Lesser spotted dogfish (*Scyliorhinus canicula*)

Summary

Size (total length) British Isles	85 cm (Ebert and Stehmann, 2013)
Lifespan	20 years (Bendiab et al., 2012)
Size of maturity (L_{50}) North East Atlantic	52 – 58 cm
Fecundity	29-62 eggs (Ellis & Shackley, 1997; Henderson and Casey, 2001)
Reproductive frequency	Annual
Capture methods	Bycatch in trawls, nets and pots
Minimum Conservation Reference Size	-
Fishing Season	Year-round

Description

The lesser spotted dogfish (*Scyliorhinus canicula*) is a species of small shark that belongs to the Scyliorhinidae family of sharks, generally known as catsharks. It is distributed across the Eastern North Atlantic from Norway, along the European coast and around the British Isles down to the coasts of Northwest Africa and the Mediterranean Sea (Ebert and Stehmann, 2013). The lesser spotted dogfish is the most abundant catshark in European inshore waters and it is the dominant shark species in the English Channel (Ellis and Shackley, 1997; Ellis et al., 2005a). The species is known by several names including small spotted catshark, rough hound, rock salmon, small spotted dog fish and sandy dog.

Lesser spotted dogfish are bottom-living sharks that occur in depths of 3 to 400 m but are usually found no deeper than 100 m on sandy, gravelly or muddy seabeds (Wheeler, 1987). Dogfish feed on a wide variety of prey from small crabs, whelks and worms to bottom dwelling bony fish and are mostly active at night (Wheeler, 1987; Olaso et al., 2004; Lythgoe and Lythgoe, 1971).

Reproductive Life history

Like most catsharks, lesser spotted dogfish is an oviparous (egg laying) species and fertilisation takes place internally. Reproduction occurs year-round and females' mate with multiple males, storing sperm for future use (Griffiths et al., 2012). Females have evolved a significantly thicker skin than males due to the biting and grasping behaviour of males during copulation (Crooks and Waring, 2012). Egg cases are deposited in

Version 1.2 16/03/2021
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pairs and attached to fixed structures on the seabed like kelp holdfasts and sessile animals such as bryozoans, hydroids and dead man's fingers (Wheeler, 1978; Ellis and Shackley, 1997; Ellis et al., 2005). Females can lay eggs throughout the year, but peak activity occurs between May and July. Few eggs are laid between August and October (Ellis and Shackley, 1997; Henderson and Casey, 2001). It is estimated that lesser spotted dogfish deposit between 29-62 eggs per year with fecundity increasing with female length (Ellis and Shackley, 1997; Henderson and Casey, 2001).

The young develop within the egg capsule for 5-8 months, depending on environmental conditions, before hatching (Wheeler, 1987). At this point the hatchlings are around 10 cm in length (Ford, 1921; Ellis and Shackley, 1997) although size at hatching on the west coast of Ireland has been recorded at 15 cm (Henderson and Casey, 2001). Juveniles remain in shallow water and mainly hunt small crustaceans (Olaso et al., 2004). Growth rate has been estimated at 5.5 mm per month and in captivity young have reached 15 cm in length at one year old, 20-25 cm at two years, 30-35 cm at three years and 45 cm at four years (Ellis and Shackley, 1997; Collenot, 1966 cited in Henderson and Casey, 2001). Lesser spotted dogfish grow to a maximum length of 85 cm in the British Isles and North Sea (Ebert and Stehmann, 2013). Maximum age has been estimated at 20 years (Bendiab et al., 2012)

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. SOM for elasmobranchs (sharks, rays and skates) 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 is determined using criteria to define maturity stages either externally or internally. External observations are based upon analysing the length of claspers in males and the cloaca in females in relation to total body length. Internal examination includes macroscopic inspection of reproductive organs e.g., coiling of the vas deferens and development of the testes in males; development of the ovaries, ova and nidamental glands in females (Saglam and Ak, 2012).

Lesser spotted dogfish in the North Atlantic mature between 52-58 cm in length with females generally maturing at a greater length than males (table 1). In the Bristol Channel, Ellis and Shackley (1997) found males matured between 49 cm and 54 cm with 50% maturity at 52 cm and females matured between 52 cm and 64 cm with 50% maturity at 55 cm. No difference in SOM was found between males and females sampled off south west Ireland with 50% maturity at 58 cm for both sexes (Henderson and Casey, 2001). The smallest mature male and female observed were 53 cm and 52 cm respectively. Ford (1921) examined the sexual maturity of the lesser spotted dogfish in the English Channel and also stated males and females matured at the same lengths, usually from 57 cm to 60 cm, however it is not known whether these lengths refer to 50% maturity; therefore, the study isn't included in table 1. In the Irish and Celtic Seas females mature at a greater size (57 cm) than males (54 cm) (Ivory et al., 2004). The smallest mature male was 49 cm and smallest female was 52 cm.

Lesser spotted dogfish in the Mediterranean Sea mature at a smaller size than populations in the North Atlantic (table 1). This is thought to be due to a relationship between maturity and latitude (Bendiab et al., 2012; Rodriguez-Cabello et al., 1998). In the Mediterranean SOM occurs between 36-41 cm with the smallest SOM found in populations sampled off the western Algerian coast. The smallest mature male and female were recorded in the Straits of Sicily at 34 cm and 35 cm respectively (Finotto et al., 2015.

Two of the studies assessed 50% age at maturity and found the lesser spotted dogfish matures between 6-8 years old (Henderson and Casey, 2001; Ivory et al., 2004).

Table 1. Size of maturity estimates for the lesser spotted dogfish (*Scyliorhinus canicula*) in the North Atlantic and the Mediterranean Sea. Male and female lengths at 50% maturity (L_{50}) rounded up and given in cm. For more details about each study please refer to the appendix.

Location	Male	Female	Reference
North Atlantic			
Bristol Channel, UK	52	55	Ellis and Shackley, 1997
West coast of Ireland	58	58	Henderson and Casey, 2001
Irish & Celtic Seas	54	57	Ivory et al., 2004
Cantabrian Sea, North Spain	-	54	Rodriguez-Cabello et al., 1998
Mediterranean Sea			
Strait of Sicily	39	37	Finotto et al., 2015
Northern Adriatic	40	41	Finotto et al., 2015
Aegean Sea	40	40	Kousteni et al., 2010
Western Algerian coast	-	36	Bendiab et al., 2012

Southern IFCA Fishery

Fishing activity

Lesser spotted dogfish are not part of a targeted fishery within the Southern IFC district, but they are captured as bycatch, throughout the year, in a number of gears including trawls, nets and pots. They are often returned to the sea because of their low market value but those that are landed are utilised as bait for pot fisheries, particularly whelk. Lesser spotted dogfish are very resilient and recover well following capture. Survival rate has been estimated to be as high as 98% for individuals caught as bycatch in beam trawl fisheries in the western English Channel (Revill et al., 2005).

Recreational

Lesser spotted dogfish are regularly caught by recreational anglers year-round from the shore and on the water. They are very rarely retained due to their tough skin making them an undesirable eating fish.

Landings & Value of Fishery

Lesser spotted dogfish landings within the Southern IFC District between 2005-2014 were minimal with the greatest amount landed in 2011 at 8 tonnes (fig.1*). In 2015, landings increased to 21 tonnes, followed by a substantial increase to 96 tonnes in 2016. In the proceeding years annual landings declined but remained much higher than average at 60 and 51 tonnes in 2017 and 2018, respectively. In 2019, 10 tonnes of lesser spotted dogfish was landed worth around £2,757. The value of lesser spotted dogfish remained consistent between 2016 and 2019 at an estimated £280 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.

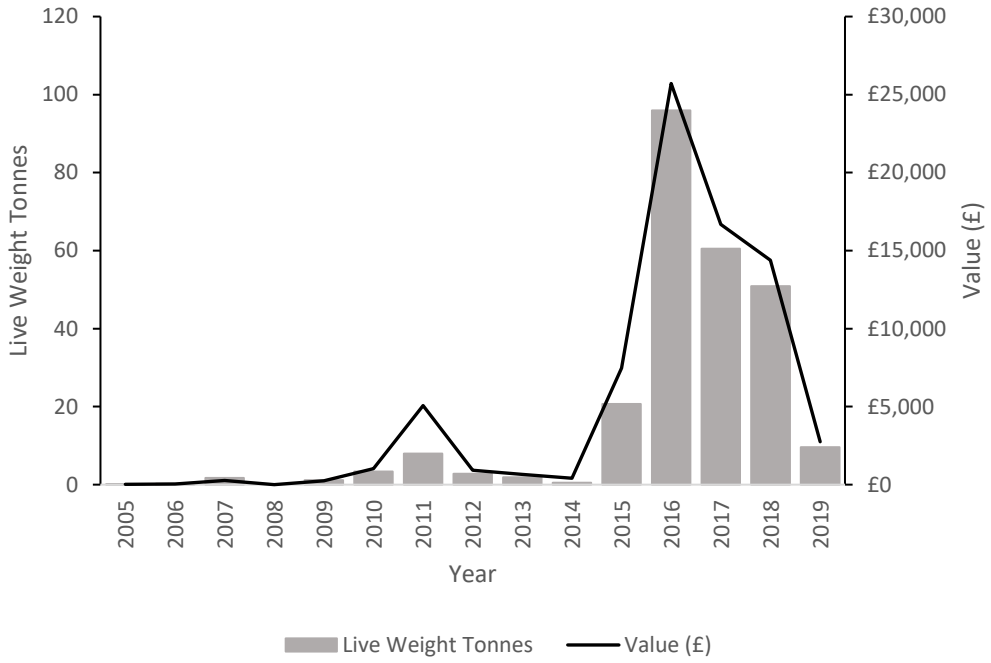

Figure 1. Landings of lesser spotted dogfish (*Scyliorhinus canicula*) into ports within the Southern IFC District from 2005 to 2019. Data sourced from the Marine Management Organisation (MMO)

ICES currently considers the lesser spotted dogfish in the English Channel under two different stock units. In the eastern English Channel (included as part of the North Sea ecoregion) the stock size has declined in recent years but remains higher than the long-term average. ICES advises landings should not exceed 2,380 tonnes across this stock unit in 2021 (ICES, 2019a). Lesser spotted dogfish in the western English Channel are considered alongside populations in the Celtic Seas and west of Scotland. The stock size is increasing, and ICES advises that the catches in 2021 should be no more than 3,540 tonnes (ICES, 2019b).

Associated management

There are no specific management measures for the lesser spotted dogfish in the Southern IFC District or wider North East Atlantic.

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Appendix

Table A. Size at maturity estimates (L_{50}) for lesser spotted dogfish (*Scyliorhinus canicular*) in studies undertaken in the North East Atlantic and Mediterranean Sea. Measurements given in cm. Number of individuals in brackets represents the number of mature individuals within sample.

Study location	Total No. surveyed	No. of individuals (n)		Length Data		Size at Maturity Data												Reference
				Size range		Total No. of individuals	No. of individuals (n)		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	M	F	M	F	
North Eastern Atlantic																		
Bristol Channel, UK	97	435	537	37.2-66.2	37.9-67	972	435	537	49	52	52	55	-	-	-	-	Ellis and Shackley, ,1997
West coast of Ireland	560	-	-	-	-	-	-	-	53	52	57.5	58.1	-	6	-	-	Henderson and Casey, 2001
Irish and Celtic Seas	745	310	435	-	-	-	-	-	49	52	53.5	57	6.6	7.9	-	-	Ivory et al., 2004
Cantabrian Sea, North Spain	-	-	-	-	-	739	-	739	-	-	-	54.2	-	-	-	-	Rodriguez-Cabello et al., 1998
Mediterranean Sea																		
Strait of Sicily	-	-	-	-	-	236	131 (81)	105 (45)	33.5	34.5	38.5	36.8	-	-	-	-	Finotto et al., 2015
Northern Adriatic	-	-	-	-	-	249	55 (50)	194 (167)	37	39	40	40.9	-	-	-	-	Finoto et al., 2015
Aegean Sea	325	167	158	28.2-48.8	26.3-46.7	325	167 (115)	158 (85)	37.1	36.4	39.6	39.9	-	-	37,1-48,8	36.4-46.7	Kousteni et al., 2010
Western Algerian coast	461	212	249	22.2-50	20.1-47.4	-	-	-	-	-	-	36	-	-	-	-	Bendiab et al., 2012