



Thornback Ray *Raja clavata* IMAGE © Marc Dando

Skates and rays comprise a large group of fish, which includes the true skates (Order Rajiformes) and species such as electric ray and stingray. The main commercial species within northern European waters are the true skates, which have common names that generally distinguish the large species with long snouts (skates), from the smaller species with short snouts (rays). For the purposes of this guide, the term skate is used in its generic (and commercial) sense to refer to all the true skates, and includes those skate species that have the term 'ray' in their common name.

Skates have a relatively high commercial importance in Europe and the UK. The total weight of the seven or eight most commonly landed species in UK ports in recent years has been 2–3,000 tonnes (t) per year (1), with a first-sale value of about £3million. There are more than 500 species of skate and ray throughout the world (2), including about 230 species of true skate, and total world catches are about 720,000 t per annum (3).

Advice on the status of the various stocks is based on data from scientific trawl

surveys (4, 5) and on knowledge of the ecology and life-history of the various species.

The purpose of this guide is to provide a brief account of north European skates of commercial importance, outline the conservation status of the main stocks marketed in the UK, and describe the measures being taken to manage and conserve them. The guide also outlines some of the research being undertaken for improving the assessment and management of skate fisheries.

BUYERS' TOP TIPS

Know your source of supply and stock status

For management purposes, the stocks of the various skate species are allocated to management areas. Find out the area from which the species has been caught.

An informed buying policy

Some skate species remain abundant and, in many areas, cuckoo, spotted and thornback ray appear to have stable catch rates. It should be possible to harvest these species sustainably. In contrast, the larger species such as white skate and common skate have disappeared from large parts of their former range (6) and landings are prohibited.

Comply with regulations

Supporting those vessels that record their landings by species will help to improve stock management. Some Sea Fisheries Committees (7) enforce a minimum landing size (MLS) which should help to protect juvenile skate.

Seafish Responsible Sourcing Service

This is one of a series of Responsible Sourcing Guides which can be found on the Seafish website.

For further guides and information see:

<http://tinyurl.com/seafishrsg>

Species and biology

Species

Some 25 species of skate and ray occur in waters around the British Isles (8). The most abundant species in inshore waters are thornback ray (*Raja clavata*), blonde ray (*Raja brachyura*) and spotted ray (*Raja montagui*) (4, 9). Cuckoo ray (*Leucoraja naevus*), shagreen ray (*Leucoraja fullonica*) and common skate (actually two biological species: *Dipturus intermedia* and *Dipturus flossada*) are found further offshore, with long-nosed skate (*Dipturus oxyrinchus*) and sandy ray (*Leucoraja circularis*) occurring along the edge of the continental shelf. In the central and northern North Sea, starry ray (*Amblyraja radiata*) is the most abundant skate species, although it is of little commercial importance due to its small size. Smalleyed ray (*Raja microocellata*) and undulate ray (*Raja undulata*) are most frequently found in the Bristol and English Channels respectively.

All these species occur widely in European seas, though the British Isles are at the northerly limits of blonde, spotted, smalleyed and undulate ray distribution. Common and long-nosed skate, and shagreen ray, may be found as far north as

Norway and Iceland. Many species have distributions that extend to southern Spain and northwest Africa, with several also occurring in the Mediterranean. Although locally-abundant skate species are targeted in some areas (such as the thornback ray in the Thames Estuary and blonde ray in St George's Channel), most skates and rays are landed in mixed demersal fisheries, along with flatfish and roundfish.

Biology

Skates and rays are elasmobranchs, that is, fish with a cartilaginous skeleton. These fish are slow growing and with a late age at maturity.

There are differences in the growth of these species: smaller-bodied species such as spotted ray and cuckoo ray grow to about 70–80cm in length; thornback ray and blonde ray grow to 110–120cm, whilst common and white skate grow to more than 200cm. Skates typically mature at between five and 10 years of age, with the smaller-bodied species maturing at an earlier age. Male and females are easily identified, as males have a pair of claspers (used in copulation) alongside the pelvic fins. The females lay fewer than 100 eggs per year, on the sea floor (compared to

cod, for example, which may each shed millions of eggs every year), and these hatch after four to six months (10).



Egg cases (left to right) of blonde, thornback and spotted ray

The juveniles of inshore species (such as thornback, spotted, blonde and small-eyed rays) occur in bays and coastal waters and move into deeper water as they grow (9). Nursery grounds for offshore species are less well known. Adult fish move over wider areas, though they may return to certain areas to feed or breed (11–13). They feed primarily on the sea floor; juveniles eat small crustaceans, and the larger species eat shrimps, crabs and fish (14).

Assessment

Historically, these species have been recorded in a generic 'skates and rays' category. However, from 2009 species-specific recording is compulsory and the UK fishery departments have been implementing this recording from 2008.

Analysis of records of the catch of individual skate species taken per hour trawling in scientific fishing surveys, allows changes in the status of particular stocks to be evaluated in the various sea areas. These surveys, however, do not sample all the size classes and habitats for the various skate species effectively. Nevertheless, in 2012 ICES provided advice on the relative status of individual species' stocks and changes in future catches for the first time, based upon survey catch rates over the past 5-7 years. This information is summarised for sea areas around the British Isles in Table 1.

There is less known about the status of skates in southern European seas. The disappearance of the largest skate species has been reported from the Bay of Biscay and Mediterranean, whilst surveys off the northern coast of Spain suggest that catch rates of some of the smaller species (such as thornback and cuckoo ray) are stable.

A general rule is that the abundance of large skates

has declined and they are relatively more vulnerable to exploitation, whilst those species that mature at a smaller size have healthier populations. This is illustrated in Table 2, which shows the IUCN conservation categories in relation to body size of the more commercially important skate species.

Fishing gear

Skates are taken as a by-catch in most bottom trawl fisheries, some of which may target skates in certain areas at certain times of the year. They are also a target species or bycatch in gill net, tangle net and long-line fisheries.

Research

Tagging studies have provided information with which to identify stocks or management units for several of the more abundant species (e.g. thornback ray), but better data for other species are required to delineate stock boundaries.

Because skates are highly vulnerable to most demersal net-fishing methods, the success of management measures such as MLS and catch

quotas rely on discarded fish being able to survive. Ongoing studies aim to provide estimates of survival of thornback rays discarded in the important inshore fisheries in the southern North Sea and Bristol Channel.

Several aspects of the biology of skates require further scientific research to improve assessment of their status, and to identify management needs and solutions. In particular, the life-history, growth and longevity of the less abundant species is virtually unknown.

Improved understanding of reproductive capacity (and, hence, sustainability) requires better information on the number of eggs laid per year, survival rates of eggs and juveniles (17), and whether egg laying is site specific.



Thornback ray
Raja clavata

Table 1 Status of European skate and ray stocks 2012			
Sea Area	Common species name	Advised/ Agreed (TAC 2012 (t) (15)	Scientific advice and management
NORTH EAST ATLANTIC SKATE AND RAY STOCKS www.ices.dk			
North Sea, Skagerrak and eastern English Channel EU waters of ICES Div. IIa, ICES Sub-area IV, Divs IIIa and VIII	Thornback ray	Advice: No TAC, but species-specific measures	Thornback ray is now concentrated in the south-western part of this area, where its abundance has increased over the last five years, and ICES advises that catches could be increased by a maximum of 20% in relation to the last three years' average.
	Spotted ray	Agreed TAC = 2,106	Spotted ray is concentrated in the central and southern North Sea (Divs IVb and c), where its abundance has increased over the last five years. ICES advises that catches could be increased by a maximum of 20% in relation to the last three years' average.
	Cuckoo ray		Cuckoo ray is primarily found in the northern and central North Sea (Div Iva and b.), where its abundance has increased over the last five years. ICES advises that catches could be increased by a maximum of 20% in relation to the last three years' average.
	Starry ray		Starry ray is widespread throughout the region, and RV surveys indicate abundance increased during the 1980s with a decline over the last decade. ICES advises that catches should be reduced by 36% in relation to the last three years' average.
Irish Sea, Bristol Channel, western English Channel and North West Scotland (ICES Divs VIIa-c, e-k, and Sub-area VI)	Thornback ray	Advice: No TAC, but species-specific measures	One of the most commonly caught rays in the area, which has increased in abundance over the last five years. ICES advises that catches could be increased by a maximum of 20% in relation to the last three years' average.
	Spotted ray	Agreed TAC = 8,924	The stock's abundance has increased both in the short and the long term, and ICES advises that catches could be increased by 20% in relation to the last three years' average.
	Cuckoo ray		Though the abundance of this widespread stock has recently increased in the Celtic Sea, the overall stock abundance has decreased, and ICES advises a decrease of 36% in catches in relation to the last three years' average.
	Blonde ray		The state of the stock is unknown and ICES advises that catches should be decreased by at least 20% compared to the last three years' average.

Table 1 Status of European skate and ray stocks 2012			
Sea Area	Common species name	Advised/ Agreed (TAC 2012 (t) (15)	Scientific advice and management
	Small-eyed ray		The stock is concentrated in the Bristol Channel, where its abundance has decreased over the last five years, although the longer-term trend has been increasing. ICES advises that catches should decrease by 36% in relation to the last three years' average.
	Sandy ray		Sandy ray is caught in low numbers on the outer continental shelf. The state of the stock is uncertain and ICES advises that catches should be decreased by 20% in relation to the last three years' average.
	Shagreen ray		Shagreen ray is caught in low numbers on the continental slope. The state of the stock is uncertain, and ICES advises that catches should be decreased by at least 20% in relation to the last three years' average.
Other	Norwegian or black skate	If these species are caught they must be released promptly unharmed in most EU waters.	Status uncertain with reason for concern.
	Undulate ray		Undulate ray has been on the EU prohibited species list since 2009. The status of the stock is uncertain, and ICES advice is no targeted fishery.
	Common skate		Common skate has disappeared from the shallow waters of the North Sea, English Channel and Irish Sea and is considered to be depleted. ICES advises that there should be no targeted fishery and measures should be taken to minimize bycatch.
	Long-nosed skate		A large-bodied species potentially vulnerable to over-exploitation, most common in deep water. Status uncertain and ICES advises that catches should be decreased by 20%.
	White skate		White skate no longer occurs regularly in its former range in coastal waters of the English Channel, Irish Sea or along the west coast of Ireland, where it is depleted. ICES advises that it remains on the Prohibited Species List.

Organisation key

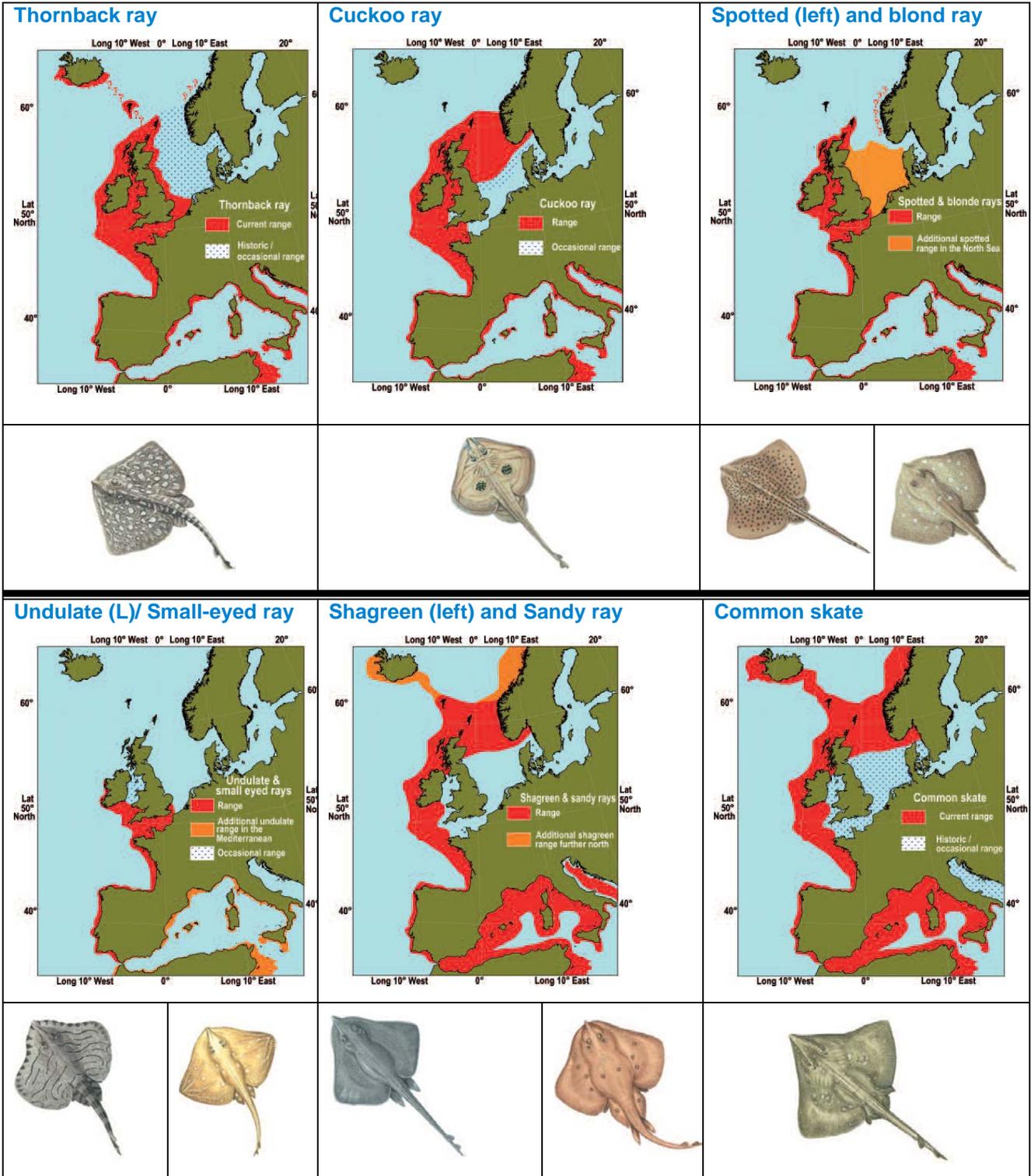
EU: The European Union manages fisheries within the Exclusive Economic Zone.

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

IUCN: World Conservation Union. Has developed the IUCN Red List Criteria (16) which gives a general indication of whether a population has declined (in either numbers or distribution) and, if so, by how much.

SRPA: The Skate and Ray Producers' Association. An organisation of specialist producers. Membership covers Great Britain and Ireland. It has played an active role in working with conservation organisations.

Species identification and distribution



Management and conservation measures

In recent decades there has been a decline in the abundance and distribution range of some UK skate species, particularly those that are either large-bodied (such as common and white skate) and/or those with restricted distributions. Whilst catch rates of thornback rays in scientific surveys seem generally stable in many areas, there has been a retraction in their overall distributional range in the North Sea. Survey catch rates for smaller species, such as spotted ray, appear to be stable in recent years, suggesting that these stocks are being harvested sustainably. However, the current status of lesser-known skate species, such as shagreen ray, that are not sampled effectively in surveys, is uncertain.

Stock management

There have been four substantial developments in the management of skates and ray stocks around the British Isles in the last four years ;

- ICES advice on stock status and future

catches has been given by sea area for most species.

- Legislation has been introduced to ensure landings of skates and rays are recorded by species, and UK authorities are working towards its implementation.
- Retention of common, white and black (Norwegian skates - *Dipturus nidarosiensis*) and undulate rays is now illegal in most European waters. Fishermen are required to return individuals of these species to the sea alive.
- Total allowable catches have been introduced for skates and rays in most European waters, putting a cap on the total quantity of skates and rays to be landed (TACs already been implemented in the North Sea). However, ICES does not advise that an individual TAC be set for any skate stock, at present.

Further measures

There is a stipulated minimum mesh size of 280mm in the cod end, and 220mm in all other parts of the trawl for targeted skate fisheries. However, targeted fisheries in North Sea waters for these species is discouraged, because vessels larger than 15m are only permitted to land a maximum of 25% of the catch (whole weight) as skates and rays.

Management of fisheries in the North East Atlantic specifically aimed at conservation of skates is relatively new, but is evolving along with improving scientific knowledge and advice. There is more uncertainty in the assessments of skates than for most other commercial fish species necessitating the need for a collaborative approach to assess and manage these species. In particular, closing spawning and/or nursery grounds to fishing, and measures to protect the spawning component of the population (e.g.

maximum landing size) could be developed to manage the fisheries on the commercial species and achieve recovery of the depleted species. However, such measures should be developed by management authorities involving all stakeholders.

Some of the main issues for management of skate stocks are:

Improvements to knowledge of catches and stock status

Until legal obligations to declare most demersal elasmobranchs to species level were introduced in 2009, skate landings have been reported in the generic group 'skates and rays'. This has made it impossible to detect changes in the catches or abundance of individual species over time from commercial data. Though a greater proportion of data are now reported by species, this information covers too short a time period to influence advice at the present time.

Recognising that most elasmobranchs represent data-limited stocks, ICES now uses an abundance index based on the fishery-

independent trawl surveys that provide the longest time-series for a particular species in an area. Changes in stock status are inferred by comparing the average of the two most recent index values with the five preceding values, and advice on future exploitation is provided using an index-adjusted *status quo* catch. These harvest control rules are expected to stabilize stock size, but they may not be suitable if the stock size is low and/or overfished.

Species identification

Identifying skates to species can be difficult, as colour patterns can vary and closely related species are difficult to distinguish, especially the juveniles. Distinguishing spotted ray and blonde ray can be difficult, for example. The production of improved, user-friendly identification material is aimed at easing this problem (21).

Management units

Currently, management units for skate stocks are based on what is known about the distribution and movements of the various species in relation to management areas (ICES

sub-areas and divisions). Tagging studies on a few of the more abundant skate species (11–12) and genetic studies (18) can help identify stock units, but scientific investigations are required to delineate stock boundaries more accurately, especially for species distributed across several management areas, such as the cuckoo ray.

Stock abundance

Existing routine scientific fishing surveys were designed primarily for roundfish or flatfish, and the gear used and survey locations may not be ideal for skates. Additionally, some species have a patchy distribution, so that only a few catches in surveys may have sufficient numbers of individuals to assess their abundance.

Location and protection of juveniles and spawning stock

There are no national or EU measures to protect juvenile skates, though several Inshore Fisheries and Conservation Authorities (7) in England and Wales have a minimum landing size (MLS; typically 40–45cm across the wings) to stop juveniles being landed. One problem is that, in order to protect the juveniles of larger-bodied species (which tend to be the most threatened), a high generic skate MLS would result in increased discarding of some of the smaller bodied species.

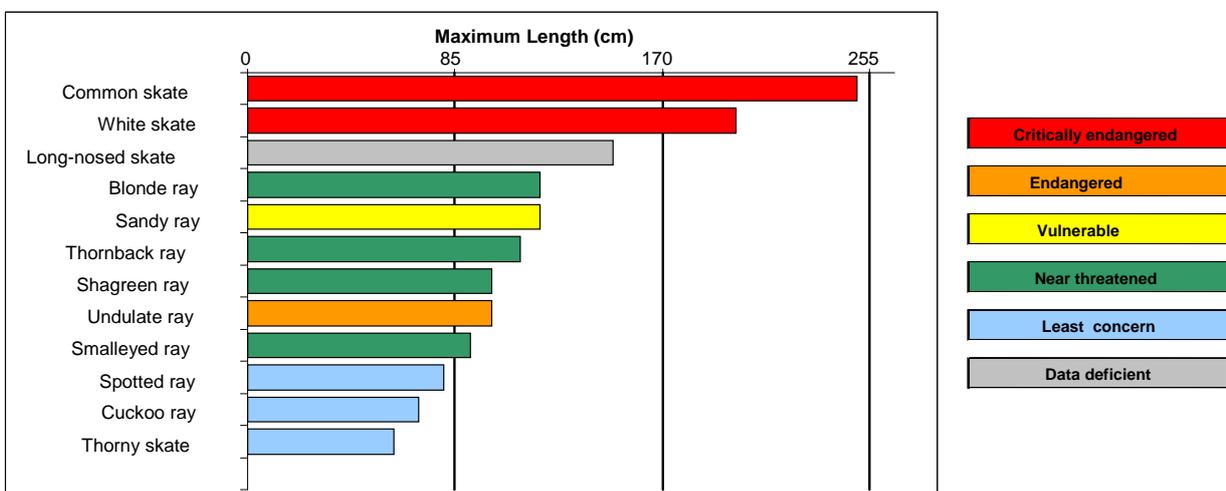
Various skate species are known to aggregate seasonally (for feeding or breeding), and closing particular areas to fishing has been suggested as a useful management measure (19). However, the locations of spawning grounds are usually not known. A maximum landing length may help protect the largest fish and the mature females of the commercially important species.

In summary, skates are vulnerable to exploitation due to their biological characteristics. Management of the fisheries is difficult because most skates are taken as by-catch in fisheries for other species. However, the situation is not the same for all species and areas, and it is important to work in a collaborative way to build on scientific and fishing industry knowledge to improve management of these stocks, starting with basic information such as identification of the species that will enable them to be assessed separately.

IUCN criteria for UK skates and ray stocks

The table illustrates IUCN criteria (16) of UK skates in relation to body size, illustrating how the larger-bodied skates are thought to have declined (and are of conservation concern). Medium-sized skates (including some of the more important commercial species) are of some concern, whilst small-bodied skates are not considered threatened. IUCN define their criteria in terms of ‘extinction risk’ - for many marine fishes this broadly equates with species that are depleted and ‘outside safe biological limits’ under ICES criteria (20).

Table 2: IUCN status of UK skate and ray species



Product characteristics

Identification charts are useful for separating the different skate species. The main edible parts of skates are the wings, and merchants should be able to identify most species from the wings alone. The flesh is distinctive and the bones are soft cartilage rather than the hard bones found in flatfish and roundfish. As with all elasmobranchs, skates have a propensity to develop ammonia during storage; good handling practice concerning temperature control and shelf life help to control this tendency.

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*European Legislation and information available on <http://europa.eu/>

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); and

- **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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