

Brill

(*Scophthalmus rhombus*)

Summary

Size (total length)	58 cm (Hammen et al., 2013)
Lifespan	22 years (Hammen et al., 2013)
Size of maturity (L₅₀) (North Sea pop.)	Female 31 cm Male 18 cm (Hammen et al., 2013)
Fecundity	600,000 to >1 million (Jones, 1974; Felix et al., 2010)
Reproductive frequency	Annual
Capture methods	Bycatch in trawl/net fisheries
Minimum Landing Size	30 cm total length
Fishing Season	Year round



Description

Brill (*Scophthalmus rhombus*), a species of left-eyed flatfish, is widely distributed in the Northeast Atlantic. It occurs at a low abundance throughout its range from Norway, along the European coastline, and the entire Mediterranean Sea and Black Sea (Nielsen, 1986). Brill inhabit soft, sandy ground but can be found on mud and gravel. Juveniles favour shallow, coastal areas whereas mature adults can be found to depths of 100 meters (Hammen et al., 2013).

Brill are visual hunters and do not scavenge for food (Wetsteijn, 1981). Juveniles predate on a variety of species including crustaceans, molluscs, worms and small fish whereas brill greater than 20 cm in length are almost exclusively fish feeders (de Groot, 1971). The most dominant food source for brill between 25-30 cm long is the sand goby whereas brill between 30-50 cm favour sand eels. Sardine, herring and anchovy are a constant food source for all brill above 25 cm and larger individuals also predate on cod species (de Groot, 1971).

Reproductive Life history

Mature brill migrate inshore to spawn at depths between 10 m and 20 m from February to August with the majority of individuals having spawned by the end of July in the North Sea (Hammen et al., 2013; Haynes et al., 2014). Brill are batch spawners whereby the female releases consecutive batches of ripe eggs over a period of up to 16 weeks (Caputo et al., 2001; Hammen et al., 2013). The total number of eggs spawned has been estimated to range between 601,550 to over 1 million per female

(Jones, 1974; Felix et al., 2010). Jones (1974) estimated the number of eggs spawned per gramme weight of fish (relative fecundity) was 465 eggs/g.

The pelagic eggs float in the plankton before hatching into larvae that is less than 4 mm in size (Hammen et al., 2013). As larvae they feed on other zooplankton in the water column such as copepod, crab and mollusc larvae (de Groot, 1971). Wind-driven currents help to transport the brill larvae to shallow inshore nursery areas where at 17 mm in size the larvae metamorphose into miniature brill (van der Land, 1991; Hammen et al., 2013). Flat fish undertake a dramatic metamorphosis from pelagic larvae to benthic juveniles. As larvae, brill resemble a typical symmetrical fish with eyes on both sides of the body however, during metamorphosis the right eye of the brill migrates to the left side of the head and the entire skull shifts in the process creating an asymmetrical appearance. The body increases in depth and the upper side develops pigmentation to help achieve camouflage whilst the underside remains white (Power et al., 2008). The flat body and location of both eyes on the top of the head make flatfish highly adapted for living on the sea bed.

The smallest juvenile brill remain in the protective shallows of the surf zone for the first few months of their life and are often seen in sand shore pools (Hammen et al., 2013; ICES, 2019). Juveniles less than 10 cm in length are mainly confined to waters less than 10 m deep whilst larger individuals between 10-25 cm occur in waters down to 30 m however, the highest densities of this size class are also found in waters less than 10 m (Hammen et al., 2013). Juveniles remain in nursery grounds for 1-2 years before migrating to deeper waters offshore to recruit into the adult stock (Haynes et al., 2014). Brill display sexually dimorphic growth where the female reaches a greater maximum body size than the male. In the North Sea females reach a total length of 58 cm whereas males grow to around 43 cm (Hammen et al., 2013). However, brill in the Bay of Biscay have been recorded at much larger sizes; 85 cm and 75 cm for females and males respectively (Deniel, 1981 cited in Hammen et al., 2013). The longevity of brill also varies between the sexes with the oldest male brill sampled in the North Sea found to be 16 years whilst the oldest female was 22 years (Hammen et al., 2013).

Size of maturity (SOM)

Size of maturity (SOM) is often used to help establish an appropriate Minimum Conservation Reference Size (MCRS) to ensure individuals can reproduce at least once before capture. For finfish, SOM is commonly accepted as the total length (L) at which 50% of a population are mature and is referred to as the L_{50} . Maturity in finfish is determined by the classification of gonad development based on macroscopic (external appearance of the gonad) or microscopic (histology) methods. Histological techniques (analysis of microscopic morphological features) provide the most accurate results but it is a time consuming and expensive process. Maturity classification based on the external appearance of the gonad is quick, simple and cheap however, it is not as accurate as histology and results may be subjective (Brown-Peterson et al., 2011).

The size at which Brill become sexually mature is relatively unknown partly due to the difficulty in attaining samples for a species which is widely dispersed at a low

abundance across its range. However, studies have confirmed males reach sexual maturity at a smaller size than females (Caputo et al., 2001; Hammen et al., 2013). Males sampled in the North Sea reached 50% maturity at 18.4 cm whereas females were sexually mature at 31.3 cm (Appendix A.). This difference in size has also been observed in brill populations in the Mediterranean where the smallest mature female sampled was 37 cm whilst the smallest mature male was 14 cm smaller at 23 cm (Caputo et al., 2001). Age at 50% maturity was also found to be higher with females taking around 1.6 years to reach sexual maturity compared to males that can take less than one year, however this is a preliminary estimate as more data is required to confirm age at maturity in males (Hammen et al., 2013).

The minimum size for brill in the Southern IFCA district is 30 cm. Based on the limited literature available the current minimum size affords protection to all immature male brill as all male brill sampled in commercial landings in the North Sea were found to be mature below 30 cm (Hammen et al., 2013). The minimum size is also very close to the estimated 50% maturity of females in the North Sea (31.3 cm) therefore the current minimum size of 30 cm would allow an opportunity for a portion of female brill in a population to reproduce at least once before capture.

Southern IFCA Fishery

Fishing activity

Brill is a valuable commercial species but due to its sparse distribution it is caught in low quantities across its range and not specifically targeted (Haynes et al., 2014). In 2019, 300 tonnes of brill worth £2.2 million was landed into England by UK vessels (MMO,2019). Brill is mostly taken as bycatch in demersal fisheries targeting other flatfish species such as sole and plaice (ICES, 2019). Within the Southern IFCA district small numbers of brill are taken throughout the year mainly by gill nets, bottom otter trawls and beam trawls however, brill can sometimes be caught as bycatch in traps and dredges or targeted by hand and pole-lines.

Recreational

Brill is rarely caught by shore-based anglers due to the larger adults preferring sand banks in deeper water, however they may be caught during the spring when adults migrate inshore to spawn. The majority of brill are targeted by recreational anglers by boat alongside other species of flatfish such as plaice and turbot. Flatfish are the fifth most valuable species for charter boats in the South Inshore marine planning area (Devon and Severn, Southern and Sussex IFCA districts) and many boats in the Southern IFCA district provide specific trips to target them from March to October (MMO,2020).

Landings & Value of Fishery

In 2019, around 6* tonnes of brill worth £43,000* was landed into ports across the Southern IFCA district (fig 1). Landings in the district have remained between 6-7 tonnes over the last three years but prior to 2017 landings were regularly between 9 and 11 tonnes with the exception of 2011 (7 tonnes) and 2015 (8 tonnes). The value of brill has also remained fairly consistent selling for between £5,200 - £5,600 per tonne most years. In 2011 and 2017 the price increased to around £6,000 per tonne but in 2019 the value of brill increased considerably from an average of £5,300 to £6,900 per tonne.

*these figures represent vessels that land into ports in the Southern IFCA district, some of which would have fished outside the district and be >12 metres in length.



Figure 1. Landings of brill (*Scophthalmus rhombus*) in the Southern IFCA district from 2005 to 2019. Data sourced from the Marine Management Organisation (MMO)

Brill from the North East Atlantic is considered to be part of one population (ICES, 2019). ICES therefore provide advice based on a single stock for brill caught in the English Channel, North Sea, Skagerrak and Kattegat (ICES, 2020). For the years 2020 and 2021 ICES advise catches should be no more than 2559 tonnes (ICES, 2020). Fishing pressure is currently below maximum sustainable yield (MSY) and spawning stock size is above MSY indicating brill are not at risk of being overfished (ICES, 2020).

Associated management

Brill caught within the Southern IFCA district is subject to a minimum size of 30 cm (total length) under the Minimum Fish Sizes byelaw. There is no minimum length restriction imposed for brill by the European Commission however a minimum size of 30 cm is enforced by two additional IFCAs in England and the Government of Jersey (table 1).

Brill is currently managed by a combined Total Allowable Catch (TAC) with turbot under the European Union's Common Fisheries Policy (CFP). However, ICES advise a single-species TAC would be more appropriate (ICES, 2020). Within recent years the CFP has introduced bycatch restrictions to reduce discarding. All quota species are subject to Landing Obligations meaning all catch must be landed and counted against quota regardless of size unless exemptions apply. Since 2019 brill has been subject to the Landing Obligation without exemptions.

Table 1. Minimum Conservation Reference Sizes (MCRS) for Brill (*Scophthalmus rhombus*) enforced by Inshore Fisheries and Conservation Authorities (IFCA) in England and authorities in other regions. All measurements in cm for total length (L).

IFCA	Minimum Landing Size (MLS)
Northumberland	-
North Eastern	-
Eastern	-
Kent & Essex	-
Sussex	-
Southern	30
Devon & Severn	-
Cornwall	30
Isles of Scilly	0
North Western	30*
Other	
EU	-
Government of Jersey	30

*Only applies within a certain area of the district

References

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Appendix

Table A. Size at maturity estimates (L_{50}) for brill (*Scophthalmus rhombus*) from the published literature. Measurements given in cm for total length (L_{50}).

Study location	Total No. surveyed	No. of individuals (n)		Length Data		Total No. of individuals	No. of individuals (n)		Size at Maturity Data								Reference
				Size range					Size of smallest mature individual		Size at 50% maturity (L_{50})		Age at 50% maturity (years)		Size range of mature individuals		
				M	F				M	F	M	F	M	F	M	F	
North Sea, Netherlands	5000	-	-	-	-	2706	979	1727	-	-	18.4	31.3	0.1	1.6	-	-	Hammen et al., 2013
Adriatic, Italy	149	-	-	-	-	-	-	-	23	37	-	-	-	-	-	-	Caputo et al., 2001