

Pleuronectes platessa

Plaice (*Pleuronectes platessa*) is the United Kingdom's most popular commercial flatfish and accounts for the greatest landings weight (97,000 tonnes (t) in 2011(1)) of the flatfish species in Europe. In 2011, 4,000 t of plaice was landed into UK ports, with a first-sale value of £5.1 million (2). In 2012, UK consumption of all plaice products was 1,900 t with a value of £22 million (3). This equates to around 6,000 t of whole fish or around 6% of world consumption. Plaice is purchased fresh, chilled or frozen and obtained from the UK and other European countries such as Holland as well as from Iceland. Plaice is not suitable for aquaculture, giving relatively poor returns on investment. The similarly-named American plaice (*Hippoglossoides platessoides*) is a separate species and should not be marketed as plaice in the UK.

The North Sea (which yields around 80% of the European catch of plaice) and western English Channel plaice stocks are inside safe biological limits. There is a management plan (4) implemented for the North Sea stocks of plaice and sole (which are caught together) aimed at improving long-term yields and reducing the risk of stock depletion. Four fisheries landing plaice from the North Sea are currently MSC certified (5). Of the other major stocks, plaice in the Skagerrak-Kattegat (yields approx. 9,000 t per

annum) and Baltic (approx. 3,000 t pa), and the Icelandic stock (approx. 6,500 t pa), appear to be increasing. The eastern English Channel stock (approx. 4,000 t pa) and those in the Celtic Sea (150 t pa) and Irish Sea (600 t pa) shows signs of recovery after a period when the stocks were depleted.

The purpose of this guide is to outline the status of plaice stocks and describe some of the measures which are being taken to protect them.

BUYERS' TOP TIPS

Know your source of supply and stock status

Biological stocks are distinct populations with different spawning areas, though there may be some mixing between them. Plaice is divided into 'management stocks' which mostly coincide with biological stocks. These areas contain the main fisheries. Find out the management stock from which the fish has been caught.

An informed buying policy

Buyers need an informed approach to stock status and management. Although some plaice stocks are considered at risk of depletion, there remain legal fisheries on them. In these situations, managers have judged that a restricted fishery can remain open.

Seafish Responsible Sourcing Service

This is one of a series of Responsible Sourcing Guides produced by Seafish to give information on sustainability issues.

This links to other sources of information and the Responsible Fishing Scheme (BSi: PAS 72:2006), aimed at ensuring best quality and environmental practice onboard vessels.

For further guides and information see:

<http://tinyurl.com/seafishrsg>

Status of plaice stocks March 2013

Assessment

The International Council for Exploration of the Seas (ICES) conducts annual analytical assessments on only two of the eleven main plaice stocks. The use of assessment models is severely limited by the lack of reliable information on the number of plaice at each age in the catch of the commercial fishery, though data collected by fishery-independent trawl surveys are used to indicate abundance trends for many plaice stocks. In these circumstances, ICES provides advice based on its approach to data-limited stocks. This uses trends in abundance indices from research surveys and commercial catches to set a Total Allowable Catch (TAC) based on recent landings. Precautionary measures are included in the method where there is uncertainty.

Research

Research on plaice biology has a long history, with some studies of migrations dating back to the early years of the twentieth century. Small plaice are most common in inshore areas, such as sandy bays and estuaries. They migrate further offshore as they grow older, so that larger plaice tend to be found in deeper water (6).

Scientists have started to use egg surveys to make independent estimates of plaice spawning stock biomass (SSB) – the total weight of mature plaice in the stock. Research surveys are used to estimate the numbers of planktonic eggs produced over the whole of the spawning area throughout the spawning season. This is related to the number of eggs produced per kg of spawning

fish, to estimate the SSB. Regular assessments have been conducted in the Irish Sea and the results are used to give management advice on the VIIa plaice stock (7).

Table 1 gives an overall picture of the status of, and advice for, North Atlantic plaice stocks. It shows the major fisheries, the catch limits or TAC for each stock in 2013 and the corresponding scientific advice given by ICES.

Maximum Sustainable Yield (MSY) and the Precautionary Approach (PA)

Current ICES advice on plaice stocks is given on the basis of MSY and the precautionary approach (8). MSY means fishing at a level that takes the maximum catch (yield) that can safely be removed from a fish stock, on a continuous basis, whilst maintaining its long-term productive capacity, and is achieved by keeping the stock above the biomass action point $MSY_{Btrigger}$. The precautionary approach aims to limit fishing mortality (F) and catches to levels that avoid depleting the stock's reproductive capacity, keeping its SSB above its biomass reference level (defined as B_{pa}).

These concepts are illustrated in the schematic (Fig. 1), which shows how catches from an unfished stock would increase in line with exploitation (or fishing mortality, F), up to a point where the total mortality on the stock causes so many fish to be caught at a relatively small size (and discarded or landed) that the potential production of the stock due to growth of individual fish is not realised ('growth overfishing'). The peak of

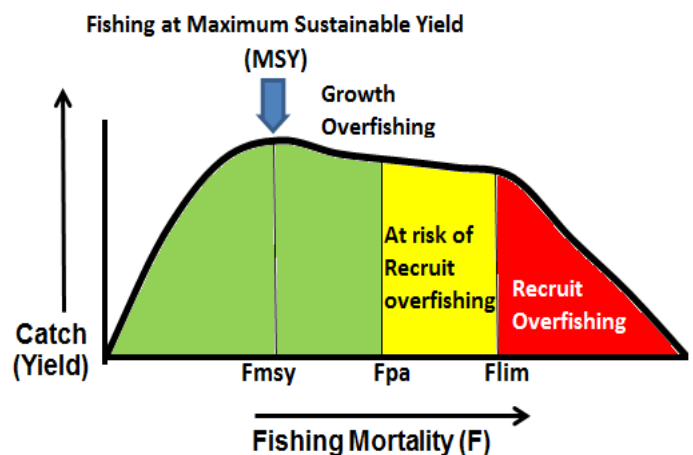
this curve represents MSY and indicates where F_{MSY} lies.

However, providing sufficient fish survive to become adults and spawn, they may still have the reproductive capacity to replace themselves. Stock collapse can occur when fishing mortality reaches a level (F_{lim}) such that removals from a stock are so high, and its spawning capacity is so diminished, that fewer and fewer juveniles are produced. So, not only is the size of the stock being reduced by too high a level of exploitation, but there are fewer juvenile fish to replace those that are caught, and stock levels are likely to fall even lower ('recruit overfishing'). The yellow area between the green (inside safe limits) and red (outside safe limits) zones in the schematic and stock trajectories (Figs 2 & 3, pages 6 & 7) represents levels of F or SSB that management should seek to avoid to ensure that the stock has a high probability of remaining sustainable.

Scientific advice given under the twin MSY/precautionary approach strategy will aim to either achieve catches consistent with

fishing levels that would result in F_{MSY} , or reduce fishing mortality to return the stock to within safe biological limits ($> B_{pa}$). For many fish stocks, including plaice fisheries in the North Sea, parties exploiting the stock have management plans, and ICES also provides advice on catches compatible with such plans.

Figure 1 Schematic of ICES' MSY and PA reference points in relation to fishing mortality and Yield



Organisation key

ICES: International Council for the Exploration of the Sea. Responsible for providing scientific advice for North East Atlantic fishery management.

EU: The European Union is responsible for fisheries management within its Exclusive Economic Zone.

FAO: The Food and Agriculture Organisation of the United Nations aims to achieve food security for all and ensure people have regular access to enough high quality food to lead active, healthy lives. FAO acts as a neutral forum for nations meet as equals to negotiate agreements and debate policy.

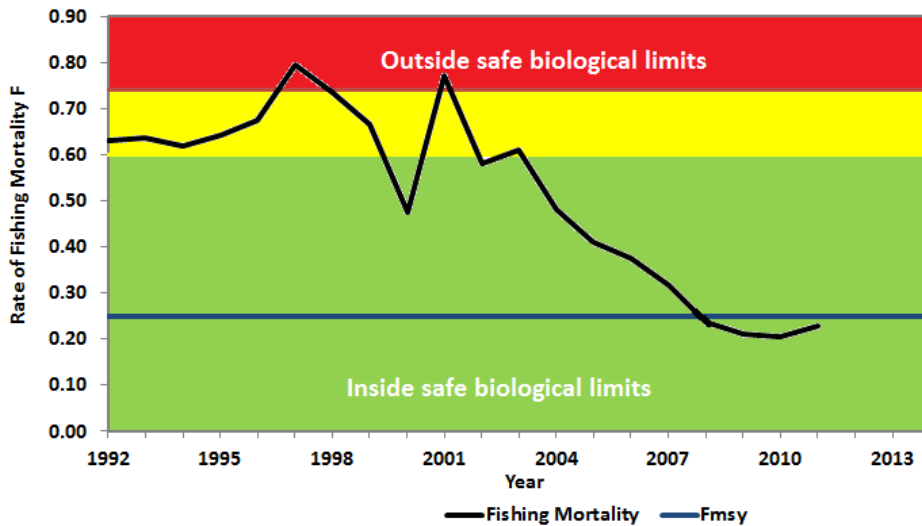
MRI: Marine Research Institute. Responsible for providing scientific advice for Icelandic fishery management.

MSC: The Marine Stewardship Council is an independent, non-profit organisation that promotes responsible fishing practices and certifies sustainable fisheries.

Table 1: Management Stock (colour coded to Fig 4)	Agreed TAC 2013 (t) (10)	Advisory TAC 2013 (t)	Scientific advice and management (June 2012 ICES advice) (7)
EUROPEAN PLAICE STOCKS (<i>Pleuronectes platessa</i>) www.ices.dk			
Inside safe biological limits			
ICES IV North Sea	90,070 (consistent with MSY)	97,070 under EU mg'tment plan	Recruitment of young fish has been around the long-term average since 2007 and the stock has reached its highest recorded level. Fishing mortality has declined since 2002 to just below F_{MSY} . An EU multi-annual management plan for North Sea plaice and sole came into effect 1 January 2008 (4) and has been evaluated by ICES as being precautionary. ICES advice for landings in 2012 is given on this basis, noting that a transition to the second stage of the plan should be arranged since both North Sea plaice and sole have now been within safe biological limits for three consecutive years. Four fisheries landing plaice from the North Sea are currently MSC certified (5).
ICES VIle western English Channel	6,400 Combined with VIId	2,100 (advisory catch VIle +VIId = 6,400)	SSB has increased to above $MSY_{Btrigger}$ in the last three years due to recruitment of the strong 2008 year class. Fishing mortality has reduced since reaching a peak in 2007, but remains well above F_{MSY} . ICES' advice is given on the basis of transition to the MSY approach. The recent dynamics of the stock has led ICES to revise $MSY_{Btrigger}$.
Reference points not defined			
ICES VIId eastern English Channel	6,400 Combined with VIle	4,300 (advisory catch VIId & VIle = 6,400)	The assessment is indicative of trends only and reference points are not defined. SSB declined since the 1990s to a record low in 2003–2008 and has subsequently increased with recruitment of the strong 2008 year class. Fishing mortality has declined since the mid 1990s and is presently among the lowest in the time-series. ICES' advice is based on its approach for data limited stocks, and recommends that discarding should be reduced.
ICES Sub-division 20 Skagerrak -	9,142	<8,400 No directed fisheries Eastern Skagerrak. Bycatch and discards to be minimised.	This is the first time ICES has advised separately on plaice in Skagerrak, where there are two components which show different trends in SSB. The Western component (normally constitutes at least 90–95% of the total catches) and is closely related to the North Sea stock, shows an increasing trend in the last 5 years, whilst the Eastern component's abundance index has declined rapidly in recent years. Fishing mortality is unknown, and there are no reference points. ICES advice is based on its approach for data-limited stocks. A joint EU–Norway long-term management plan is being developed for plaice in the Skagerrak.
ICES Sub-divisions 21 Kattegat	1,800 (Kattegat only Sub div 21)	1,800	This is the first time ICES advises on plaice in the Kattegat, the Belt Sea (Sub div 22) and the Sound (Sub div 23), although the agreed TAC relates to Kattegat only. An exploratory assessment indicates that fishing mortality has dropped since 2006, and SSB has been increasing since 2009, but there is considerable uncertainty because of the short time-series available. ICES advice is based on its approach for data-limited stocks.

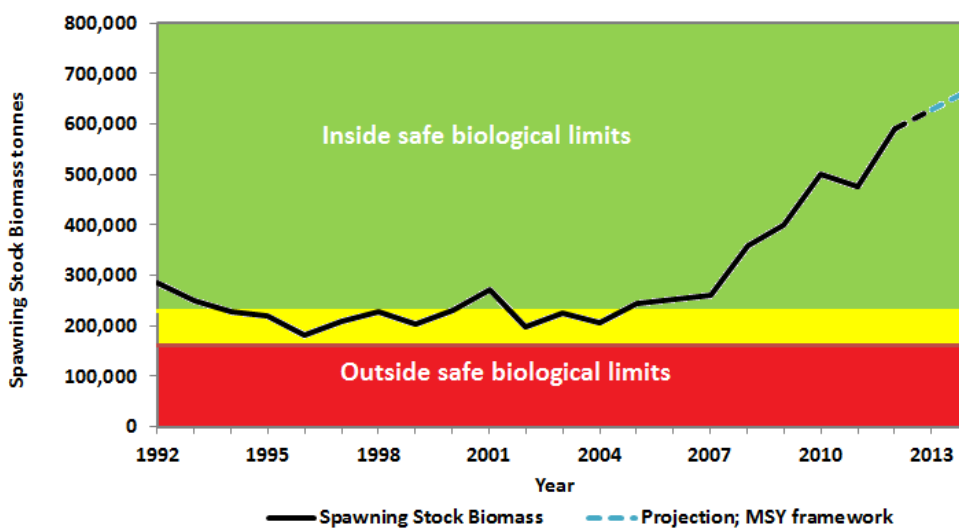
Table 1: Management Stock (colour coded to Fig 4)	Agreed TAC 2013 (t) (10)	Advisory TAC 2013 (t)	Scientific advice and management (June 2012 ICES advice) (7)
ICES Baltic 22 - 32	3,409 (includes Sub div 22 and 23)	900	The advice relates to Sub div 24-32 but the TAC includes Sub div 22 and 23. Landings have declined slightly since 2009, though a steady increase in abundance has been observed in surveys since the early 2000s (by about x5). ICES' advice is based on its approach for data-limited stocks.
ICES Va Icelandic waters	6,500 Sept 2012- Aug. 2013	6,500	Surveys suggest improved recruitment in the last few years and assessments indicate increasing biomass since the historic low in 2000/01, whilst fishing mortality has been decreasing. The MRI recommends that the catch should not exceed 6,500 t in the quota year 2012/2013 and that regulations regarding area closures on spawning grounds remain in effect (9).
ICES VIIa Irish Sea	1,627 (as last three years)	490	The assessment is indicative of trends only (commercial catch data are uncertain due to high rates of discarding) and reference points are not defined. The available information from surveys and annual egg production estimates show an increase in stock size since the mid-1990s to a stable level since 2002. It is inferred that recent fishing mortality is low and stable, having declined since the early 1990s. ICES' advice is based on its approach for data limited stocks.
ICES VI, Vb (EC waters only)	658		No assessment, precautionary TAC only.
ICES VII f-g Celtic Sea	369 (as last year)	<360	The assessment is indicative of trends only (uncertainty due, in part, to the high rate of discarding) and reference points are not defined. Recruitment has been fluctuating without clear trend in recent years and, though SSB has increased since 2004, it is considered to be well below historic levels. Fishing mortality remained stable from 2000, but increased in 2011 and is considered to be well above levels that would achieve MSY. ICES advice is based on its approach for data limited stocks, and recommends technical measures to reduce discarding.
ICES VII h-k South west of Ireland	141	<100	There is no analytical assessment and the state of the stock is unknown. However, recent landings have been near the historic low, and estimates suggest the stock is being fished above MSY. ICES' advice is based on its approach for data limited stocks, and recommends by-catch and discards should be reduced.
ICES VIII and IXa (EC waters)	395 (as last year)	Not quantifi ed	The available information is insufficient to evaluate stock trends or exploitation status. ICES' advice, based on its approach to data-limited stocks, is that catches should decrease by 20% in relation to the last three years average. Due to the uncertainty in the landings data, ICES is not able to quantify the resulting catch.
ICES VIIb, c West of Ireland	74	30	Recent landings have been near the historic low, but the catch statistics are not considered reliable indicators of abundance and the stock status is unknown. ICES' advice is based on its approach for data limited stocks.
ICES Vb Faroese waters	Effort limits Catch <20 pa (11)		Faroe plaice are captured in a tightly controlled fishery using selective otter trawls, within a grid for reducing whitefish by catch. Research vessel catch per effort over the past decade is consistent with a sustainable exploitation pattern.

Figure 2: Fishing mortality trajectory North Sea plaice (Sub Area IV). ICES 2012 assessment.



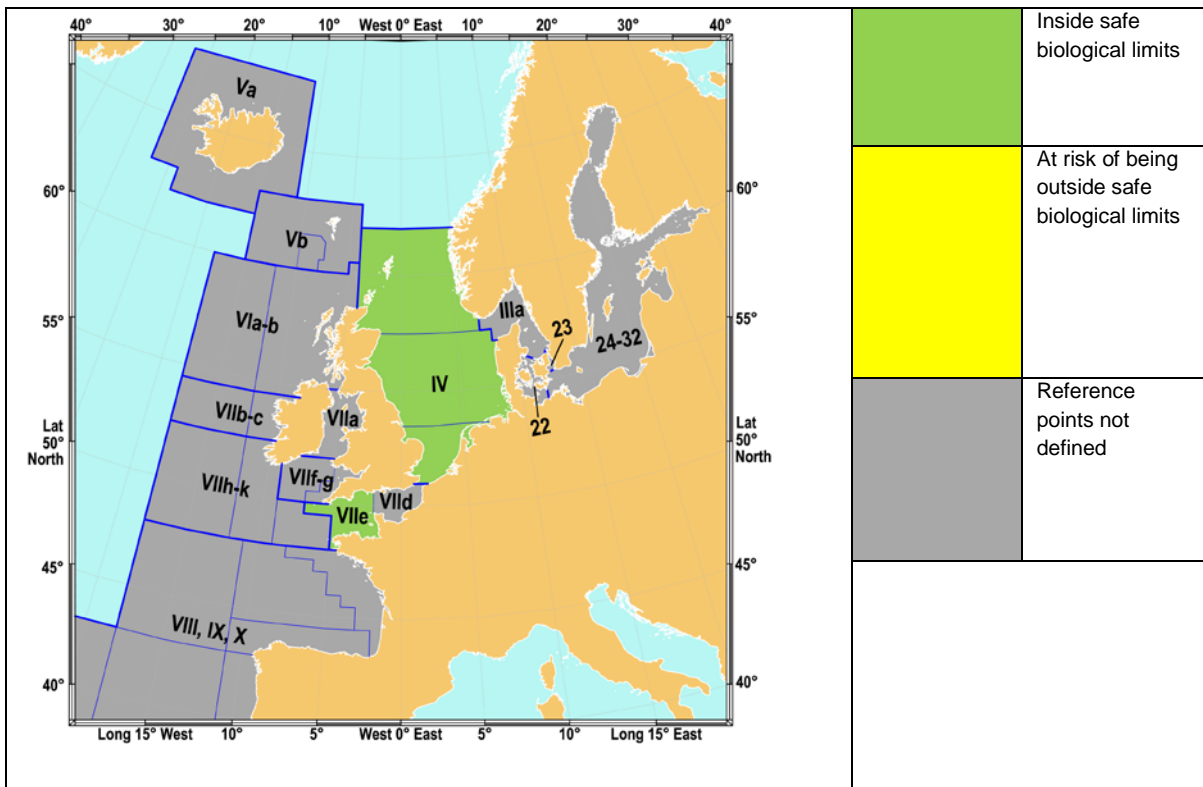
The stock has been exploited sustainably since 2003 and is now exploited at a rate close to the estimated F_{MSY} (at 0.25 - blue line).

Figure 3: Spawning Stock Biomass (SSB) trajectory of North Sea plaice (ICES Sub area IV). ICES 2012 assessment.



$MSY_{Btrigger}$ and B_{pa} are at 230,000 t and the safe biological limit (B_{lim}) is at 160,000 t. The stock has been inside safe biological limits since 2005 and the SSB has continued to rise since then. The projection indicates that this trend will continue, based on the agreed TAC for 2013, which is compatible with the MSY framework

Figure 4: Management stocks of European plaice (colour keyed to Table 1)



Management and conservation measures

Plaice fisheries

Plaice are caught predominantly in mixed fisheries using demersal towed gears, otter trawls, beam trawls and anchor seines. Of these, anchor seines can probably be regarded as the most specialised for targeting plaice.

In most beam-trawl fisheries, plaice is targeted along with sole, thus the management of these species is closely linked. When the primary target is sole, beam trawlers are permitted to use cod-end mesh sizes of 80 mm. Although this provides good selectivity of sole, a much larger mesh size would be more suitable for plaice because of its wider body shape. This leads to discarding

of undersized and less marketable small plaice. Changes in the spatial distribution of fisheries, due to reductions in TACs, restrictions in the number of days at sea and fuel price rises, have resulted in a concentration of fishing effort in the southern North Sea, where aggregations of juveniles and adult spawning plaice are found. In heavily fished stocks, the juvenile fish will constitute the most abundant group in the stock, and are likely to be targeted. Where adult plaice are targeted using beam trawls in the northern North Sea, larger cod end mesh sizes of 100 mm (N. of 55°N, E. of 5°E) and 120 mm (N. of 56°N) are used (12), and plaice discards are much lower.

Spatial management

Conservation of plaice stocks is closely bound up in the management of inshore and estuarine areas, which are the preferred habitat of juvenile plaice. Within the 12-mile limits of UK and Irish waters, beam trawlers are restricted to a maximum aggregate beam length of 9 m and a maximum power of 221 kW, which also applies within the North Sea 'plaice box' (see Figure 5 and ref. 13). An increase in beam trawling above 1998 levels is not allowed in these areas. There are also areas, such as the Kattegat, where beam trawling is banned.

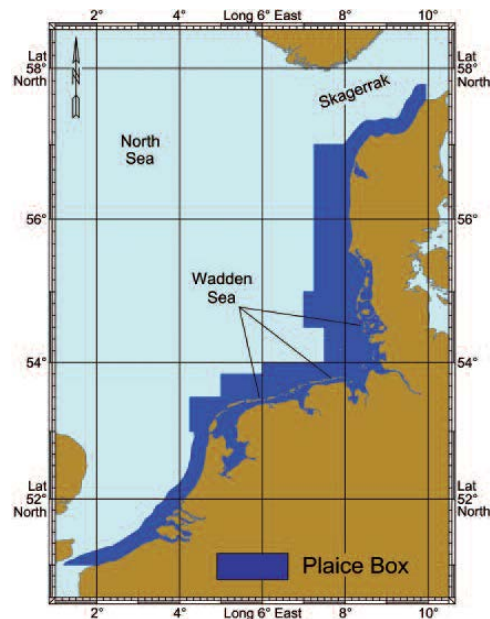
The 'plaice box'

The 'plaice box' is an important aspect of plaice conservation in the North Sea. It was established in 1989 and closed fully to beam trawlers of >221 kW (300 HP) in 1995, since when beam trawl effort in the box has been reduced by 90%. Although the distribution of juvenile plaice has changed since its inception, some 70% of the juvenile North Sea plaice population is found within the box. Given changes in the North Sea fleets' fishing power and its distribution, it is difficult to estimate to what extent the box has helped plaice stocks. Nature conservation initiatives in the Wadden Sea and along other coastlines should also benefit the habitats for juvenile plaice.

Management plan

In January 2008, a multi-annual management plan for plaice and sole came into effect in the North Sea (4), defining target levels of fishing mortality. This is designed to improve yields in the long term and aims to reduce biological risk to the stocks. Fishing mortality has been reduced by 10% year on year and the target levels have now been reached. ICES considers this plan to be precautionary and, noting that both North Sea plaice and sole have now been within safe biological limits for three consecutive years, recommends a transition to the second stage of the plan, with the aim of exploiting the plaice and sole stocks at MSY.

Figure 5: The 'plaice box' and 12-mile zone along the east coast of the North Sea where measures are taken to protect juvenile plaice.



Technical measures

Shrimp trawl fisheries using small-meshed nets occur in inshore and estuarine areas where juvenile fish, including plaice, live. Regulations have been introduced to compel the use of technical measures to reduce the by-catch of juvenile fish in this fishery (13). If successful, it is estimated that an increase in catch of adult plaice of around 15% could result (14).

Product characteristics and seasonal cycles

Plaice is a demersal flatfish species which ranges in size up to 4 kg and can live for 40 years. The species is easily identified by distinctive orange spots which also give an indication of the freshness (the brighter the spots the fresher the plaice).

Plaice undergo a seasonal spawning cycle (see the table below and ref. 15) which causes the condition and quality of the fish to vary: the flesh is thin and watery during and after spawning. Timing of spawning depends on the stock, so local knowledge is important.

	J	F	M	A	M	J	J	A	S	O	N	D
Irish Sea												
Scottish East Coast												
Flamborough												
Southern North Sea												
German Bight												
Southwest Baltic & Kattegat												
Faroes												
Iceland												
			Spawning					Peak spawning				

Supply chain standards

Responsible practice in the chilled and frozen supply chain depends on correct catching, gutting, washing, chilling or freezing, processing and handling practices throughout the chain. There are standards which cover these aspects from capture to retailer:

- **Seafish Responsible Fishing Scheme.** Sets best practice standards for fishing vessels, based on British Standards Institution specifications (BSi: PAS 72:2006) (16);
- **British Retail Consortium (BRC) Global Standard & Safe & Local Supplier Approval (SALSA) certification.** Designed to raise standards in the seafood processing and wholesaling sectors.

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*European legislation available on: <http://europa.eu/>

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