	100
Sweden	23	62	89	68	36	25	39	33	36	27	46	55	71	73	63
Total	595	938	843	811	823	702	776	626	660	602	621	667	476	515	163

*) Official Danish landing statistics for 2005 were not available but provided by Danish scientists.
**) Preliminary

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Table 5.4.29.4 Nominal catch (t) of Anglerfish in Division IIa, 1992–2005, as officially reported to ICES.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005**)
Denmark	+	+	+	+	+	+	+	+	+	2	+	-	1	*)
Faroes	+	+	+	+	+	+	+	+	-	1	1	2	5	3
France	-	-	-	-	-	-	-	+	-	-	-	-	-	+
Germany	1	2	3	1	4	20	53	4	17	65	59	55	70	N/a
Norway	488	3,044	1,026	526	893	576	1,488	1,731	2,952	3,552	2,000	2,404	2,905**	2,649
Russia	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Sweden	-	-	-	-	+	+	+	+	+	+	-	-	-	N/a
UK (total)	1	1	2	74	15	5	7	6	30	2	10	15	18	19
Total	490	3,047	1,031	601	912	601	1,548	1,741	2,999	3,622	2,070	2,476	2,999	2,672

*) Official Danish landings for 2005 were not available but provided by Danish scientists.
**) Preliminary

5.4.30a Herring in Division VIa (North)

State of the stock

The state of the stock is uncertain. Exploratory assessments this year confirm earlier perceptions of a lightly exploited stock (F<=0.2), but the level of the current biomass is uncertain. There appears to be no recent strong year classes since 2001.

Management objectives

There are no explicit management objectives for this stock.

Reference points –defined in 2004

	ICES considers that:	ICES proposed that:
Precautionary Approach reference points	$\mathbf{B}_{lim}$ is at 50 000 t.	$\mathbf{B}_{pa}$ is at 75 000 t.
	$\mathbf{F}_{lim}$ not defined.	$\mathbf{F}_{pa}$ not defined.

Yield and spawning biomass per Recruit
F-reference points

Reference point	F multiplier	Absolute F
$\overline{F}_{(3-6)(2002-2004)}$	1.00	0.19
$\mathbf{F}_{0.1}$	0.85	0.16
$\mathbf{F}_{35\%SPR}$	0.90	0.17
$\mathbf{F}_{low}$	0.33	0.06
$\mathbf{F}_{med}$	1.48	0.27

In the absence of defined PA reference points for fishing mortality, candidates for target reference points are between $\mathbf{F}_{0.1}$ and $\mathbf{F}_{med}$. The Yield-per-Recruit curve rises slowly above $\mathbf{F}_{0.1}$ and there is a 12% gain in long-term yield by fishing at the higher fishing mortality of $\mathbf{F}_{med}$.

Technical basis

$\mathbf{B}_{lim}$: lowest reliable estimate of SSB.	$\mathbf{B}_{pa}$: Approximately 1.5 $\mathbf{B}_{lim}$.
$\mathbf{F}_{lim}$ is not defined.	$\mathbf{F}_{pa}$ is not defined.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary limits

The recent level of fishing mortality is low and decreasing. The SSB, although uncertain is around $\mathbf{B}_{pa}$. Given that the perception of the stock is the same as last year, the 2006 TAC should be applicable in 2007 also.

Management considerations

A catch forecast was not made in 2006 for technical reasons (described below). Thus, the current advice is based on the perception that the stock status is stable and lightly exploited. This perception should be confirmed by the next acoustic survey which will be available by September 2006. There appear to have been no strong year classes since 2001.

Ecosystem considerations

Herring in this area is an important food source for seabirds, sea mammals, and many piscivorous fish.

Factors affecting the fisheries and the stock

Changes in fishing technology and fishing patterns

Historically, catches have been taken from this area by three fisheries:

i) A Scottish domestic pair trawl fleet and the Northern Irish fleet operating in shallower, coastal areas, principally fishing in the Minches and around the Island of Barra in the south; younger herring are found in these areas. This fleet has reduced in recent years.
ii) The Scottish single-boat trawl and purse seine fleets, with refrigerated seawater tanks, targeting herring mostly in the northern North Sea, but also operating in the northern part of Division VIa (N). This fleet now operates mostly with trawls, but many vessels can deploy either gear.
iii) An international freezer-trawler fishery has historically operated in deeper water near the shelf edge where older fish are distributed. These vessels are mostly registered in the Netherlands, Germany, France, and England, but most are Dutch owned.

In recent years the catch of these last two fleets has become more similar and has been dominated by younger adults, due to increased recruitment into the stock from the stronger 2000 and 2001 year classes.

In 2005, the Scottish trawl fleet fished in areas similar to the freezer trawler fishery, and not in the coastal areas in the southern part of Division VIa (N). The Northern Irish fleet fished in both the north and the south of Division VIa (N).

As a result of perceived problems of area-misreporting of catch from IVa into VIa (N), Scotland introduced a fishery regulation in 1997 with the aim to improve reporting accuracy. Under this regulation, Scottish vessels fishing for herring were required to hold a license either to fish in the North Sea or in the west of Scotland area (VIa (N)). Only one licensed option could be held at any one time. However in 2004, the requirement to carry only a single license was rescinded. Area-misreporting of catch taken in area IVa into area VIa (N) then increased in 2004 and continued in 2005. It is possible, therefore, that the relaxation of this single area license has contributed to resurgence in area-misreporting. Reinstating the single-area license requirement should be considered as it appears to be helpful in the management of this area. It is also important that all nations with reported official catch in VIa (North) investigate the accuracy of the catch area reported.

Other factors

The stock identity is uncertain and is being reviewed by an ongoing EU-funded project.

Scientific basis

Uncertainties in assessment and forecast

A potential year effect is apparent in the 2005 acoustic survey; causing a problem with the scaling of the SSB in the most recent years. The assessment is sensitive to the inclusion of the most recent acoustic estimate (Figure 5.4.30.1). Estimates of fishing mortality are still consistent and low.

Catch estimates from observer programmes indicate that misreporting of the catches has decreased until 2003 and risen again in 2004 and 2005. The figure for misreporting used for 2005 is 14 000 tonnes. Better information on the catches had been obtained and biological sampling of catches had improved over the last 4–5 years, but it declined both in 2004 and 2005.

Comparison with previous assessment and advice

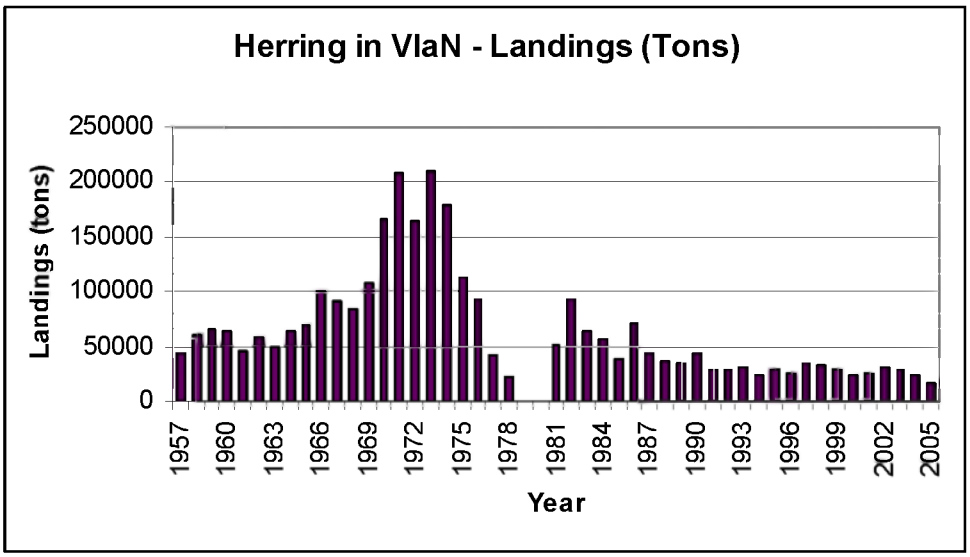
Even though the SSB estimate in the current assessment is uncertain, the perception of trends in fishing mortality is unchanged from last year. The 2007 SSB estimate needs to be confirmed through the July survey as noted above.

Source of information

Report of the Herring Assessment Working Group for the Area South of 62°N 14–23 March 2006 (ICES CM 2006/ACFM:20).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Disc. slip.	ACFM Catch[1]
1987	Reduce F to $F_{0.1}$/*status quo* F	38–55	49.7		44
1988	TAC	46	49.8		36
1989	TAC	58	58	1.6	34
1990	TAC	61	75	1.3	45
1991	TAC	57	62	1.2	29
1992	TAC	62	62	0.2	29
1993	Catch at *status quo* F	54–58	62	0.8	32
1994	Catch at *status quo* F	50–60	62	0.7	24
1995	No specific advice	60[2]	77		30
1996	No advice because of misreporting	-	83.57		26
1997	Catch at *status quo* F		83.57	0.1	33[3]
1998	Catch at *status quo* F	59	80.37	0.9	33
1999	Average catches, 1991–1996	28	68		30
2000	Average catches, 1991–1996	28	42		23
2001	Average catches, 1991–1999	30	36.36		25
2002	Average catches, 1991–1999	30	36.36		32
2003	Catch at *status quo* F	30	30		29
2004	F=0.30	41	30	0.1	23
2005	Catch at *status quo* F	30	30.1		17
2006	Catch at *status quo* F	34	34		
2007	*Status quo* TAC advice	34			

Weights in '000 t.
[1]Adjusted for misreporting. [2]Catch at *status quo* F. [3]Revised down from 60 in 1999.



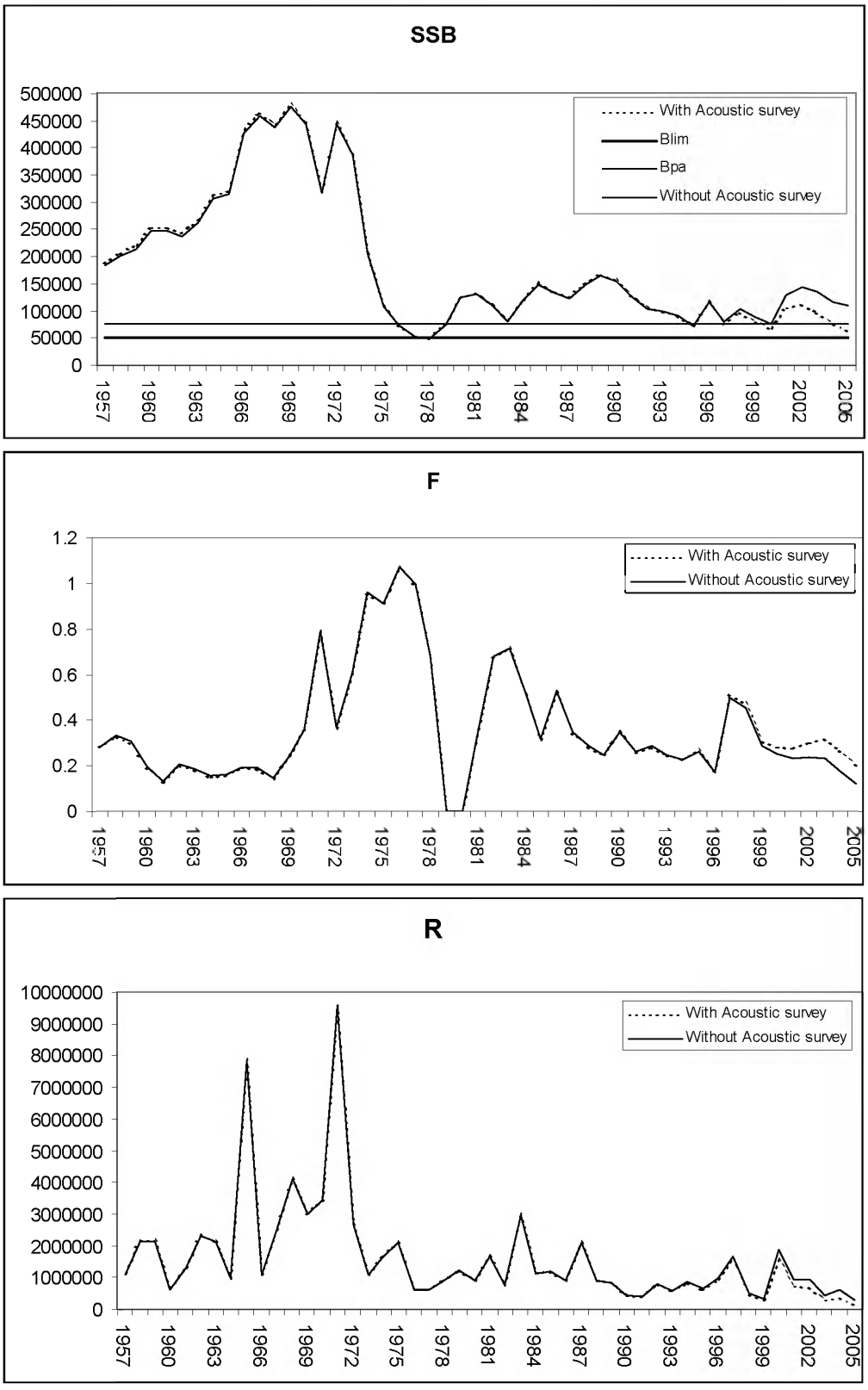


Figure 5.4.30.1 Plots of Landings, SSB, F, and Recruitment for Division VIaN herring, showing the effect of the 2005 survey on the perception of the trends and state of the stock in 2005.

5.4.30.b Herring in Division VIa (North) - *update*

Background

In the June 2006 advice for this stock, ICES noted that "a potential year effect is apparent in the 2005 acoustic survey; causing a problem with the scaling of the SSB in the most recent years. The assessment is sensitive to the inclusion of the most recent acoustic estimate (Figure 5.4.30.1). Estimates of fishing mortality are still consistent and low." and that "The 2007 SSB estimate needs to be confirmed through the July [acoustic] survey as noted above".

This section provides an update of the advice for Herring in Division VIa (North) based on the new survey information that has become available in September 2006.

State of the stock

The state of the stock is unchanged compared to the June 2006 advice and remains uncertain. The new exploratory assessment confirms earlier perceptions of a lightly exploited stock with a relatively stable biomass. The absolute level of the current biomass is uncertain. The new survey information of 2006 confirms the impression of a relatively stable stock. (figure 5.4.30.b.1).

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary limits

The recent level of fishing mortality appears to be low. The SSB is uncertain appears to be relatively stable. Given that the perception of abundance is similar to recent years, there is no basis to change the advice of June 2006.

Scientific basis

Data and methods

The exploratory assessment is based on catch-at-age data (1976-2005) and acoustic survey data (1987-2006). The assessment is indicative of trends only.

Uncertainties in assessment and forecast

A potential year effect was apparent in the 2005 acoustic survey which caused a problem with the scaling of the SSB in the most recent years. The surveys is noisy which is evident from the lack of correspondence between the exploratory assessment and the individual survey points (figure 5.4.30.b.1)

Comparison with previous assessment and advice

In 2005 ICES based the advice on an assessment that estimated the stock to be stable just above Bpa. The SSB estimate in this exploratory assessment is similar to the trend that was estimated in June 2006 which indicates a small decrease in stock size in 2002-2005. However, the survey in 2006 indicates that the stock is likely to be at the same level as in the previous years. This is interpreted that the stock is still in a stable condition. The advice is reiterated from June 2006.

Source of information

Report of the Herring Assessment Working Group for the Area South of 62°N 14–23 March 2006 (ICES CM 2006/ACFM:20).

Simmonds, E.J. (2006) West of Scotland herring. Working document.

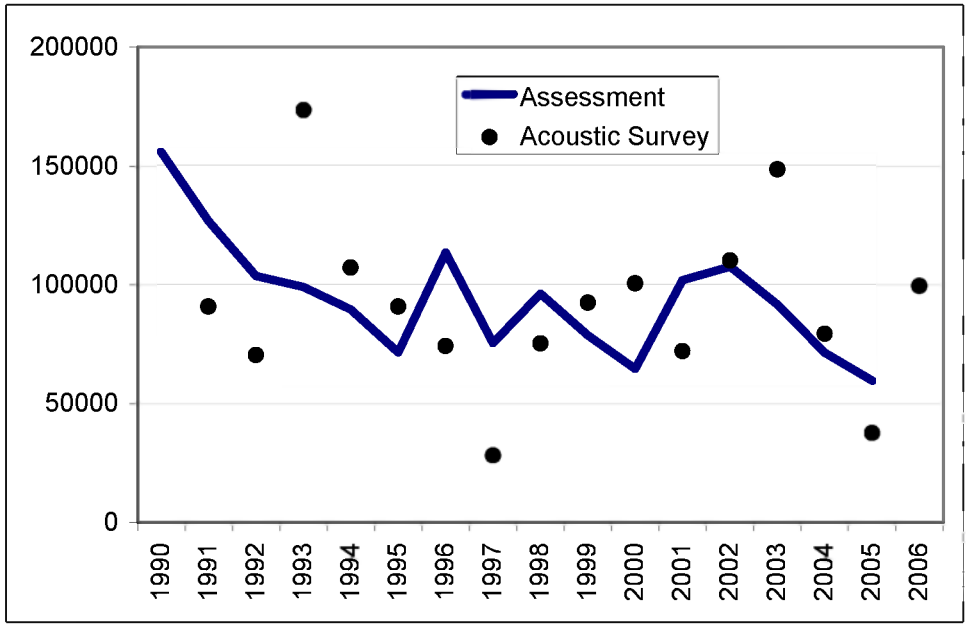


Figure 5.4.30.b.1 Herring in VIa North. Comparison between acoustic survey and assessment.

5.4.31 Norway pout in Division VIa (West of Scotland)

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	

The available information is inadequate to evaluate spawning stock or fishing mortality relative to risk, so the state of the stock is unknown. The size of the stock is unknown.

Management considerations

The fishery is a small-mesh trawl fishery operated by Danish vessels.

Scientific basis

Uncertainties in assessment and forecast

Catches are highly variable. The only data available are official landings statistics. There is no information available on which to base scientific advice.

Ecosystem considerations

Bycatches in this fishery should be quantified and made available to ICES.

Source of information

Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, 5–14 September 2006 (ICES CM 2006/ACFM:35).

Year	ICES advice	Official Landings
1987	No advice	38.3
1988	No advice	6.7
1989	No advice	28.2
1990	No advice	3.3
1991	No advice	4.3
1992	No advice	5.2
1993	No advice	7.3
1994	No advice	14.1
1995	No advice	24.4
1996	No advice	6.3
1997	No advice	9.6
1998	No advice	7.2
1999	No advice	4.6
2000	No advice	2.0
2001	No advice	3.2
2002	No advice	4.8
2003	No advice	6.4
2004	No advice	2.3
2005	No advice	0.0
2006	No advice	
2007	No advice	

Weights in '000 t.

5.4.32 Sandeel in Division VIa (West of Scotland)

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	

The available information is inadequate to evaluate spawning stock or fishing mortality relative to risk, so the state of the stock is unknown. There is no current information on which to evaluate the state of the stock.

Management objectives

There are no explicit management objectives for this stock.

Single-stock exploitation boundaries

The stock was last assessed in 1996 and a new assessment has not been made. At that time it was considered to be within safe biological limits.

Reference points

No reference points have been defined for this stock.

Management considerations

The current management regime uses a multi-annual TAC of 12 000 t per year with the fishery closed from 31 July. Access is limited to vessels with a track record. These arrangements took effect in 1998 for a period of three years and were renewed in 2001 for another three years.

Ecosystem considerations

Fishing grounds are close inshore and often adjacent to large colonies of seabirds for which the sandeel population is an important food supply, especially during the breeding season.

Source of information

Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, 5–14 September 2006 (ICES CM 2006/ACFM:35).

Year	ICES Advice	Agreed TAC	Official landings	ACFM catch
1987	No advice		14.5	14.5
1988	No advice		24.5	24.5
1989	No advice		18.8	18.8
1990	No advice		16.5	16.5
1991	No advice		8.5	8.5
1992	No advice		4.9	4.9
1993	No advice		6.2	6.2
1994	No advice		10.6	10.6
1995	No advice		7.1	7.1
1996	No advice		13.3	13.3
1997	No advice		12.7	12.7
1998	No advice	12	5.3	5.3
1999	No advice	12	2.6	2.6
2000	No advice	12	5.8	5.8
2001	No advice	12	0.3	0.3
2002	No advice	12	0.7	0.7
2003	No advice	-	NO AVAILABLE DATA	NO AVAILABLE DATA
2004	No advice	-	0.6	0.6
2005	No advice	-	0	0
2006	No advice	-		
2007	No advice	-		

Weights in '000 t.

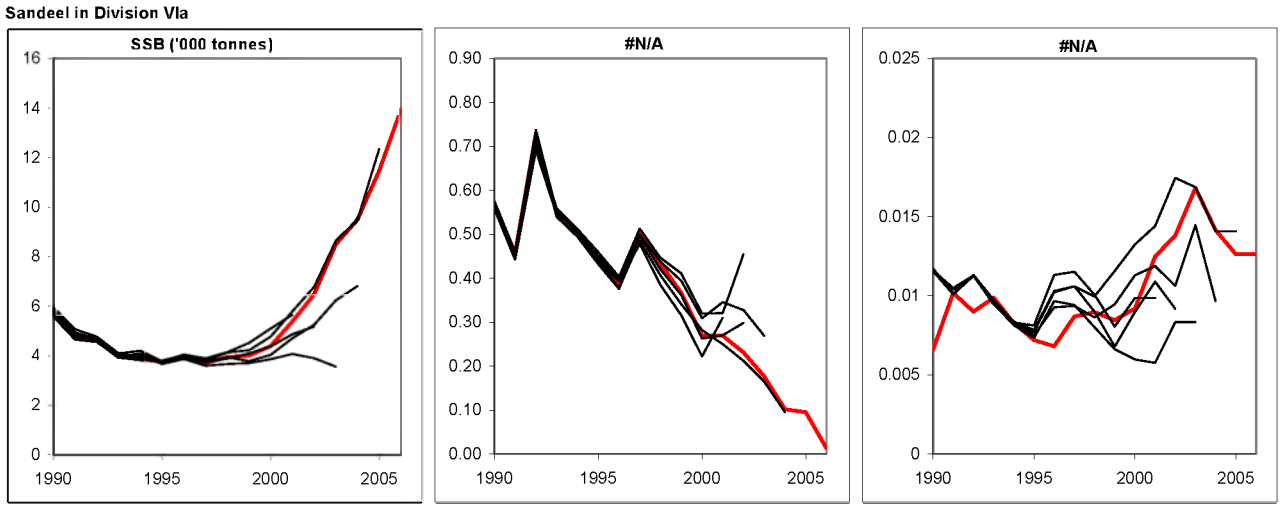


Figure 5.4.32.1 Sandeel in Division VIa. Historical performance of the assessment (SSB, fishing mortality, and recruitment).

5.4.33 *Nephrops* in Division VIa (*Nephrops* Area C)

There are three Functional Units in Division VIa: a) North Minch (FU 11), b) South Minch (FU 12), and c) Clyde (FU 13).

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	

The uncertain quality of fishery information, particularly landings, is inadequate to use analytical methods relying on accurate catch statistics to evaluate spawning stock or exploitation rate relative to risk. Results from TV surveys, and trends in mean size, however, suggest that the stocks comprising this Division VIa appear to be exploited at a sustainable level.

a. North Minch: The TV survey estimate of abundance for *Nephrops* in the North Minch suggests that the population remained relatively stable between 1994 and 2001, but increased sharply between 2001 and 2003. The higher level of abundance observed in 2003 is maintained in the latest (2005) survey. The increase in abundance observed between 2001 and 2003 coincides with the increases in CPUE observed in the catch data, particularly for the smaller size category, interpreted as increase in recruitment. The mean size of larger *Nephrops* (>35 mm carapace length) in the landings has been stable throughout the time-series.

b. South Minch: The TV survey estimate of abundance for *Nephrops* in the South Minch suggests that the population fluctuated without trend between 1995 and 2000, but remained more stable and at a slightly higher level from 2001 to 2003. A further increase in abundance in 2004 has been maintained in the latest (2005) survey. The increase to the more stable level of abundance observed after 2001 coincides with the increase in CPUE and reduction in mean size observed in the catch data, particularly for the smaller size category, interpreted as an increase in the recruitment. The mean size in larger *Nephrops* (>35 mm carapace length) in the landings has been stable throughout the time-series.

c. Clyde: Two TV surveys are conducted in the area. The TV survey estimate of abundance for *Nephrops* in the Firth of Clyde suggests that the population has increased steadily since 1999, with the latest estimate (2005) being the highest in the series. Reductions in the mean size in catches of small animals (<35 mm carapace length) coincide with increases in CPUE. The increase to the more stable level of abundance observed after 2001 likewise coincides with the increase in CPUE, suggesting strong recruitments in 1995, 1998, and 2003. A series of good recruitments would be consistent with the increase in abundance observed from the TV surveys. The higher levels of discarding observed in recent years are associated with the increase in CPUE of smaller individuals. The mean size in larger *Nephrops* (>35 mm carapace length) in the landings has declined very slightly throughout the time-series. The less detailed TV survey in the Sound of Jura is of shorter duration and suggests that the population has been fairly stable over the last 5 years.

d. *Nephrops* are also caught outside these areas. TV surveys in deep water suggest widespread distribution at low density, and surveys at Stanton Bank and in sea lochs (where important creel fisheries occur), suggest widespread distribution there also.

Management objectives

No specific management objectives have been set for this fishery.

Reference points

Precautionary reference points relating to stock biomass and fishing mortality rate have not been determined for *Nephrops*.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary limits

The effort in this fishery should not be allowed to increase relative to the past three years. In addition to the ceiling on effort ICES advises that the exploitation ratio in this stock should be no more than 15%, until such time that more

reliable catch information becomes available. This corresponds to landings of less than 3200 t for North Minch, 7200 t for the South Minch, and 3800 t for the Firth of Clyde stock. Landings from other areas in Division VIa should be below the average of 2003–2005, corresponding to landings of 2100 t.

Short-term implications

Outlook for 2007

A range of candidate harvest ratios were applied to the TV abundance estimates (average of last 3 years) and adjusted to the landed weight equivalent to provide predictions of landings in 2007 under the different options as follows:

Harvest ratio	North Minch	South Minch	Firth of Clyde	Total
15%	**3213**	**7226**	**3765**	**14204**
20%	4284	9634	5020	18938
25%	5355	12043	6275	23673

Note: These are predicted landings for the three Functional Units only and, in the case of the Clyde this only includes the Firth of Clyde component, not the Sound of Jura component.

Additional allowance needs to be made for *Nephrops* in areas that are outside the main FUs but still part of the VIa TAC area (Management C). Some of these areas are now being surveyed by TV, but the data series is short. A predicted landing based on recent landings provides a short-term solution which should be replaced as soon as more reliable data become available. Figures below should be added to the predicted landings figure adopted:

Creeling areas: average creel landings 2003–2005 = 1673 tonnes
Sound of Jura: average landings 2003–2005 = 35 tonnes
Other areas in Management Area C: 2003–2005 = 363 tonnes

Management considerations

Landings divided by survey biomass indices is a proxy of the exploitation ratio. Available information indicates that landings in recent years are most likely an underestimate of actual landings. The landings reported in the 1990s are considered to be more accurate. The lower bound of the exploitation ratio for the stocks during that period was around 15%. The general increase in *Nephrops* abundance in recent years indicates that using a 15% exploitation ratio as a basis for setting a TAC will probably not have a detrimental effect on the stocks.

The TAC in 2006 was increased substantially in this area to allow catches to be reported. This higher TAC was based on a harvest ratio of 20% without additional allocation for stocks not assessed by TV surveys. It is not clear as yet if this harvest ratio of 20% will be sustainable in the longer term; therefore ICES maintains the advice given last year of using a 15% harvest ratio. When more reliable catch and effort data become available, the 15% harvest ratio can be re-evaluated. ICES considers that the harvest ratio could be adaptively adjusted over time in the fishery to ensure that the stock is exploited at a sustainable ratio. Implicit in this approach is that catch and effort are reported accurately and the fishery is managed at an appropriate geographic scale (i.e. Functional Unit).

The *Nephrops* trawl fisheries take bycatches of other species, especially haddock and whiting but also cod, megrim, and anglerfish. The management of these fisheries should be seen in the context of mixed fisheries.

A recent investigation suggests that bycatches of cod are generally low (as is the cod stock) in Division VIa in the *Nephrops* fisheries. Nevertheless, young cod are known to occur in inshore areas and any future emerging year classes should not be subjected to mortality as bycatch in smaller-mesh fisheries. The use of 70-mm mesh continues in a number of the VIa *Nephrops* fisheries. Every effort should be made to eliminate bycatches of cod in *Nephrops* fisheries.

Factors affecting the fisheries and the stock

The effects of regulations

The minimum landing size for *Nephrops* is 20 mm carapace length (CL), and less than 0.5% of the animals are landed under size. Discarding takes place at sea. The main bycatch species is haddock, although whiting, Norway pout, and flatfish also feature significantly in discards.

The introduction of 'Buyers and Sellers' legislation to this area and the higher TACs in 2006 are expected to lead to major improvements in the quality of fishery data over the next few years.

Scientific basis

Data and methods

There is considerable uncertainty about landings, discard, and effort data for these stocks and assessments based on quantitative fishery data are considered unreliable at the present time. TV surveys of the main Functional Units have been carried out for over 10 years now and provide estimates of abundance and variance. Recent TV surveys indicate higher stock abundance than in recent years and have remained consistently high in this period. Though subject to continuous refinement the method is considered to give more reliable indications of abundance than other approaches.

Comparison with previous assessment and advice

The assessment and advice is consistent with last year's advice which was also based on a no effort increase and a harvest ratio of 15%.

Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 9–18 May 2006 (ICES CM 2006/ACFM:30).

Year	ICES advice	Recommended TAC	Agreed TAC	Official landings	ACFM catch
1989				11.0	n/a
1990				10.0	n/a
1991				10.5	n/a
1992	maintain current effort	~11.4	12.0	10.8	n/a
1993	maintain current effort	~11.3	12.0	11.3	n/a
1994	maintain current effort	11.3	12.6	11.1	n/a
1995	maintain current effort	11.3	12.6	12.8	n/a
1996	maintain current effort	11.3	12.6	11.2	n/a
1997	as for 1996	11.3	12.6	11.2	n/a
1998	maintain current effort	11.3	12.6	11.2	n/a
1999	as for 1998	11.3	12.6	11.5	n/a
2000	maintain current effort	11.3	12.6	11.0	n/a
2001	as for 2000	11.3	11.34	10.9	n/a
2002	maintain current effort	11.3	11.34	10.5	n/a
2003	as for 2002	11.3	11.34	10.8	n/a
2004	maintain current effort	11.3	11.3	10.4	n/a
2005	as for 2004	11.3	12.7	10.5	n/a
2006	No increase in effort	-	17.7		
2007	No increase in effort	-			

Weights in '000 t.
n/a = not available.

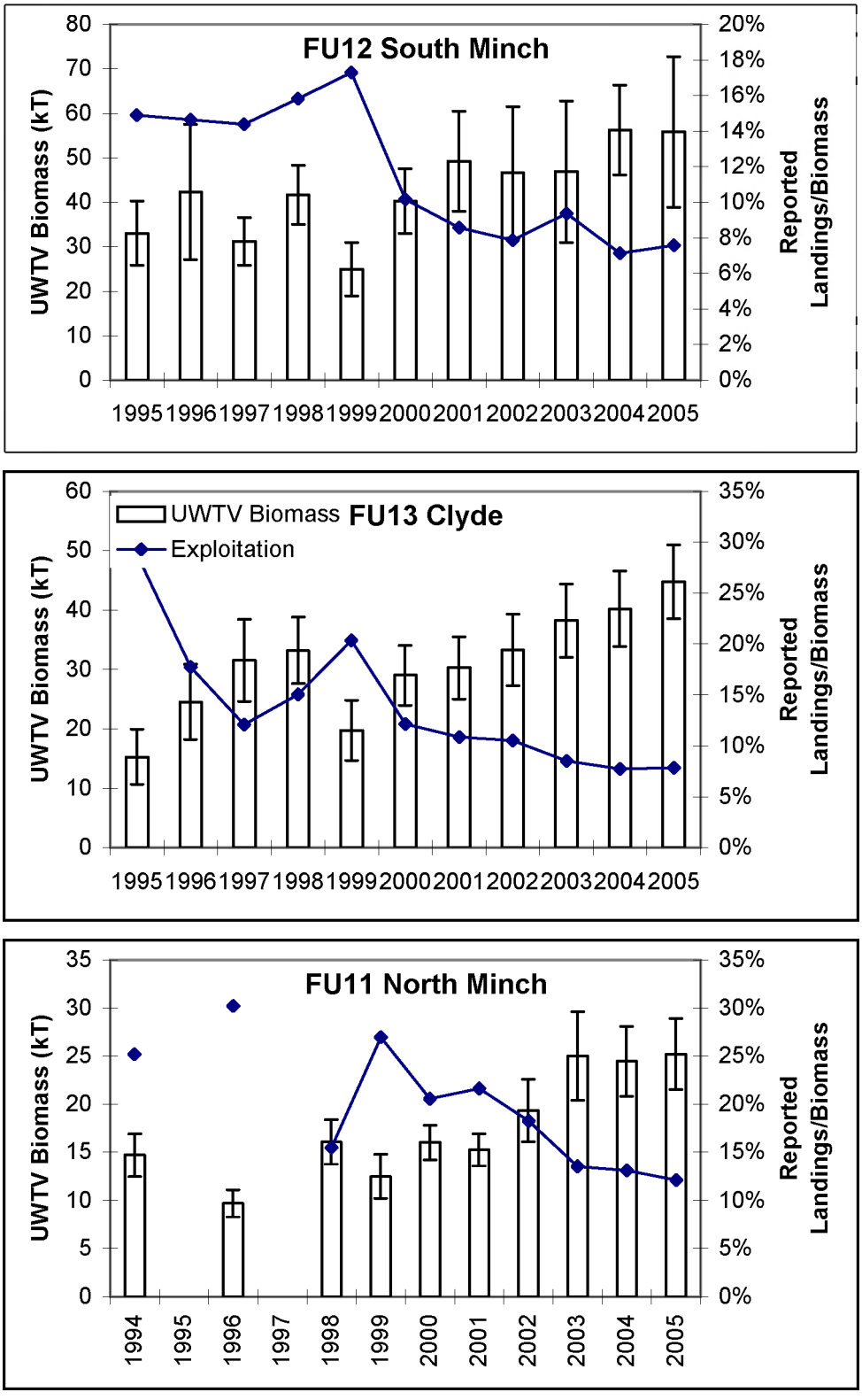


Figure 5.4.33.1 Recent TV survey biomass estimates and exploitation ratio proxies (i.e. landings/survey biomass).

Table 13.3 Nephrops, Management Area C: Total Nephrops landings (tonnes) by Functional Unit plu Other rectangles, 1981-2005.

Year	FU 11	FU 12	FU 13	Other	Total
1981	2861	3651	2968	39	9519
1982	2799	3552	2623	27	9001
1983	3196	3412	4077	34	10719
1984	4144	4300	3310	36	11790
1985	4061	4008	4285	104	12458
1986	3382	3484	4341	89	11296
1987	4083	3891	3007	257	11238
1988	4035	4473	3665	529	12702
1989	3205	4745	2812	212	10974
1990	2544	4430	2912	182	10068
1991	2792	4442	3038	255	10527
1992	3560	4237	2805	248	10849
1993	3192	4455	3342	344	11332
1994	3616	4415	2629	441	11101
1995	3656	4680	3989	460	*12785*
1996	2871	3995	4060	239	*11165*
1997	3046	4345	3618	243	*11253*
1998	2441	3730	4843	157	*11171*
1999	3257	4051	3746	438	*11492*
2000	3246	3952	3420	421	*11039*
2001	3259	3992	3190	420	*10861*
2002	3440	3305	3383	397	*10525*
2003	3268	3879	3171	433	*10751*
2004	3135	3868	3025	403	*10431*
2005*	2984	3841	3423	254	*10502*
* provisional					

5.4.34 *Nephrops* in Division VIIa, North of 53°N FU 14 & 15 (Area J)

There are two Functional Units in this area: a) Irish Sea East (FU 14) and b) Irish Sea West (FU 15).

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	

The uncertainty in the fishery information, particularly landings, makes such information inadequate for use by analytical methods and the status of spawning stock or exploitation rate cannot be evaluated relative to risk. Results from TV surveys and trends in biological characteristics, however, suggest that the stocks in Division VIIa are exploited at a sustainable level.

a) Irish Sea East: Annual LPUEs have been fluctuating, but were generally lower in the 1990s and 2000s than in the late 1970s and early 1980s. Landings have been fairly stable since the mid-1980s.
b) Irish Sea West: TV survey estimates of abundance for *Nephrops* in Irish Sea West are available only since 2003. They show that the stock has declined in 2004 and 2005 from the 2003 level. Indices of abundance from the August trawl survey are available for a longer period. They show the stock to have reached its highest abundance in 2003 and also indicate a decline from this level in 2004 and 2005. The 2005 trawl survey index of abundance is close to the long-term (1994–2004) mean abundance estimates. Mean size in the catches and in trawl surveys has been stable over time.

Management objectives

Nephrops in Division VIIa are managed through a total TAC for Subarea VII. There are no specific management objectives set for this fishery.

Reference points

No reference points have been determined for *Nephrops*.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary limits

Given the uncertainties surrounding the landings for this stock it is not possible to provide advice on catches in 2007. The stocks in this area appear to be in good condition and have sustained current levels of effort for many years. Therefore ICES advises that effort in this fishery should not be allowed to increase compared to 2003–2005 levels.

Management considerations

The advice implies maintaining fishing effort in *Nephrops*-directed fleets at recent levels of around 4.4 million kW days. This is based on the 2003–2005 average effort by *Nephrops* single- and twin-rig trawls as estimated by STECF for 2003 and 2004 and updated by ICES for 2005. If effort can be effectively controlled, this fishery can be managed without a TAC.

If the true landings can be established ICES considers that the harvest ratio based on the TV surveys could be adjusted over time in the fishery to ensure that the stock is exploited at a sustainable rate in the long term. Implicit in this approach is that catch and effort are reported accurately and that the fishery is managed at an appropriate geographic scale (i.e. Functional Unit).

The *Nephrops* trawl fisheries take bycatches of other species such as cod and particularly juvenile whiting. The management of these fisheries should be seen in the context of mixed fisheries.

Factors affecting the fisheries and the stock

The effects of regulations

The minimum landing size for *Nephrops* is 20 mm carapace length (CL), which is appropriate for the gears used in this area. Almost all of the discarded catch are above the minimum landing size and discard sampling indicates that *Nephrops* over 25 mm CL are mainly retained.

Separator trawls were introduced in the Irish fishery in 2000 in an attempt to reduce cod bycatches. The uptake of separator trawls has increased in recent years (to around 80% of the vessels in 2002).

Scientific basis

Data and methods

There is considerable uncertainty in landings data for these stocks and assessments that rely on quantitative fishery data are considered unreliable at the present time. Size distribution of catches in the fishery and surveys is available for a longer period and these data are considered reliable. The time-series of underwater TV surveys is very short and the 2006 estimate is not yet available; however, the abundance estimates in recent years are consistent with the August trawl survey which has a longer series. Although subject to continuing refinement the UWTV method is considered to provide more reliable indications of stock status than other approaches.

Comparison with previous assessment and advice

The assessment is similar to last year. The advice is similar to last year; effort information is now available for the *Nephrops* fleets and a reference period has been given.

Source of information

Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks, 9–18 May 2006 (ICES CM 2006/ACFM:30).

Year	ICES advice	Recommended TAC	Agreed TAC [1]	Official Landings	ACFM landings
1987				10.3	9753
1988				9.3	8586
1989				12.4	8147
1990				12.0	8308
1991				13.1	9566
1992		8.9	20.0	8.0	7547
1993		9.4	20.0	8.6	8110
1994		9.4	20.0	8.7	7623
1995		9.4	20.0	9.3	7790
1996		9.4	23.0	8.3	7257
1997		9.4	23.0	10.9	9979
1998		9.4	23.0	9.1	9145
1999		9.4	23.0	11.3	10786
2000		9.4	21.0	8.9	8370
2001		9.4	18.9	8.1	7441
2002	Set TAC in line with 1995–99 landings	9.55	17.79	7.3	6793
2003	Set TAC in line with 1995–99 landings	9.55	17.79	7.5	7052
2004	Set TAC in line with 1995–99 landings	9.55	17.45	7.9	7398
2005	Set TAC in line with 1995–99 landings	9.55	19.544	5.0*	6603
2006	No increase in effort	9.55	21.498		
2007	No increase in effort	-			

Weights in '000 t.
[1)] Subarea VII.
* Preliminary.

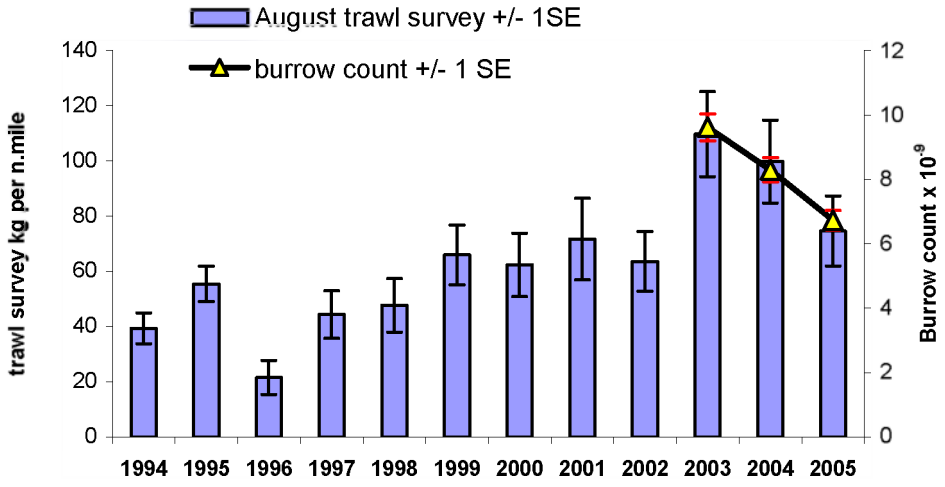


Figure 5.4.34.1 Indices of abundance from the UK(NI) August trawl survey and the underwater TV survey.

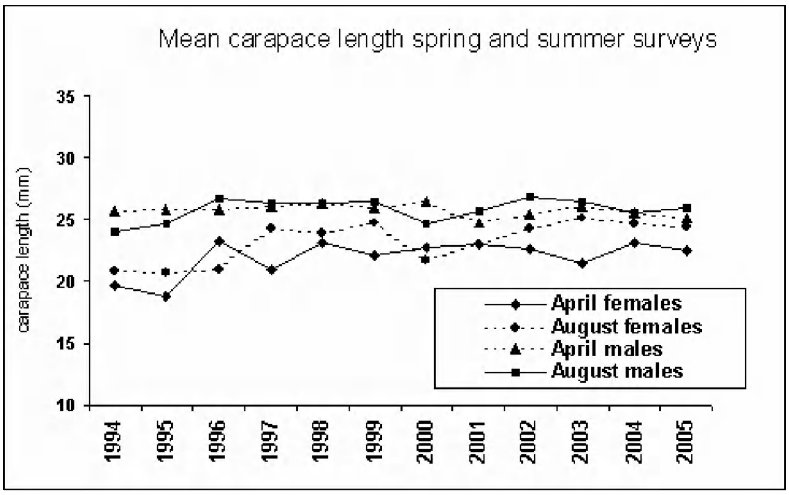


Figure 5.4.34.2 **Mean carapace** from the UK(NI) August trawl survey.

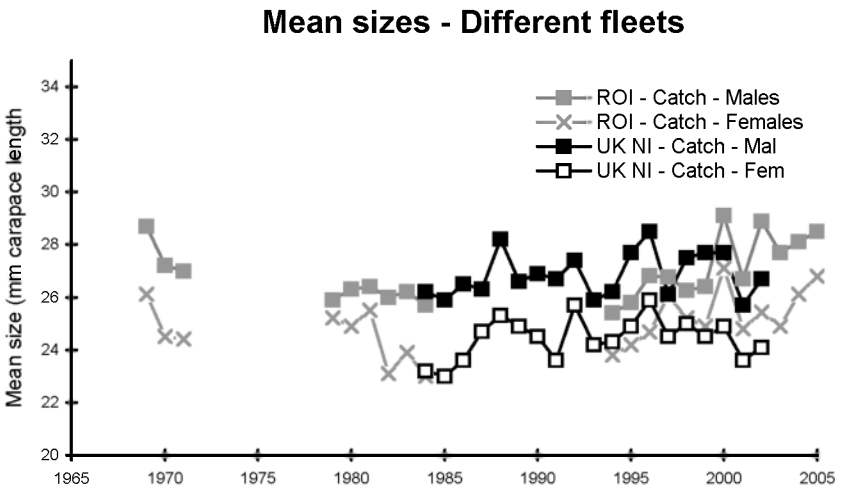


Figure 5.4.34.3 **Mean carapace** in the catches by sex by for the UK(NI) and Ireland.

Table 5.4.34.1 - Maungement Area J (VIIa, North of 53° N): Total Nephrops landings (tonnes) by Functional Unit plus Other rectangles, 1996-2005.

Year	FU 14	FU 15	Other	Total
1996	511	7257	6	7774
1997	597	9979	44	10620
1998	389	9145	4	9538
1999	625	10786	2	11412
2000	567	8370	0	8937
2001	532	7441	1	7974
2002	577	6793	0	7370
2003	377	7052	2	7431
2004	472	7398	11	7881
2005*	567	6603	33	7202

*** provisional**

Table 5.4.34.2 ICES estimates of reported landings from all individual Functional Units within TAC Area VII.

Year	FU 14 - Irish Sea East	FU 15 - Irish Sea West	FU 16 - Porcupine	FU 17 - Aran Grounds	FU 18 - Ireland North West coast	FU 19 - Ireland South West and South East coast	FUs 20+21+22 - All Celtic Sea FUs combined	Other statistical rectangles - Outside FUs	Total Landings ICES Sub-area VII
1978	1039	4867	1744	272	0	0	4056	249	12226
1979	1010	5944	2269	481	0	0	4542	237	14484
1980	799	3022	2925	452	0	0	3535	205	10938
1981	873	4301	3381	442	0	0	3680	382	13060
1982	897	5004	4289	414	1	2	3316	238	14161
1983	765	5152	3426	210	0	0	3732	182	13467
1984	619	4500	3686	131	0	2	3691	190	12819
1985	520	4522	3967	324	0	1	3602	194	13129
1986	693	5393	2591	208	0	0	2638	117	11640
1987	475	5169	2499	147	0	2	2842	348	11483
1988	497	5447	2375	62	1	2	2769	299	11451
1989	438	8147	2115	831	17	899	3801	356	16604
1990	644	8308	1895	344	7	754	4050	360	16361
1991	859	9568	1640	519	0	1077	3132	350	17145
1992	495	7548	2015	412	2	888	4018	645	16023
1993	582	8112	1857	372	10	905	4374	735	16948
1994	513	7618	2512	729	126	390	4869	859	17614
1995	637	7799	2936	866	26	695	5223	727	18909
1996	511	7257	2230	525	46	888	4611	881	16949
1997	597	9979	2409	841	15	756	4027	637	19260
1998	389	9145	2155	1410	78	827	3835	663	18501
1999	625	10786	2132	1140	16	572	3532	471	19273
2000	567	8370	872	880	9	686	4579	299	16263
2001	532	7378	1163	913	2	809	4644	409	15850
2002	577	6914	1282	1154	14	1292	4603	389	16227
2003	377	7052	867	933	16	1226	4915	188	15573
2004	472	7398	1441	525	25	1066	4173	172	15272
2005	567	6603	2129	764	15	641	4932	210	15861
Average	**627**	**6832**	**2314**	**582**	**15**	**514**	**3990**	**393**	**15268**

5.4.35 *Nephrops* in Divisions VIIb,c,j,k

There are 4 Functional Units in this Divisions VIIb,c,j,k: a) Porcupine Bank (FU 16), b) Aran Grounds (FU 17), c) Ireland SW and SE Coast (FU 19), and d) Ireland NW Coast (FU 18).

The TAC area applies to the whole of Area VII, including VIIa (Section 5.4.34).

State of the stock

No quantitative assessment of this stock is available.

For FU 16 (Porcupine bank) landings have been variable over time. Maximum landings of more than 4000 t were observed in the early 1980s before declining to less than 1000 t in the early 2000s. Landings increased in 2005 to over 2000 t. For most fleets, landings and LPUEs were at low levels in the early 2000s. Landings and LPUEs seem to have increased for some fleets recently.

For FU 17 (Aran Grounds) the maximum landings of 1400 t were reported in 1998. Since then the reported landings have shown a decline. The LPUEs have fluctuated without trends around 37kg/hr over the time-series. A recent UWTV survey series shows increased burrow density and estimated biomass from 2002–2004 before declining slightly in 2005.

For FU 19 (Ireland SW and SE coast) landings have been variable throughout the time-series, reaching the highest observed levels in 2002–2004. Landings declined sharply in 2005. The LPUEs have fluctuated considerably over the short time-series.

Landings FU 18 (Ireland NW coast) have been negligible in recent years and there are no major *Nephrops* fishery in this area.

Management objectives

No management objectives have been set for this fishery.

Reference points

There are no reference points and no yield-per-recruit table for this fishery.

Single-stock exploitation boundaries

There are no exploitation boundaries for this stock. Although the total reported landings appear relative stable for FUs 16, 17, 18, and 19 combined (~3500 t), there have been large changes in fishing effort and landings for individual stocks. Furthermore, landings may be unreliable for some countries. This may lead to unbalanced exploitation of stocks and overfishing. ICES herefore advises that these *Nephrops* fisheries should be constrained to recent levels of effort at an appropriate geographical scale (FU).

Management considerations

The FU populations are distinct populations and management should be matched to these FUs. Currently the TAC is set for Subarea VII. Therefore there is a risk that inappropriate levels of effort may occur for these stocks due to effort shifts from other areas.

Fishing effort directed at *Nephrops* will have implications for the hake stock in the mixed fisheries unless species and size selectivity of gears can be improved.

Factors affecting the fisheries and the stock

Changes in fishing technology and fishing patterns

In FU 16 (Porcupine bank) landings effort and LPUEs indicate increased targeting of *Nephrops* over the last two years by all countries involved in the fishery.

In FU 17 (Aran Grounds) the typical vessel length is 13–38 m compared to 15–25 m in 2003, while engine power ranges from 120–870 kW compared to 150–550 kW in 2003. The most recent change in the fishery is the proportion of twin-rig vessels, which has increased to over 90 % of the fleet in the past eight years. There have also been changes to the fleet structure which implies that nominal fishing effort is not an appropriate indicator of effective fishing effort.

In FU 19 (Ireland SW and SE coast) there has been a shift of effort to *Nephrops* by Irish vessels due to a combination of factors. There has been increasing enforcement of the anglerfish quota, leading to detention of a number of Irish vessels. As a result several vessels in the 20- to 24-m category based in the southwest of Ireland have converted to *Nephrops*. Due to the low price of whitefish species during 2004 and in early 2005 a number of Irish seine net vessels have also switched to *Nephrops*.

Scientific basis

Data and methods

There are some length–structured data available, but growth rates cannot be well determined. There are concerns about the accuracy of the landings statistics in some fleets. Analytical assessments are not feasible at present.

For FU 16 (Porcupine bank) annual landings length compositions for males and females are available from Spain (1986–2005), France (1995–2005), and Ireland (1995–2005). LPUE and effort data are available for the Spanish (SP-CORUTR7), French (FR-PORCUPINE), and Irish fleets (Figure 5.4.35.2).

For FU 17 (Aran Grounds) landings length compositions by sex are available for 1995–2000. Since 2001 a catch and discard sampling programme has been in place which shows the discarding of smaller individuals. An effort and LPUE data set for Irish trawlers from 1995–2005 is available (Figure 5.4.35.3). Results of the TV survey for this stock are shown in Table 5.4.35.1.

For FU 19 (Ireland SW and SE coast) length–frequency data of the landings were collected on an irregular basis in the years 1996–1997, 1999, and 2002 to 2005. Spatial and temporal coverage is problematic because landings from FU 19 originate from several discrete grounds. In 2005 length–frequency data were only available for quarters 2 and 3. Since 2001 a catch and discard sampling programme has been in place which shows the discarding of smaller individuals. Effort and LPUE data are available for the Irish *Nephrops* fleet in FU 19 from 1995–2005 (Figure 5.4.35.1).

For FU 18 (Ireland NW coast) only landing data are available.

Comparison with previous assessment and advice

The advice last year was based on average landings. As there are serious doubts about the quality of the landings data, the advice is now presented in terms of no increase in effort.

Source of information

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

Year	ICES advice	Recommended TAC	Agreed TAC [1]	ACFM Landings [2]
1987				2669
1988				3343
1989				3492
1990				3270
1991				3296
1992		3.8	20.0	3683
1993		~4.0	20.0	3599
1994		~4.0	20.0	4327
1995		~4.0	20.0	4920
1996		4.0	23.0	4312
1997		4.0	23.0	4361
1998		4.0	23.0	4985
1999		4.0	23.0	4182
2000		4.0	21.0	2691
2001		4.0	18.9	3256
2002		4.44	17.79	3986
2003		4.44	17.79	3227
2004	Restrict landings to 2000–2002 levels	3.3	17.45	3218
2005	Restrict landings to 2000–2002 levels	3.3	19.5	3726
2006	Restrict landings to 2000–2002 levels	3.3		
2007	Maintain effort at recent levels	--		

Weights in '000 t.
[1] Subarea VII.
[2] Discards not included.

Figure 5.4.35.1 **Nephrops in FU 19 (Ireland SW and SE Coast) Landings in tonnes by country**

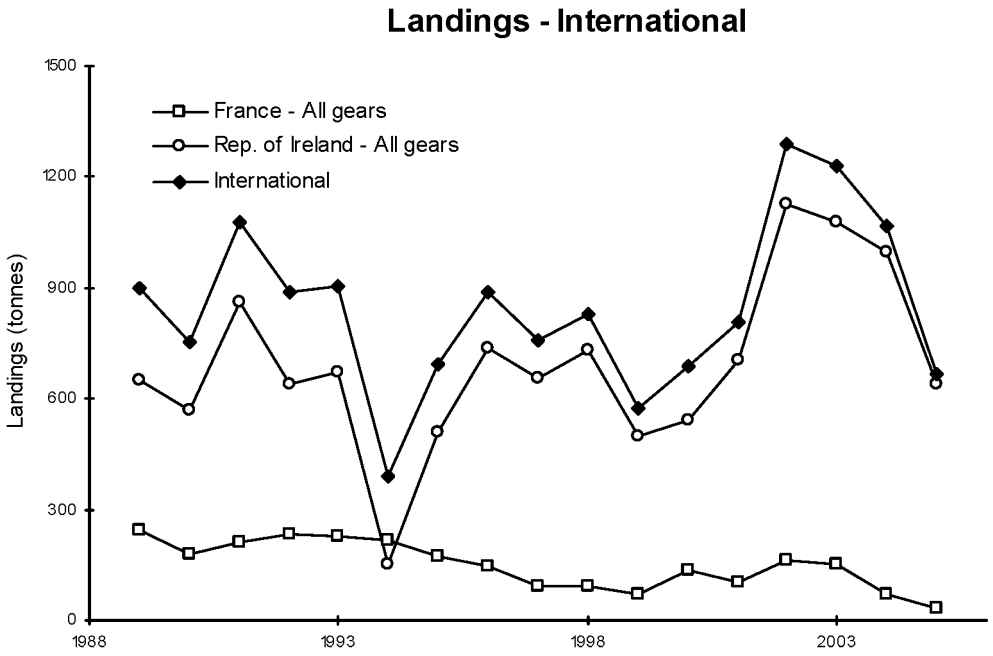
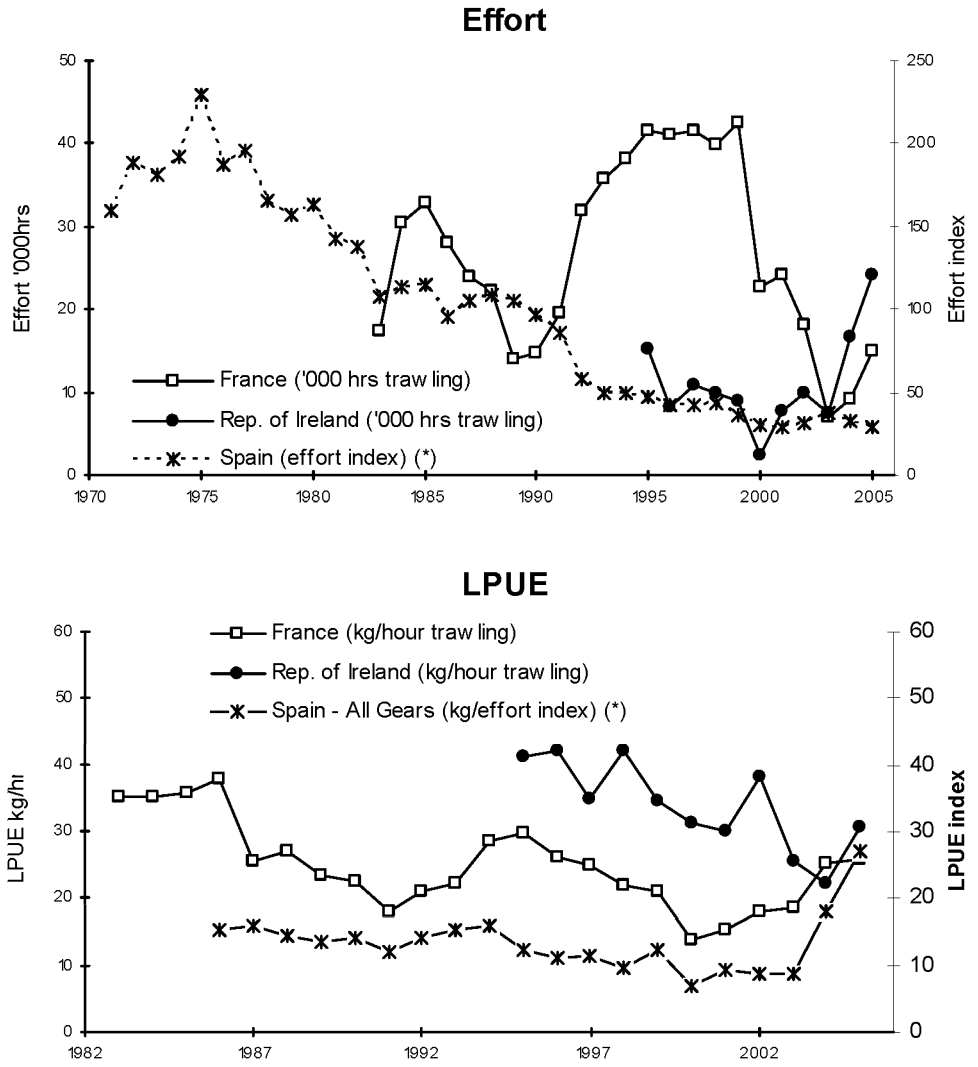


Figure 5.4.35.2 Nephrops FU 16 (Porcupine). Effort and LPUE trends for fleets



(*) The Spanish effort index is based on a combination of hours at sea and average engine power. Irish and French effort and LPUE is unstandardised.

Figure 5.4.35.3 Nephrops in FU 17 (Aran Grounds)
Mean UWTV density and 95% confidence intervals

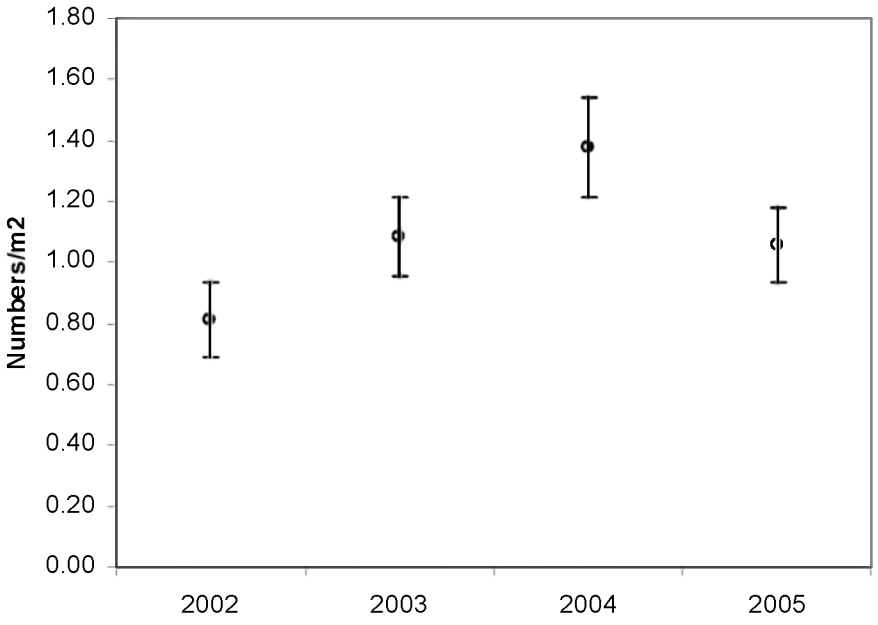


Figure 5.4.35.4a Nephrops in FU 19 (SW and SE Ireland)
Irish fishing effort

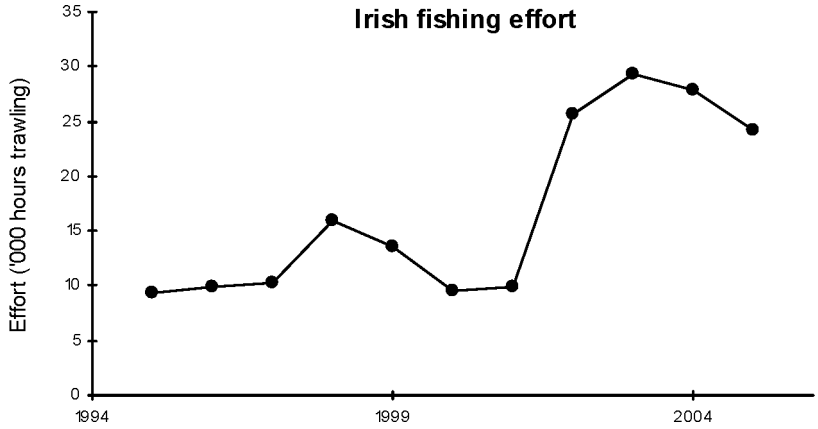


Figure 5.4.35.4b Nephrops in FU 19 (SW and SE Ireland)
Irish LPUE

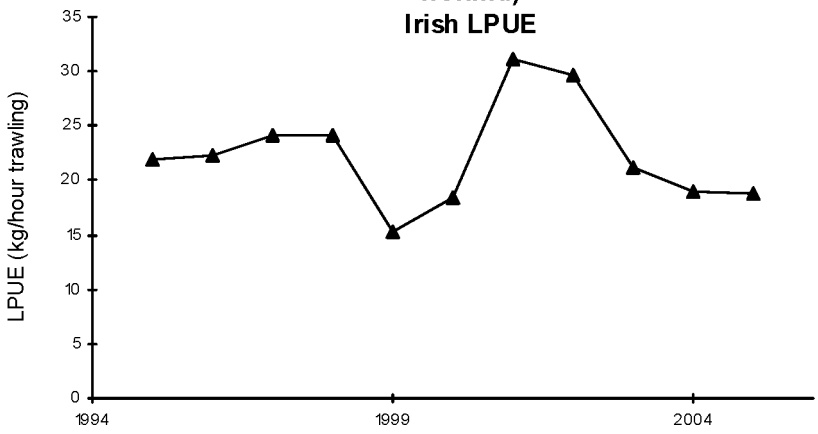


Table 5.4.35.1 Total Nephrops landings (in tonnes) in MA L

Year	FU 16	FU 17	FU 18	FU 19	Other Rectangles	TOTAL MA L
1965	514	-	-	-	-	514
1966	0	-	-	-	-	0
1967	441	-	-	-	-	441
1968	441	-	-	-	-	441
1969	609	-	-	-	-	609
1970	256	-	-	-	-	256
1971	1944	-	-	-	-	1944
1972	1738	-	-	-	-	1738
1973	2946	-	-	-	-	2946
1974	2794	477	-	-	-	3271
1975	2150	822	-	-	-	2972
1976	1327	131	-	-	-	1458
1977	1545	272	-	-	-	1817
1978	1744	481	-	-	249	2474
1979	2269	452	-	-	237	2958
1980	2925	442	-	-	205	3572
1981	3381	414	-	-	382	4177
1982	4289	210	-	-	234	4733
1983	3426	131	-	-	174	3731
1984	3571	324	-	-	187	4082
1985	3919	207	-	-	194	4320
1986	2591	147	-	-	113	2850
1987	2499	62	-	-	107	2669
1988	2375	828	-	-	140	3343
1989	2115	344	-	899	134	3492
1990	1895	519	-	754	102	3270
1991	1640	410	-	1077	169	3296
1992	2015	372	-	888	409	3683
1993	1857	372	10	905	455	3599
1994	2512	729	126	390	570	4327
1995	2936	866	26	695	397	4920
1996	2230	525	46	888	623	4312
1997	2409	841	15	756	340	4361
1998	2155	1410	78	827	514	4985
1999	2132	1140	16	572	322	4182
2000	872	880	9	686	243	2691
2001	1163	913	2	809	368	3256
2002	1282	1154	14	1292	243	3986
2003	867	933	16	1226	186	3227
2004	1441	525	25	1066	161	3218
2005	2129	764	15	641	177	3726

- indicate no data available (landings form all areas are only available since 1993)

5.4.36 *Nephrops* in Divisions VIIf,g,h, excluding Rectangles 31 E1, 32 E1–E2 + VIIa, South of 53°N (*Nephrops* Area M)

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
Unknown	Unknown	Unknown		

In the absence of reference points, the state of the stock cannot be evaluated in this regard. Landings have fluctuated around 4500 t since the mid-1990s. The landings per unit effort (LPUE) series for the French *Nephrops* trawlers increased between 1999 and 2002 and then stabilised at this level. The Irish LPUE seems to have a slight downward trend but with large variations from year to year.

Management objectives

There are no explicit management objectives for this stock.

Reference points

No reference points have been established.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary considerations

Landings have been relatively stable at around 4600 t in recent years and there are no other specific concerns about recent stock development. Therefore, ICES advises that *Nephrops* fisheries in this area should be constrained at recent levels of effort.

The landings from all FUs in this TAC area is presented in Section 5.4.36 (*Nephrops* in Division VIIa).

Management considerations

Management for *Nephrops* stocks should be conducted at an appropriate geographic scale (e.g. Functional Unit). Currently the TAC is set for Subarea VII, and this may allow unrestricted catches for stocks under excessive fishing pressure where catches should be limited.

Nephrops in these functional units are known to occur in several areas of muddy sediment and the stock structure is uncertain. The *Nephrops* fisheries target different areas, and *Nephrops* catches and landings show very different size structures. These fisheries also have differences in non-*Nephrops* bycatch composition. Cod, whiting, and to a lesser extent haddock are the main bycatch species.

Discarding of small *Nephrops* is substantial. Because of the heterogeneity of FUs 20–22 and of divergence in the exploitation pattern of the main fleets, the discard rate seems to have notably fluctuated between fleets or years. This shows that trawls currently used to target *Nephrops* are not technically adapted to select marketable *Nephrops*. Discarding of other fish species is also a problem in *Nephrops* fishery.

There are no specific concerns of underreporting in this area.

Ecosystem considerations

Nephrops occur in discrete patches where the sediment is suitable for them to construct their burrows. There is a larval phase where there may be some mixing with *Nephrops* from other areas depending on the oceanographic conditions, but the mechanisms for this in the Celtic Sea are not currently known.

Cod has been identified as a predator of *Nephrops* in some areas, and the generally low level of the cod stock is likely to have resulted in reduced predation on *Nephrops*.

Factors affecting the fisheries and the stock

Landings from this stock are reported by France, the Republic of Ireland, and the UK. The contribution of the French landings to the total quantity gradually decreased from 80–90% at the end of the 1980s to 50–60% at the beginning of the 2000s. There has been a considerable increase in Irish landings, from around 500 t to more than 2000 t in 15 years. There has also been increasing effort by Irish vessels targeting *Nephrops* in the Celtic Sea in recent years.

The effects of regulations

The minimum EU landing size (MLS) for *Nephrops* in this area is 8.5 cm of total size (25 mm CL), whereas French Producers' Organizations adopted a specific regulation of 11.5 cm of total size (35 mm CL). There has been strong discarding above this EU 8.5 cm MLS by the French fleet, but some recent indications point out that the discard rate of French trawlers may have decreased. The decrease must be substantial to determine whether this decrease is induced by the gradual adoption of new mesh regulations or by a recruitment decline.

Changes in fishing technology and fishing patterns

There has been increasing diversification into different *Nephrops* fisheries within this area by the Irish fleet. Several old fishing units of the French fleet were replaced by more recent ones, but the contribution of this change to the fishing pattern remains unknown. A fishing power analysis has not yet been carried out.

Scientific basis

Data and methods

The basic source of information is landings and LPUE together with some information on the length distributions of the landings. There are some concerns about increasing efficiency of the French fleet. Discarding is substantial, but varies between fleets and areas.

There is limited fishery-independent survey data for this stock and none of the current surveys in this area specifically target *Nephrops*. There was an UWTV survey for this stock for the first time in 2006, but the results are not yet available.

French discard data are available for some years only (1985, 1991, and 1997; only 1997 is entirely useful for compilations). Some methodological investigations on discard derivation for missing years improved quantitative information on actual catches. It is expected that the new Irish catch sampling programme implemented under EU DCR will improve the quality of the series for future assessment. More frequent discard samplings of the French fleet would greatly improve the quality of the length–frequency data.

Information from the fishing industry

Prior to the assessment, meetings were held with the Irish and French industry. The French industry underlined that the increase of LPUE series since the end of the 90s may be caused by the change of the global fishing efficiency of the fleet because some old vessels were replaced by more recent ones.

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Comparison with previous assessment and advice

It was not possible to carry out a reliable analytical assessment for this stock, as was the case last year as well. The advice is based on recent average landings and indicators as LPUE and CPUE.

Source of information

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 27 June–6 July 2006 (ICES CM 2006/ACFM:33).

Year	ICES advice	Recommended TAC	Agreed TAC[1]	ACFM landings[2]
1987				3.409
1988				3.165
1989				4.005
1990				4.290
1991				3.296
1992		~3.8	20	4.165
1993		3.8	20	4.374
1994		3.8	20	4.869
1995		3.8	20	5.223
1996		3.8	23	4.611
1997		3.8	23	4.027
1998		3.8	23	3.835
1999		3.8	23	3.532
2000		3.8	21	4.579
2001		3.8	18.9	4.644
2002		3.8	17.79	4.603
2003		3.8	17.79	4.915
2004	Adjust TAC in line with landings of most recent 10 years	4.6	17.45	4.173
2005	Adjust TAC in line with landings of most recent 10 years	4.6	19.544	4.932
2006	Recent average landings 2000–2002	4.6	21.498	
2007	No increase in effort	-		

Weights in '000 t.
[1)] Subarea VII.
[2)] Does not include discards.

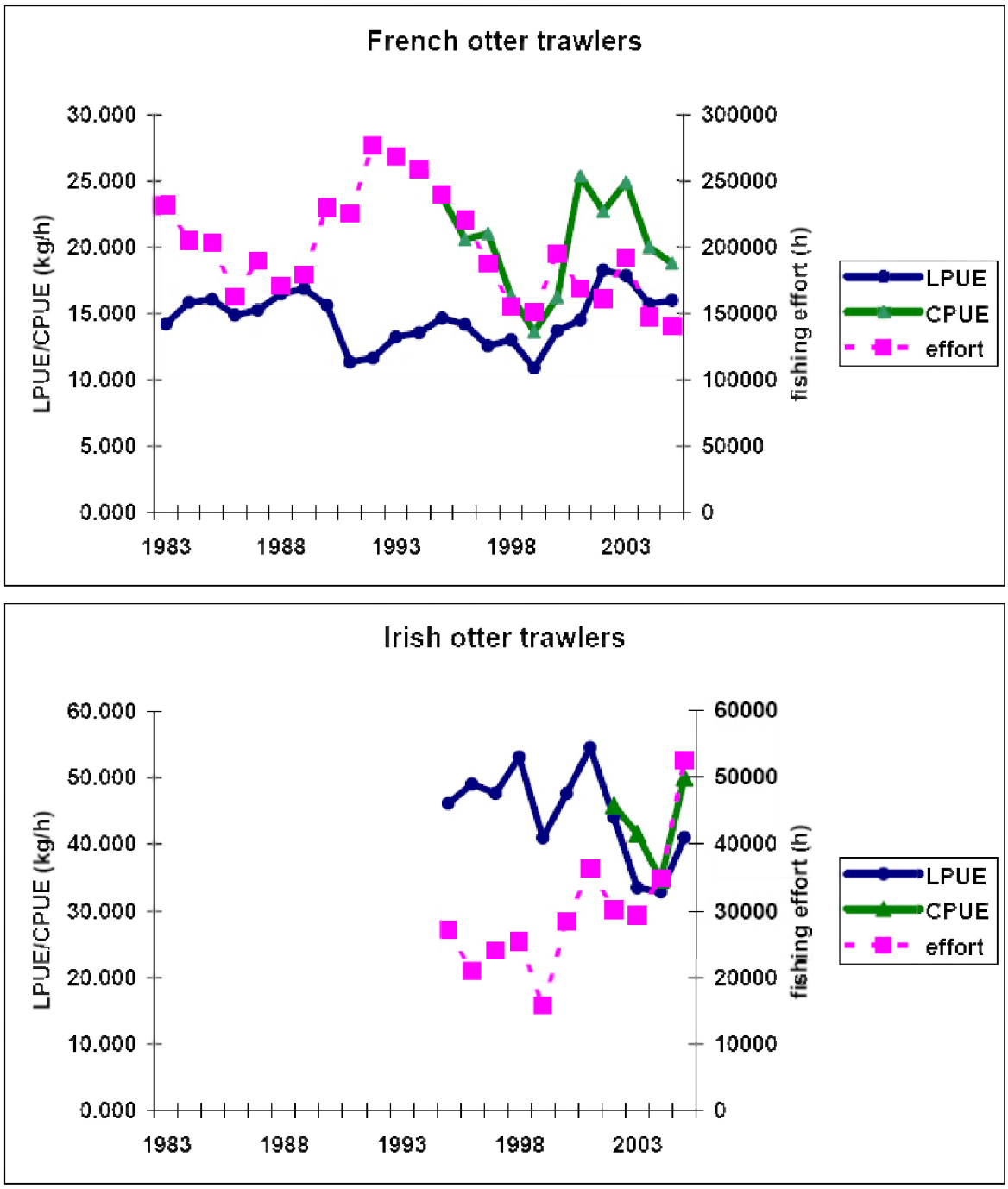

Figure 5.4.36.1 *Nephrops* in VIIgh. LPUE and fishing effort series for French (top) and Irish fleet (bottom). The CPUE indices are calculated by including discard sampling on-board and, failing that, by a derivation method.

Table 5.4.36.1 . *Nephrops* FU 20-22 (Celtic Sea). Total and by country nominal landings (t) in Division VIIgh as used by WG.

Year	France	Rep. of Ireland	UK	Other Countries[1]	Total reported	Unallocated	Total
1983	3667						
1984	3653						
1985	3599						
1986	2638						
1987	3080	329					
1988	2926	239					
1989	3221	784					
1990	3762	528					
1991	2651	644					
1992	3415	750					
1993	3815	770	63	0	4648	-274	4374
1994	3658	1415	68	2	5143	-274	4869
1995	3803	1575	125	2	5505	-282	5223
1996	3363	1377	86	2	4828	-217	4611
1997	2589	1552	95	4	4240	-213	4027
1998	2241	1619	64	1	3925	-90	3835
1999	2745	824	41	0	3610	-78	3532
2000	2782	1793	47	1	4623	-44	4579
2001	2532	2123	21	1	4677	-33	4644
2002	3134	1496	15	8	4653	-50	4603
2003	3511	1385	19	N/A	4915	0	4915
2004	2511	1626	36	N/A	4173	0	4173
2005	2490	2389	53	N/A	4932	0	4932

[1]Other countries include Belgium

5.4.37 Sole Southwest of Ireland (Division VIIh–k)

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	

The state of the stock is unknown. No assessment was performed, due to the short series of data and lack of reliable tuning indices.

Management objectives

There are no explicit management objectives for this stock.

Reference points

No precautionary reference points have been established.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary considerations

Catches in 2007 should be no more than the recent average (2003–2005) of around 287 t, in order to avoid an expansion of the fishery until there is more information to facilitate an adequate assessment.

Short-term implications

No forecast.

Management considerations

Sole are taken as part of a mixed demersal fishery by otter trawlers. Management options proposed for sole should also take into consideration other demersal fish species taken in the fishery.

Area misreporting from VIIf,g into VIIhjk is known to be a problem in some fleets, but landings data have not been corrected for this. The extent of other misreporting is not known.

Factors affecting the fisheries and the stock

Sole are predominantly caught in mixed-species otter trawl fisheries in Division VIIj. These vessels target mainly hake, anglerfish, and megrim. Sole are also caught in flatfish-directed beam trawler fisheries. Seiners generally take a lesser catch of sole. Ireland and Belgium are the major participants in this fishery.

The effects of regulations

Sole is managed through TAC and technical conservation measures. Boat quota restrictions were imposed on Irish vessels for hake, cod, and anglerfish, and these are likely to have impacted the sole landings.

Council Regulation (EC) No. 1954/2003 established measures for the management of fishing effort in a 'biologically sensitive area' in Divisions 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).

Changes in fishing technology and fishing patterns

Ireland, UK, and France are the major participants in this fishery. Sole were predominantly caught by Irish otter trawl vessels in Division VIIj, within a mixed-species fishery. Irish otter trawl vessels operate from the ports of Castletownbere, Dingle, Union Hall, Baltimore, and Schull. Increasingly these Irish vessels target mainly hake, anglerfish, and megrim and not the more traditional inshore species (plaice, sole, whiting, and cod). The Irish beam trawlers and seiners generally take a lesser catch of sole. Other international fleets operating in this area are the UK, French otter trawl, and Belgian beam trawl fleets.

Scientific basis

Data and methods

Data update and screening methods only. No analytical assessment was performed.

Source of information

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 27 June–6 July 2006 (ICES CM 2006/ACFM:33).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	ACFM landings
1993	No advice		-		-	495
1994	No advice		-		-	398
1995	No advice		-		-	403
1996	No advice		-		-	443
1997	No advice		-		-	564
1998	No advice		-		-	423
1999	No advice		-		-	381
2000	No advice		-		-	329
2001	No advice		-		650	325
2002	No advice		-		650	430
2003	Reduce TAC to recent landings		330		390	245
2004	[1]	Reduce TAC to recent average (2000–2002)	[1]	360	390	
2005		Reduce TAC to recent average (2001–2003)		335	650	290
2006		Reduce TAC to recent average (2002–2004)		380	650	326
2007		Reduce TAC to recent average (2003–2005)		287		

Weights in t.

[1] Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

Table 5.4.37.1 **Sole in Divisions VII h-k (Southwest Ireland).**
Nominal landings (t), 1973-2005,as officially reported to ICES.

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Belgium	406	369	210	664	583	320	384	555	580	490	420	474
Denmark	-	-	-	-	-	-	5	-	-	-	-	-
France	2640	2999	3028	19	103	23	29	27	2688	1722	176	120
Ireland	108	116	97	152	126	73	109	162	195	172	176	156
Netherlands	4	15	41	107	146	62	-	-	13	52	83	369
Spain	306	259	250	302	267	284	70	109	96	57	38	40
UK - Eng+Wales+	.	.	.	.	.	.	.	.	.	.	.	.
UK - England & W	6	5	24	11	12	11	18	42	83	108	129	151
UK - Scotland	-	-	-	-	-	-	-	-	-	-	-	-
Total	3470	3763	3650	1255	1237	773	615	895	3655	2601	1022	1310

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	343	494	395	389	563	654	747	752	717	804	979
Denmark	-	-	-	-	-	-	-	-	-	-	-
France	25	38	44	53	84	66	55	43	44	42	47
Ireland	201	188	168	182	206	266	306	255	237	184	243
Netherlands	449	216	145	-	-	-	-	-	-	-	-
Spain	308	75	101	-	-	-	-	-	-	-	-
UK - Eng+Wales+	.	.	.	.	177	144	234	215	210	172	192
UK - England & W	200	261	193	166	.	.	.	.	.	.	.
UK - Scotland	-	-	-	-	-	-	-	2	5	2	-
Total	1526	1272	1046	790	1030	1130	1342	1267	1213	1204	1461

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Belgium	835	803	815	101	8	13	154	170	157	90
Denmark	-	-	-	-	-	-	-	-	-	.
France	50	58	74	.	1171	897	280	223	166	52.158
Ireland	183	203	221	207	111	125	130	105	111	.
Netherlands	70	-	7	1	10	-	-	-	-	.
Spain	-	-	-	-	-	-	1	-	-	.
UK - Eng+Wales+	148	113	111	97	95	111	124	78	79	111.7
UK - England & W	.	.	.	.	.	.	.	.	.	.
UK - Scotland	-	-	-	-	-	-	-	-	-	.
Total	1286	1177	1228	406	1395	1146	689	576	513	254
Unallocated	843	613	805	25	1066	821	259	331	223	-72
Total figures used by Working Group	443	564	423	381	329	325	430	245	290	326

5.4.38 Sole West of Ireland (Division VIIb,c)

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	

The state of the stock is unknown. No assessment was performed, due to the short series of data and lack of reliable tuning indices.

Management objectives

There are no explicit management objectives for this stock.

Reference points

No precautionary reference points have been established.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary considerations

Recent catches have been close to the TAC of 65 t. Catches should not be allowed to increase unless it can be shown that an expansion of the fishery is sustainable.

Short-term implications

No forecast.

Management considerations

The recent average catches (2002–2004) were 64 t. Sole are taken as part of a mixed demersal fishery by otter trawlers. Management options proposed for sole should also take into consideration other demersal fish species and *Nephrops* taken in the VIIb,c fishery.

Factors affecting the fisheries and the stock

Ireland is the major participant in this fishery with around 75% of the international landings in recent years. Sole are normally caught in a mixed species otter trawl fisheries in Division VIIb. These vessels mainly target other demersal fish species and *Nephrops*.

The effects of regulations

Sole is managed by a precautionary TAC and technical measures. The agreed TAC for 2004 and 2005 was 65 t, which is a decrease from the previous TAC of 80 t for 2001–2003.

Council Regulation (EC) No. 1954/2003 established measures for the management of fishing effort in a 'biologically sensitive area' in Divisions 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).

Changes in fishing technology and fishing patterns

Sole are opportunistically exploited in otter trawl fisheries in this area and there is no known change in fishing technology and fishing patterns in this area.

Scientific basis

Data and methods

Data update and screening methods only. No analytical assessment was performed.

Source of information

Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks, 27 June–6 July 2006 (ICES CM 2006/ACFM:33).

Year	ICES Advice	Single-stock exploitation boundaries	Predicted catch corresp. to advice	Predicted catch corresponding to single-stock boundaries	Agreed TAC	ACFM landings
1993	-		-		-	60
1994	-		-		-	70
1995	-		-		-	59
1996	-		-		-	57
1997	-		-		-	55
1998	-		-		-	66
1999	-		-		-	72
2000	-		-		-	57
2001	-		-		80	60
2002	No advice		-		80	61
2003	Reduce TAC to recent landings		65		80	64
2004	[1]	Reduce TAC to recent landings (1998–2002)	[1]	65	65	69
2005		Reduce TAC to recent landings (1999–2003)		62	65	44
2006		No increase in catches		64		
2007		No increase in catches		64		

Weights in t.

[1] Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries protecting stocks outside safe biological limits.

Table 5.4.38.1 Sole in Divisions VII b, c (Southwest Ireland).
Nominal landings (t), 1973-2005,as officially reported to ICES.

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
France	-	25	7	6	3	3	6	9	6	5	9	3
Ireland	12	12	19	44	14	16	13	24	47	55	40	17
Spain	19	16	30	25	1	-	11	1	-	-	-	-
UK - Eng+Wales+N.Irl.	.	.	.	.	.	.	.	.	.	.	.	.
UK - England & Wales	-	-	-	-	-	-	-	-	-	1	-	-
Total	31	53	56	75	18	19	30	34	53	61	49	20

Country	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
France	6	8	2	2	-	-	5	2	1	1	2
Ireland	44	29	39	34	38	41	46	43	59	60	59
Spain	-	-	-	-	-	-	-	-	-	-	-
UK - Eng+Wales+N.Irl.	.	.	.	.	-	-	-	-	-	-	-
UK - England & Wales	-	-	-	1	.	.	.	.	.	.	.
Total	50	37	41	37	38	41	51	45	60	61	61
Unallocated									0	9	-2
Total as used by the Working Group									60	70	59

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
France	2	3	-	.	13	11	14	24	24	6
Ireland	52	51	49	68	65	53	50	50	49	.
Spain	-	-	-	-	-	-	-	-	-	.
UK - Eng+Wales+N.Irl.	-	1	-	-	-	-	-	-	-	.
UK - England & Wales	.	.	.	.	.	.	.	.	.	.
Total	54	55	49	68	78	64	64	74	73	
Unallocated	3	0	17	4	-10	-4	-3	-10	-4	44
Total as used by the Working Group	57	55	66	72	68	60	61	64	69	44