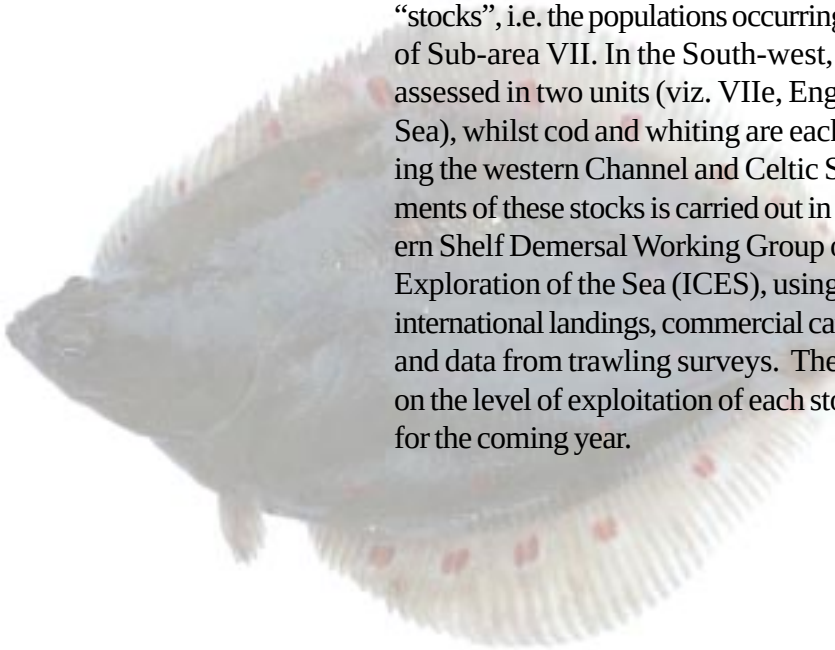
CEFAS
The Centre for Environment, Fisheries & Aquaculture Science

# FISHERIES INFORMATION - COD, SOLE, PLAICE AND WHITING IN THE SOUTH WEST OF THE BRITISH ISLES

Funded by EU Study Contract 99-009
IMPROVING SAMPLING OF WESTERN AND SOUTHERN EUROPEAN ATLANTIC FISHERIES
- SAMFISH-

**July 2000**

This leaflet gives up-to-date information on the fisheries and stock status of four fish which are important to commercial fisheries around the south west of the British Isles. These are two flatfish, sole (*Solea solea*) and plaice (*Pleuronectes platessa)*, and two gadoids, cod (*Gadus morhua*) and whiting (*Merlangius merlangus*). For management purposes, the populations of these species are separated into "stocks", i.e. the populations occurring within single or multiple divisions of Sub-area VII. In the South-west, sole and plaice fisheries are each assessed in two units (viz. VIIe, English Channel; and VIIf&g, Celtic Sea), whilst cod and whiting are each assessed as one stock unit covering the western Channel and Celtic Sea (VIIe,f,g,h). Analytical assessments of these stocks is carried out in September each year by the Southern Shelf Demersal Working Group of the International Council for the Exploration of the Sea (ICES), using the numbers of fish at each age in international landings, commercial catch rates in relation to fishing effort, and data from trawling surveys. The results are used to provide advice on the level of exploitation of each stock, and on management measures for the coming year.



**2000 UK quota and other member states' share of the TAC as decided by the EU Council**

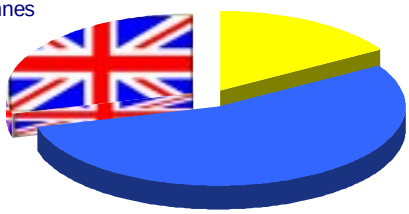
385 tonnes

**Sole in Division VIIe**

270 tonnes

**Sole in Divisions VIIf & g**

3350 tonnes

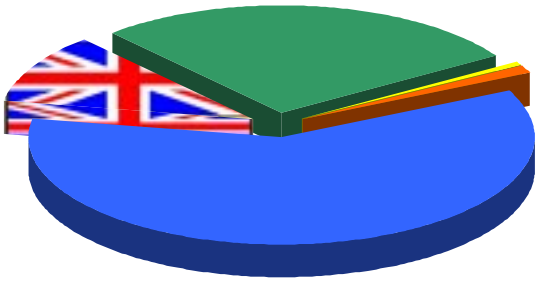


**Plaice in Division VIIe**

185 tonnes

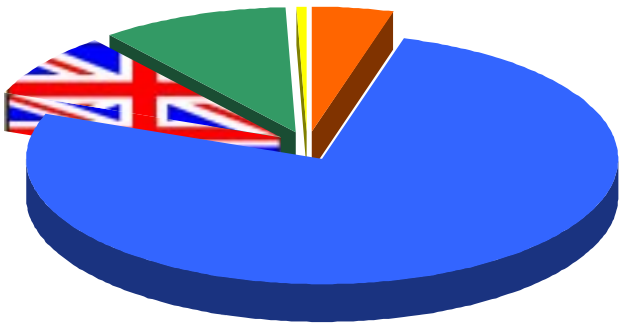
**Plaice in Division VIIf&g**

2410 tonnes



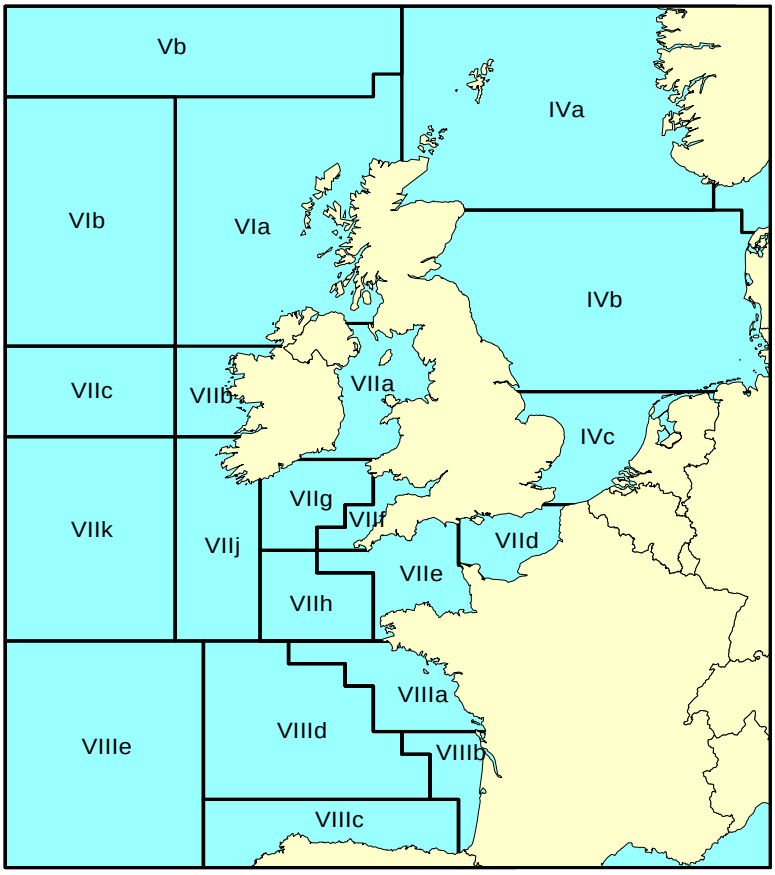
**Whiting in Divisions VIIb-k**


3350 tonnes



**Cod in Divisions VIIe-k**

UK landings of **sole and plaice** from ICES Division VIIe were at a low level until 1977, when they increased rapidly due to the gradual replacement of otter trawlers by beam trawlers. These are still the principal gears used, and the target species of the offshore beam-trawl fleet are high value demersal ones such as sole, plaice and anglerfish. The main sole fishery is concentrated off the south Cornish coast. Plaice are taken mainly as a by-catch in beam-trawls directed at sole and anglerfish. The main fishery is concentrated to the south and west of Start Point. Although plaice are taken throughout the year, landings are heaviest during February/ March and October/ November.




In the 1970s, the fishery for **sole and plaice** in VIIf&g was mainly carried out by Belgian beam trawlers and Belgian and UK otter trawlers. The use of beam-trawls, which target sole in this area, became more prevalent during the 1980s, and the Belgian otter trawlers have now been replaced by beam trawlers. The main fishery is concentrated on the Trevose Head ground off the north Cornwall coast and around Land's End. Although plaice are taken throughout the year, heavier landings occur during March, after the peak of spawning, and in September**.**

**Cod** in the western English Channel and Celtic Sea are taken in mixed trawl fisheries. Cod are mostly landed by French gadoid trawlers, although landings by French *Nephrops* trawlers have increased in recent years. Landings are made throughout the year, but mainly in the winter months November to April.

**Whiting** are also taken in mixed trawl fisheries in the Celtic Sea and the main gears used are otter trawls and seines. The French *Nephrops* trawlers have recently adopted a larger mesh size following by-catch restrictions and market demand for larger *Nephrops*. The main UK fisheries in the ICES Division VIIe-h are inshore between Newlyn and Salcombe and off the north Cornish coast, the bulk of the landings (>60%) being made between November and March. 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. Discarding of whiting can be considerable.

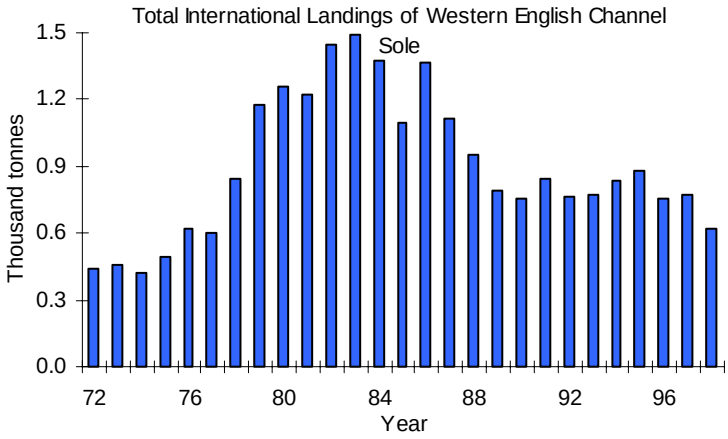
**Technical measures in force**

The minimum mesh size in the western English Channel and Celtic Sea is 80 mm for otter-trawls and beam-trawls and 70 mm for *Nephrops* trawlers. Panels of 75 mm square mesh are compulsory in all *Nephrops* fisheries in ICES Sub-area VII.

**Minimum landing size**

| | |
|---|---|
| Sole | 24 cm |
| Plaice | 27 cm |
| Cod | 35 cm |
| Whiting | 27 cm |

# SOLE in ICES Divisions VIIe (Western English Channel)

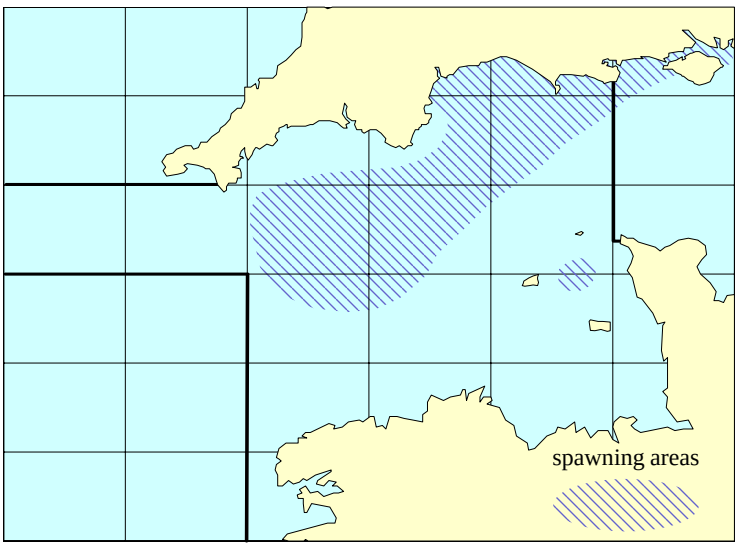



In recent years, English vessels have accounted for approximately 60% of the total landings of sole in the western English Channel. The proportion of the total landings that French vessels have reported has been increasing to its current level of 35%. Belgian vessels take the remainder of the catch. Landings of sole from ICES Division VIIe rose rapidly to a peak in 1983 and have since declined and remained relatively stable throughout the 1990s.

**The sole stocks in the Western English Channel**

The peak spawning period of sole in the western English Channel is during April and May. The main spawning areas are to the west of the Isle of Wight and in the vicinity of Hurd Deep. Plankton surveys in 1991 showed sole eggs to be generally more abundant in the eastern Channel than in the western Channel, where the highest densities were found in the Baie de St Michel, Start Bay and in mid-Channel. There are sole nursery grounds in estuaries, tidal inlets and shallow, sandy bays along the English and French Channel coasts. The overall density of juvenile sole is lower than in the eastern Channel, although they may be abundant in small western Channel nurseries such as the Tamar. Marking studies suggest that sole are resident in these nurseries for the first 2 years of their life.

Adult sole in the western Channel may recruit from local nurseries and from those in the eastern Channel, but there is no evidence for subsequent emigration from the western Channel. Recapture of tagged fish showed that adult sole seldom move distances of more than 50 miles and are frequently caught within 10 miles of their release position. Coupled with the localised spawning areas in the western Channel, this suggests that adult sole there are largely isolated from those found in northern Biscay, the eastern Celtic Sea and the eastern Channel.



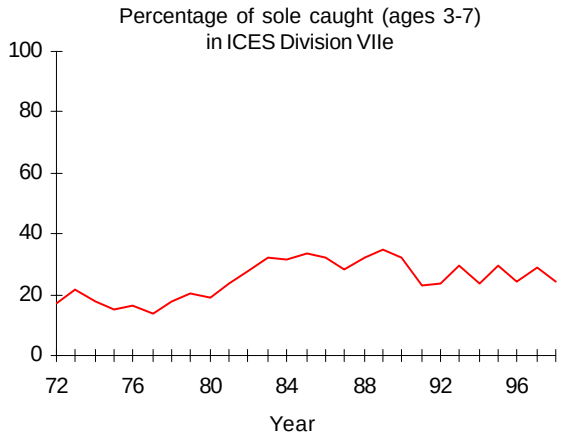

**Advice given by ICES Advisory Committee for Fisheries Management in October 1999**

ICES considers that the sole stock in the western English Channel is outside safe biological limits, and recommends that, in order to increase spawning stock biomass (SSB) above 2500 t, a reduction in fishing mortality of 30% is required: this corresponds to landings of 560 t in 2000.

As both sole and plaice are taken in the same fishery, any advice given for one species should take into account the implications for the other.

## EXPLOITATION

The proportion of the sole (ages 3 to 7) population caught annually (fishing mortality) gradually rose during the late 1970s and 1980s as the beam-trawl fleet increased. Fishing mortality on sole has declined in recent years to around 25%, but still remains higher than levels in the 1970s.

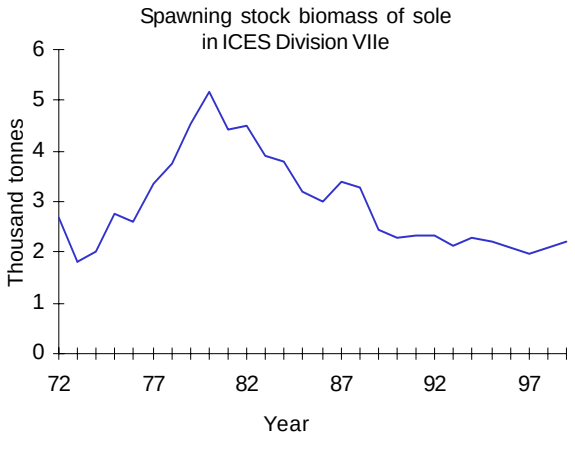



## RECRUITMENT

The abundance of juvenile sole showed an increasing trend between 1972 and 1984. Apart from the good 1989 year class, and poor 1992 and 1993 year classes, subsequent recruitment has tended to be around the long-term average.

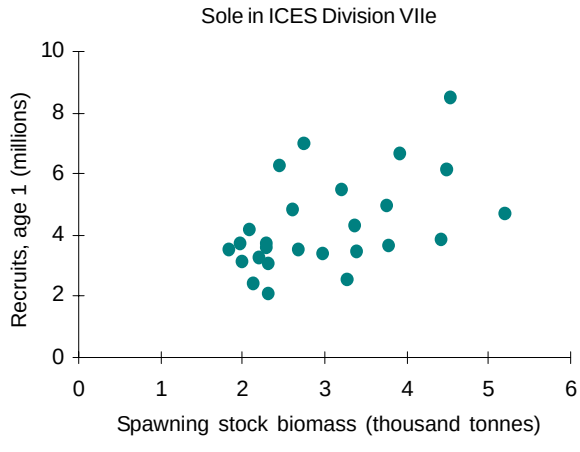

## SPAWNING STOCK BIOMASS

The spawning stock biomass (SSB - the weight of all mature fish) of VIIe sole peaked in 1979 as a result of good recruitment and relatively low fishing mortality. It then declined as exploitation increased and has remained at a low level since 1989.

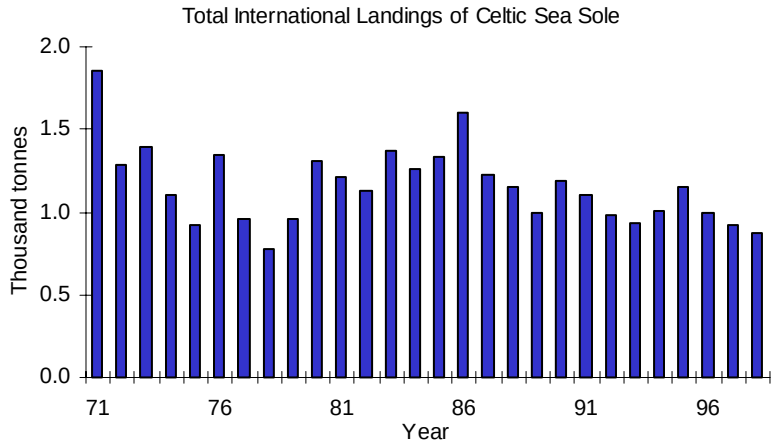



## STOCK AND RECRUITMENT

Examination of the relationship between the abundance of spawning adults and subsequent recruitment of one-year-old sole suggests that recruitment is reduced at levels of SSB below 2,500 t.



# SOLE in ICES Divisions VIIf&g (Celtic Sea)

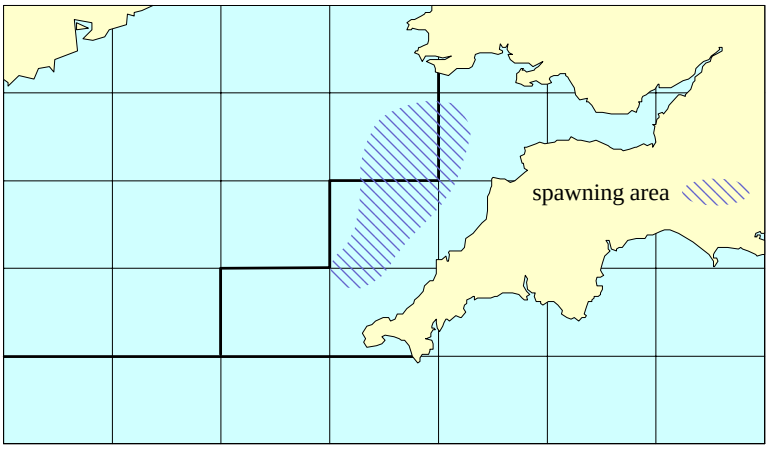



The fisheries for sole in the Celtic Sea and Bristol Channel involve vessels from Belgium as well as from countries bordering the area, with Belgium takes approximately 65%, the UK 23%, France 8% and Ireland 4% of the total landings of sole from ICES Divisions VIIf and g. Landings have declined steadily since the mid 1980s.

**The sole stocks in the Celtic Sea**

In the coastal waters of western England and Wales, sole are found in greatest abundance in the north eastern Irish Sea and the eastern Celtic Sea. The main spawning areas for sole in the Celtic Sea are in deep waters (40-75m) off Trevose Head, where spawning usually takes place between March and May. Sole nursery grounds are generally located in shallow waters such as estuaries, tidal inlets and sandy bays. Juvenile sole (0 and 1 year old fish) are found chiefly 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.

Over 6,000 sole were tagged on the nursery grounds of the Bristol Channel and the Irish Sea between 1977 and 1988. The majority of fish tagged in Swansea Bay and Carmarthen Bay were between 15 and 24 cm in length. Most of the recaptures of these tagged fish occurred two or more years after release, which meant that many fish tagged as juveniles were recaptured as adults. The majority of returned fish were reported off the north coasts of Devon and Cornwall, and over a wide area in the eastern Celtic Sea and St. George's Channel. These results suggest that once an adult sole has recruited to an area, it tends to remain there, and that there is only limited movement of sole between the Celtic Sea and adjoining areas.




**Advice given by ICES Advisory Committee for Fisheries Management in October 1999**

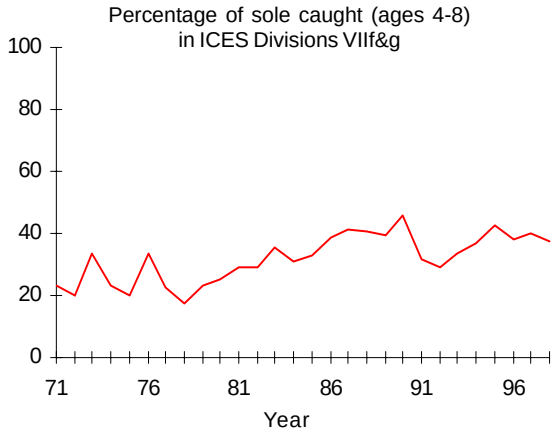
The stock is considered to be outside safe biological limits. Fishing mortality has increased since the late 1970s and is above the proposed precautionary level. SSB has declined steadily since the early 1970s, reaching a record low in 1998.

ICES recommends that the fishing mortality should be reduced below the proposed precautionary level, corresponding to a reduction of nearly 30%. This corresponds to landings of less than 1,160 t in 2000, and will promote an increase in SSB above the biological reference level in the short term.

Both sole and plaice are taken in the same fishery, therefore any advice given for one species should take into account the implications for the other.

## EXPLOITATION

The proportion of the sole (ages 4 to 8) population caught annually (fishing mortality) has risen steadily from the late 1970s to a peak in 1990 as more fishing vessels switched to beam trawling. The recent fluctuations are probably due to the amount of time spent by the beam-trawl fleets fishing in different TAC areas.

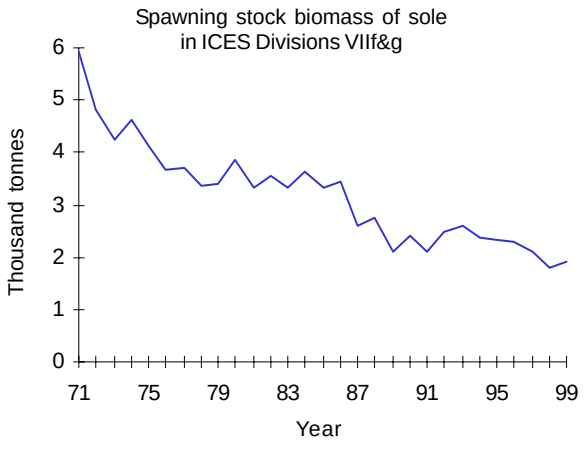



## RECRUITMENT

The abundance of juvenile sole has fluctuated about the average value without any trend, with the 1989 year class being nearly double the long term average. The 1997 year class is estimated to be the strongest in the time series at almost three times the long-term average.

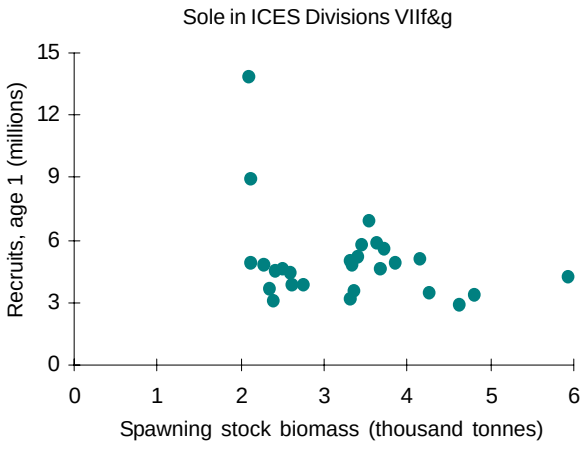

## SPAWNING STOCK BIOMASS

The spawning stock biomass (SSB - the weight of all mature fish) of VIIf&g sole has steadily declined since the early 1970s, reaching a record low in 1998.

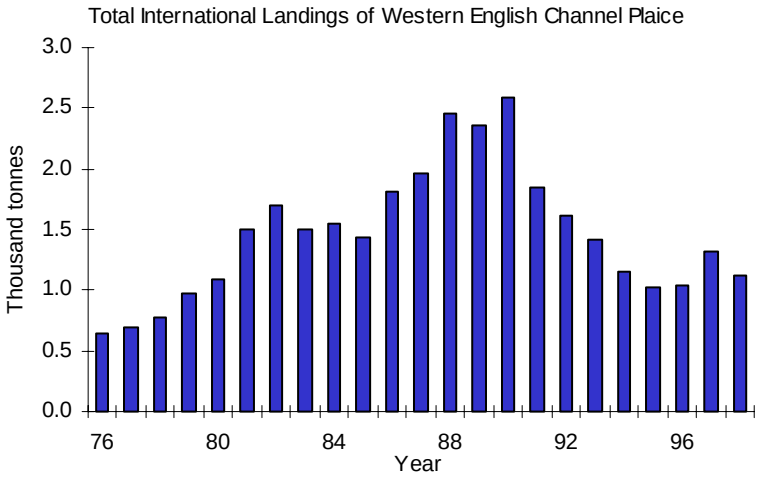



## STOCK AND RECRUITMENT

There is no evidence of reduced levels of recruitment at the lowest levels of SSB, and high recruitment has been observed at the lowest stock levels recorded.



# PLAICE in ICES Division VIIe (Western English Channel)

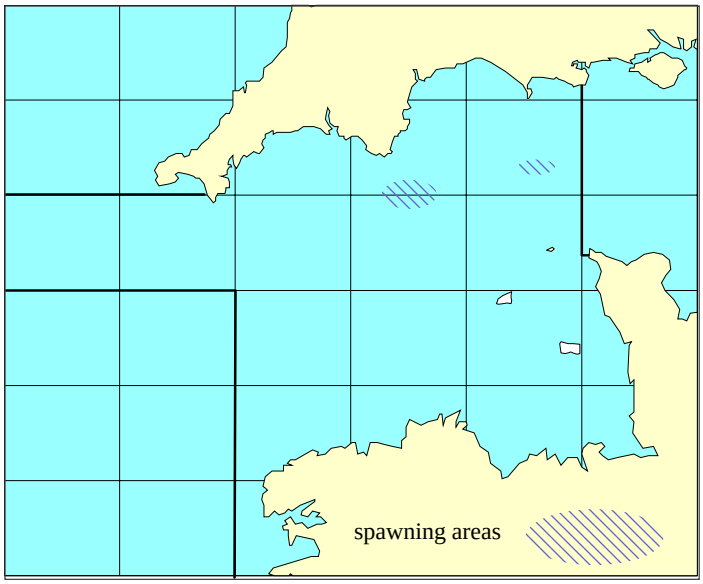



The fisheries taking plaice in the western English Channel mainly involve vessels from the bordering countries: English vessels account for about 72%, France 26% and Belgium 2% of the total plaice landings from ICES Division VIIe. Landings reached a peak of over 2,500 tonnes in 1990, since when they declined rapidly.

**The plaice stocks in the Western English Channel**

The main spawning areas for plaice in the western English Channel are south of Start Point and Portland Bill. Spawning takes place from December to March with a peak in January and February.

Between 1965 and 1976, over 5,500 plaice were tagged and released around Start Point. Analysis of the recapture data of plaice tagged whilst spawning in the Channel during January and February showed that 20% spent the summer in the western Channel, 24% in the eastern Channel, and approximately 56% migrated to the North Sea after spawning. However few of the plaice tagged in the western Channel during April and May were recaptured outside the Channel. This suggests there is also a resident stock which does not migrate to the North Sea after spawning in the Channel.



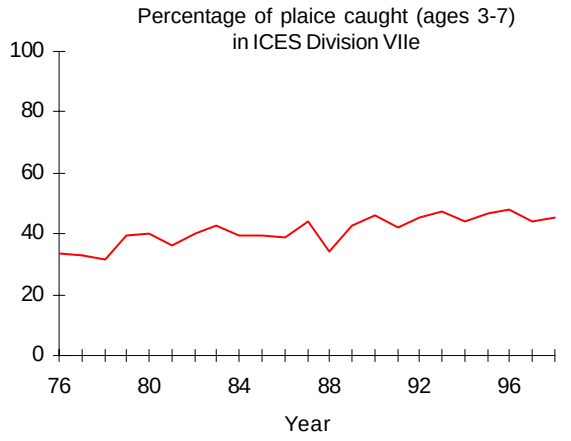

**Advice given by ICES Advisory Committee for Fisheries Management in October 1999**

ICES considers the stock to be outside safe biological limits. SSB peaked in 1988–1990, following a series of good year classes in the mid 1980s, but has declined rapidly to well below the biological reference level. Fishing mortality has been increasing throughout the assessment period, and is currently above the proposed precautionary level and close to record high levels. Recruitment has been low since 1989.

ICES recommends that fishing mortality in 2000 should be reduced below the proposed precautionary level, corresponding to catches of less than 1,080 t in 2000. A more substantial reduction in fishing mortality (40% corresponding to catches of less than 970 t) would be required to promote SSB above the biological reference level in the short term.

## EXPLOITATION

The proportion of the plaice (ages 3 to 7) population caught annually (fishing mortality) has risen gradually throughout the time series. Plaice landings have been declining throughout the 1990s, due to high levels of exploitation and a succession of below-average recruitments since 1989.

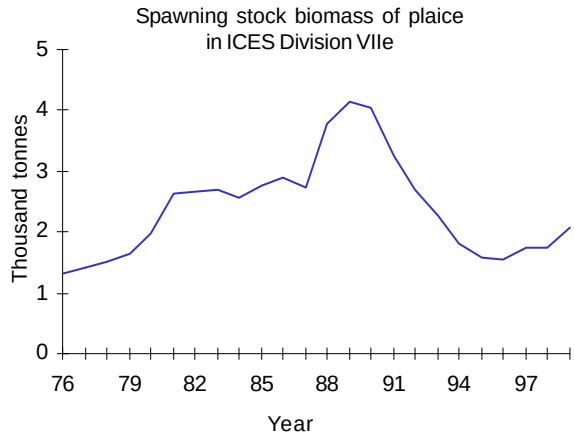



## RECRUITMENT

Levels of recruitment of juvenile plaice in VIIe have generally been below average since the strong 1985, 1986 and 1987 year classes.

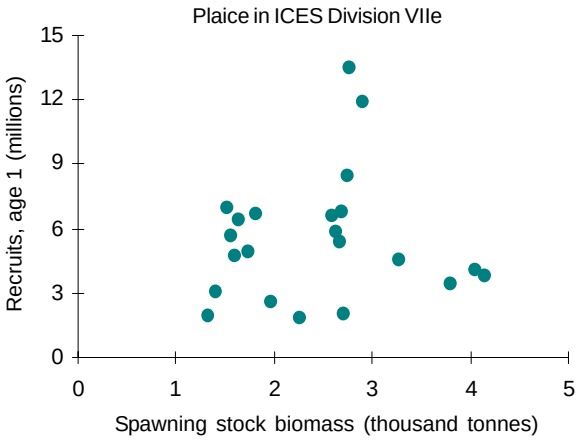

## SPAWNING STOCK BIOMASS

The spawning stock biomass (SSB - the weight of all mature fish) of VIIe plaice increased from 1976 and, due to a series of good year classes in the late 1980s, reached a peak in 1989-1990. SSB has since declined rapidly and was close to the lowest recorded level in 1996, though there has since been a recovery.

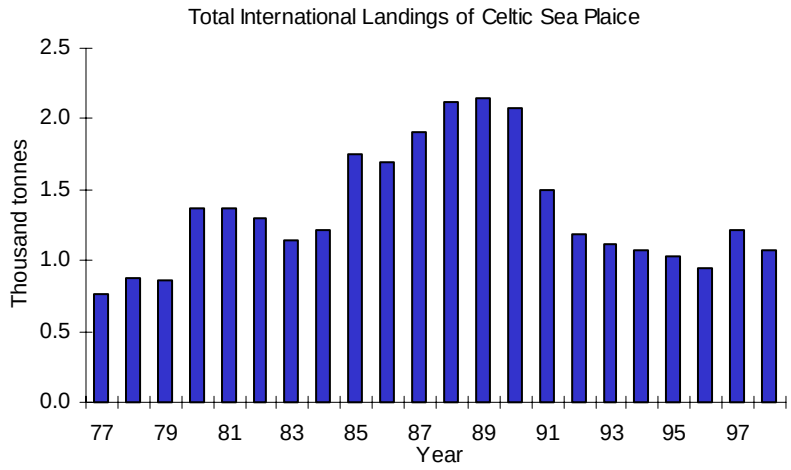



## STOCK AND RECRUITMENT

Examination of the relationship between the abundance of spawning adults and subsequent recruitment of 1 year old plaice suggests that recruitment tends to be reduced at SSB levels below approximately 2,500 t.



# PLAICE in ICES Division VIIf&g (Celtic Sea)



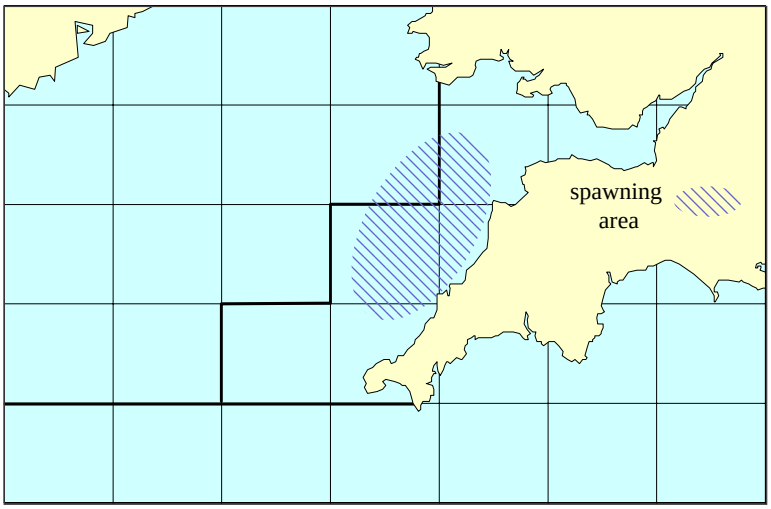

The fisheries taking plaice in the Celtic Sea mainly involve vessels from Belgium, France, England and Wales. Belgium accounts for 43%, France reports 28%, the UK about 16%, and Ireland accounts for the remaining 13% of the total landings of plaice in ICES Divisions VIIf&g. Landings of Celtic Sea plaice increased gradually in the late 1970s and throughout the 1980s and peaked in 1989, although landings in recent years have been around the long-term average level.

**The plaice stocks in the Celtic Sea**

The main spawning area for plaice in the Celtic Sea is about 20 to 25 miles off the north Cornish coast, in waters greater than 40 m in depth. Spawning takes place from December to March, with a peak during February and March.

During August and September 1993, over 2,000 juvenile plaice were tagged in Carmarthen Bay. The majority of the recaptured plaice were caught close to the release sites, but there is some evidence that fish from the South Wales coast join the adult population off the north Cornish coast during spawning.

Annual beam-trawl surveys carried out by CEFAS have found that, unlike in the Irish Sea, immature plaice up to 2 years old are not restricted to the shallow, inshore waters and may be found with the adults in water of 20-40 m depth.



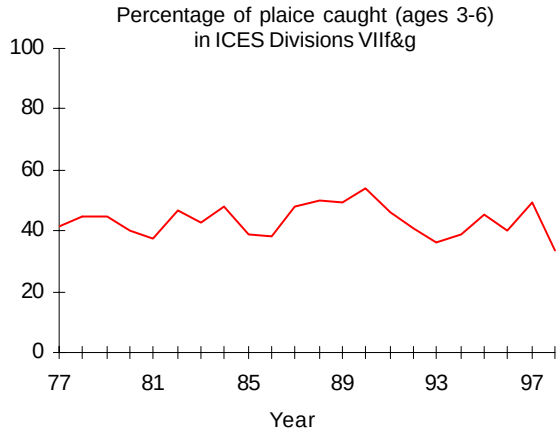

**Advice given by ICES Advisory Committee for Fisheries Management in October 1999**

ICES considers the Celtic Sea plaice stock to be outside safe biological limits. SSB has declined sharply since the peak value in the late 1980s and remained below the biological reference level since 1993. Fishing mortality is estimated to be above the proposed precautionary level. Recruitment since 1989 has tended to be well below average, and it is unlikely that SSB will increase in the short term at the current fishing mortality.

ICES recommends a reduction in fishing mortality of 30%, corresponding to landings of 700 t in 2000. This will result in fishing mortality in 2000 below the proposed precautionary level and an increase in SSB in the medium term. It is consistent with the reduction in fishing mortality recommended for sole which is the target species for the flatfish fishery in this area.

## EXPLOITATION

The proportion of the plaice (ages 3 to 6) population caught annually (fishing mortality) rose slowly between 1977 and 1990, and has since fluctuated around the mean of 45%.

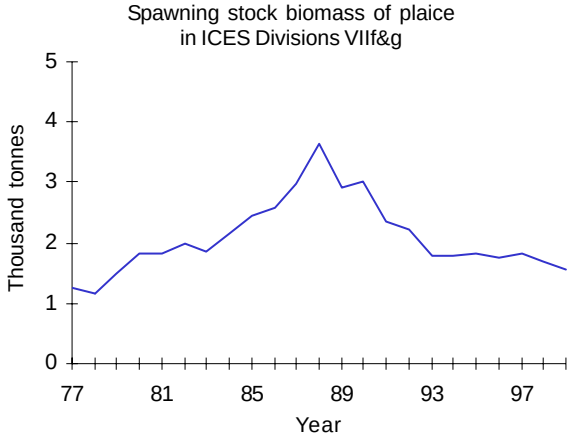



## RECRUITMENT

Abundance of one-year-old plaice in VIIf&g was generally high between 1983 and 1988, but since then recruitment has been relatively poor.

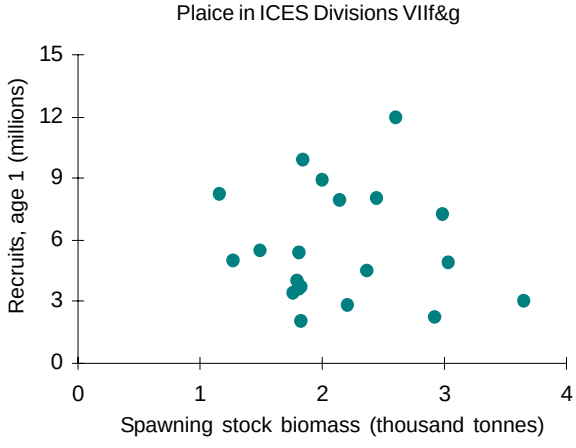

## SPAWNING STOCK BIOMASS

Following a series of good year classes in the mid 1980s, the spawning stock biomass (SSB - the weight of all mature fish) of VIIf&g plaice reached a peak in 1988, but has since declined to around the average level as a result of poor recruitment and high fishing mortality

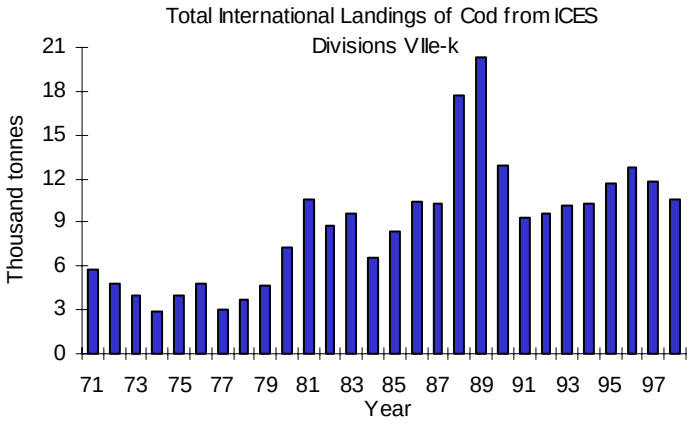



## STOCK AND RECRUITMENT

Examination of the relationship between the abundance of spawning adults and subsequent recruitment of 1 year old plaice shows no evidence that recruitment is reduced at low levels of SSB.



# COD in ICES Divisions VIIe-k (Western Approaches)




The fisheries taking cod in the western English Channel and Celtic Sea mainly involve vessels from France, which reports about 71% of the total landings of cod from ICES Divisions VIIe-k. Ireland accounts for about 16%, the UK (England and Wales) 9%, and Belgium the remainder. International cod landings reached a peak of 20,300 tonnes in 1989 and then decreased to around 9,000 t in 1991 as the strong 1986 year class was fished out. Landings then increased gradually to about 13,000 t in 1996 but have since declined slightly.

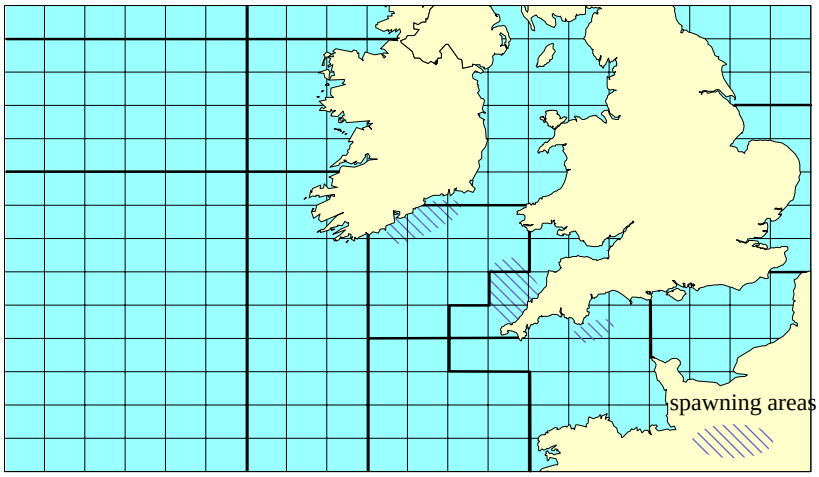
**The cod stocks in the Western English Channel and Celtic Sea**

Most cod spawning in the Celtic Sea occur off northern Cornwall in March and April. There is also some spawning off south-east Ireland, and a little in the western English Channel. After spawning, the cod larvae move with the prevailing currents into shallow coastal waters. Having grown to about 2 cm, young cod move to live near the seabed and, by late summer, they are concentrated in coastal waters.

Tagging studies have given no evidence of cod movement either east or west out of Division VIIe, where there appears to be a simple inshore-offshore migration between deep-water wrecks and reefs in the summer and inshore feeding areas in the winter.

Some cod tagged in the Celtic Sea have been returned from the Irish Sea, but most were recaptured in the area of release and there was no evidence of any movement into the Western Channel. Juveniles released off Land's End dispersed to the south and west and, by spring the following year, the maturing cod were well distributed in the Western Approaches and Celtic Sea. Tagged mature cod were subsequently found in the Trevose spawning area. Mature cod tagged off north Cornwall were recaptured along the west coast of Britain as far north as the Clyde, and some subsequently returned to the spawning area.

Some adult cod tagged off south-east Ireland in October demonstrated a rapid migration to the County Down spawning grounds in the Irish Sea. Many cod less than one year old when tagged in the north-east Irish Sea were recaptured in the Celtic Sea during the first year after release, though some were subsequently recaptured during January to April on the spawning areas in the northern Irish Sea.




This suggests that most cod in the eastern Celtic Sea regularly return to the spawning area off north Cornwall, though a small component of cod landings from the Celtic Sea are fish which spawn in the Irish Sea.

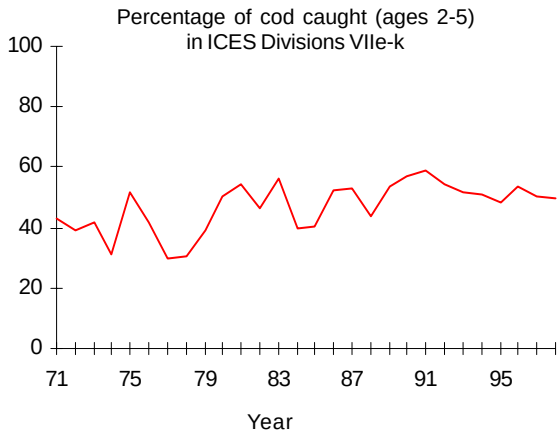
**Advice given by ICES Advisory Committee for Fisheries Management in October 1999**

ICES considers the stock to be harvested outside safe biological limits. Fishing mortality is above the proposed precautionary level. SSB has fluctuated and at present is estimated to be above the proposed biological reference level. Most recent year classes have been above average.

ICES recommends that fishing mortality should be reduced below the proposed precautionary level, corresponding to landings of less than 7,600 t in 2000. This represents a reduction in fishing mortality of at least 17%. This would give a high probability of maintaining SSB above the biological reference level in the short and medium term (10 years).

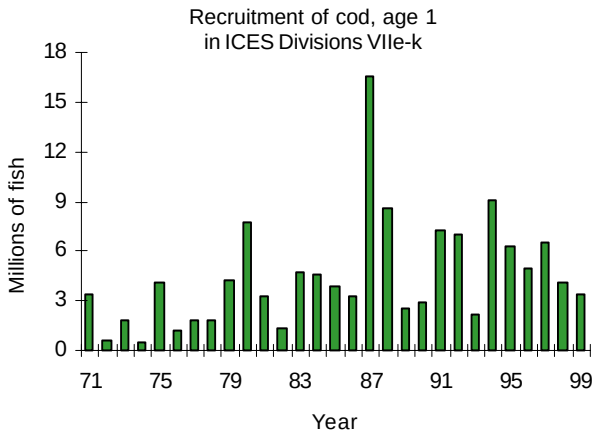
## EXPLOITATION

There was an increase through the 1970s and 1980s in the proportion of the VIIe-k cod (ages 2 to 5) population caught annually (fishing mortality). Since 1991, fishing mortality has declined somewhat but still remains high (at around 50%), and good year classes are fished out rapidly.



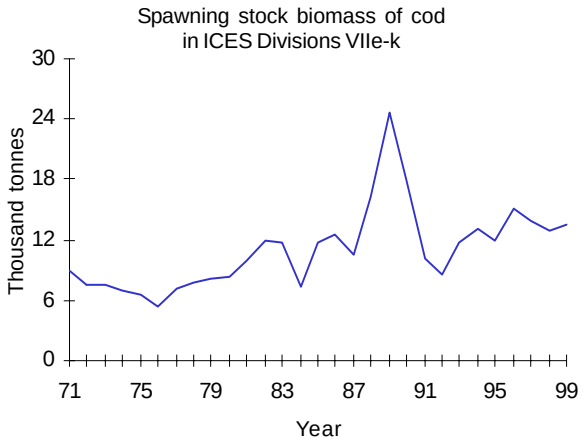

## RECRUITMENT

Recruitment of juvenile cod to this stock varies widely. The 1986 year-class was the highest of the time series, and subsequent year-classes have fluctuated around the series average.



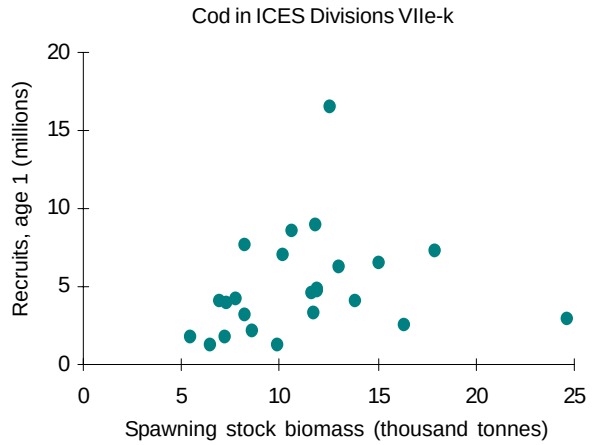

## SPAWNING STOCK BIOMASS

Spawning stock biomass (SSB - the weight of all mature fish) of VIIe-k cod has increased steadily since 1976, and peaked in 1989 due to recruitment of the strong 1986 and 1987 year classes.

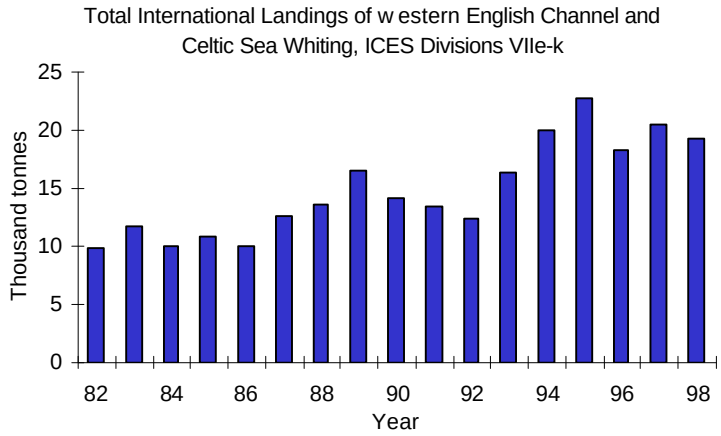



## STOCK AND RECRUITMENT

High fishing mortality on VIIe-k cod makes the SSB fluctuate widely, depending on the strength of recruitment from incoming year-classes. There is some evidence of reduced recruitment at SSB levels below 8,000 tonnes.



# Whiting in ICES Divisions VIIe-k (Western Approaches)

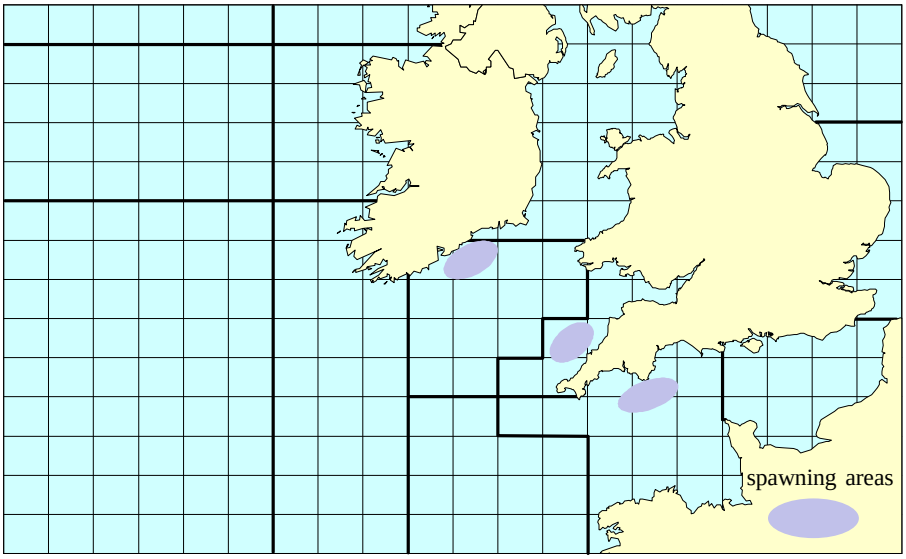



The fisheries taking whiting in the western English Channel and Celtic Sea mainly involve vessels from France, which report about 62% of the total landings of whiting from ICES Divisions VIIe-k, Ireland reports 27% and the UK (England and Wales) 9%, while Belgian vessels take less than 2%. Landings have generally increased since 1982, with peaks in 1989 (16,540 t) and in 1995 (22,680 t).

**The whiting stocks in the western English Channel and Celtic Sea**

The main spawning areas of whiting in the Western Channel and Celtic Sea are off Start Point, off Trevose Head and south-east of Ireland. The spawning season is from February to May, and the larvae are found in mid-water before moving to live near the seabed by September. For the next two years, juvenile whiting are found in shallow coastal and estuarine areas, being particularly abundant around Start Point. Nearly 4000 adult whiting were tagged and released off Start Point during August 1958 and 1960. Most returns were within three months of release and showed little indication of movement. Subsequent recaptures indicated more movement of whiting into the Celtic Sea than between the western and eastern Channel. Whiting released in the summer months between 1957 and 1961 near Carmarthen Bay moved south and west towards the two spawning grounds off Trevose and south-east of Ireland. There was no evidence of emigration out of the Celtic Sea area.

Returns of whiting tagged and released in the County Down spawning area in the Irish Sea show more movement south into the Celtic Sea than north to the west of Scotland.



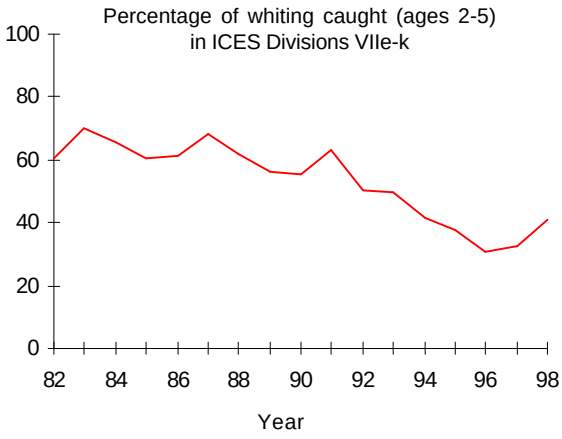

**Advice given by ICES Advisory Committee for Fisheries Management in October 1999**

ICES considers the western English Channel and Celtic Sea whiting stock to be within safe biological limits. The SSB reached a record high in 1995 and has decreased since then, but remains above the proposed biological reference level. Fishing mortality on this stock has displayed a declining trend since the beginning of the assessment period.

Whiting is taken together with cod in mixed fisheries and, based upon the advice on cod, ICES recommends a 17% reduction in fishing mortality. This would correspond to landings in 2000 of less than 13,100 t. This would keep SSB above the proposed biological reference level with a high probability in the short term.

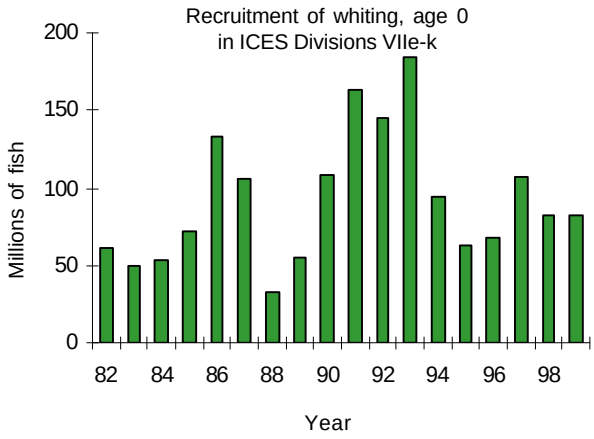
## EXPLOITATION

The proportion of the whiting (ages 2 to 5) population caught annually (fishing mortality) in VIIe-k has gradually declined over the period 1983-96, but appears to have increased in 1997 and 1998.



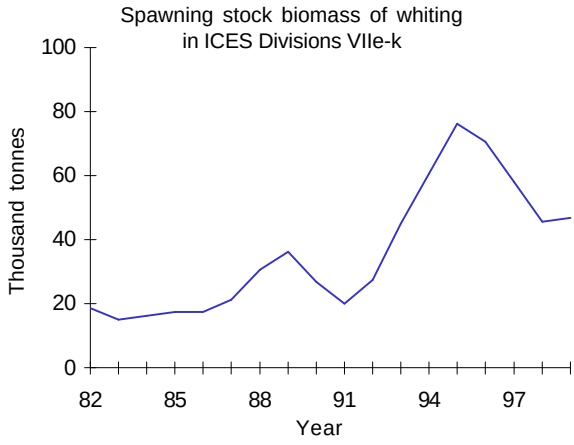

## RECRUITMENT

Levels of recruitment of juvenile whiting in VIIe-k have shown two distinct peaks (1986-87 and 1991-93) followed by two periods of low recruitments. Recent year classes are around the series average.



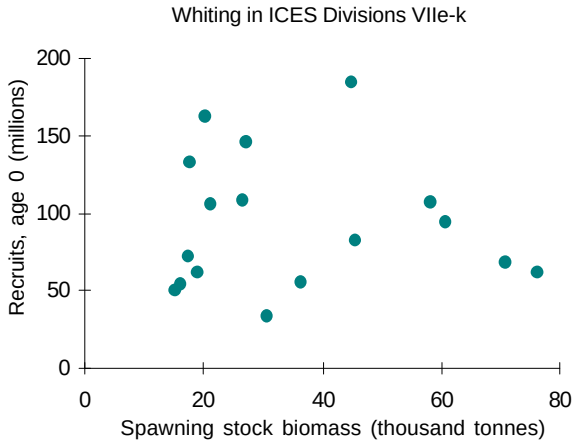

## SPAWNING STOCK BIOMASS

The spawning stock biomass (SSB - the weight of all mature fish) of VIIe-k whiting increased to a high in 1994-96, due to the strong 1991, 1992 and 1993 year-classes. Since then it has fallen rapidly.




## STOCK AND RECRUITMENT

The SSB of VIIe-k whiting fluctuates considerably, depending on the strength of recruitment from incoming year-classes. There is no indication of reduced recruitment at low levels of SSB.



CEFAS
The Centre for Environment, Fisheries & Aquaculture Science

**The Centre for Environment, Fisheries & Aquaculture Science**
**Lowestoft Laboratory, Pakefield Road,**
**Lowestoft, Suffolk NR33 0HT UK**
**Tel: +44 (0) 1502 562244**
**Fax: +44 (0) 1502 513865**
**http://www.cefas.co.uk**