

# Spotted ray

## *(Raja montagui)*

### Summary

<b>Size (total length)</b>	Max. 80 cm (Ebert and Stehmann, 2013)
<b>Lifespan</b>	-
<b>Size of maturity (DW<sub>50</sub>)</b>	Male 34-40 cm Female 39-42 cm
<b>Fecundity</b>	60-70 egg capsules
<b>Reproductive frequency</b>	Annual
<b>IUCN Status</b>	Least Concern (Ellis et al., 2007)
<b>Capture methods</b>	Nets, lines and trawl
<b>Minimum Conservation Reference Size</b>	40 cm (disc width) 20 cm (detached wing)
<b>Fishing Season</b>	Year round, peak in summer



### Description

The spotted ray (*Raja montagui*) is distributed in the Eastern North Atlantic from Morocco to its most northerly range around the coasts of the British Isles and the North Sea (Ebert and Stehmann, 2013; Ellis et al., 2005). Its distribution is patchy in the northern North Sea with the greatest concentration of spotted ray found off the coast of southern Ireland (Elliott et al., 2020; Ellis et al., 2005).

The species shares a similar distribution to thornback ray in that it favours shallow, soft grounds from 8 m but can be found to depths of 280 m (Ellis et al., 2005). Similar to thornback ray, spotted ray predominately feed on crustacea and fish and to a lesser extent polychaetes (bristle worms) (Ajayi, 1982).

### Reproductive Life history

Skates and rays are k-strategy species meaning they grow slowly to a large size and reproduce at a low rate making them vulnerable to over exploitation. The spotted ray, exhibits these characteristics to a lesser extent than larger species such as the undulate or blonde ray as it grows at a faster rate and displays a smaller overall size (Gallagher et al., 2004).

Like all skate species the spotted ray is oviparous (egg-laying) and deposits eggs on the seafloor following internal fertilisation. Observations of captive spotted ray indicate females lay an average of one egg every two days during the spawning season (Holden et al., 1971). Approximately 60-70 egg capsules are deposited in total between the months of February to July (Holden et al., 1971; Ebert and Stehmann, 2013; Ryland and Ajayi, 1984). Embryonic development takes five to six months and the young hatch at about 8-10 cm in length (Ebert and Stehmann, 2013).

Juveniles take shelter in shallow areas and particularly high densities of juvenile spotted ray have been recorded in Cardigan Bay, the Bristol Channel, off the east coast of Ireland and in the north-east of the English Channel (Ellis et al., 2005). It is thought the spotted ray may migrate offshore during winter months however, tagging studies undertaken in the English Channel found 75% of recaptured spotted rays had remained within 30 nautical miles of their release site (Elliott et al., 2020; Walker et al., 1997).

### 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 skates and rays is commonly accepted as the total length (L) at which 50% of a population are mature and is referred to as the  $L_{50}$ . Some studies may also measure SOM based on the total disc width (DW) of a specimen (wing tip to wing tip). Table 1 includes total length-disc width conversions based on conversion factors in McCully et al, (2012).

Maturity in skates and rays 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).

A review of the available literature indicates that spotted ray around the British Isles reach 50% maturity between 51-64 cm total length (table 1). The most recent study undertaken for populations in the North Sea and Celtic Sea found males reach SOM at 51 cm and females 63 cm (McCully et al., 2012). These sizes are in line with older studies where SOM ranged between 54-64 cm, however the difference in SOM between sexes was not as extensive. Male and female spotted ray studied in the Irish sea matured at a similar size of 54 cm and 57 cm, respectively (Gallagher et al., 2005) whereas Walker et al, (1997) found no difference in the SOM between sexes for populations in the North Sea and English Channel as both were recorded to reach SOM at 60 cm.

The smallest mature male and female observed by McCully et al, (2012) were 40 cm and 49 cm compared to 56 cm and 57 cm for males and females sampled in Wales (Ryland and Ajayi, 1984). Spotted ray age at 50% maturity was recorded by Gallagher et al, (2005) to be 3.4 and 4.1 years for male and female, respectively.

Table 1. Size at maturity estimates ( $L_{50}/DW_{50}$ ) for spotted ray (*Raja montagui*) in studies undertaken around the British Isles. Male and female total length ( $L_{50}$ ) has been converted to disc width ( $DW_{50}$ ) using conversion factors ( $DW=0.6605L_{50} + 0.2841$ ) presented in McCully et al., 2012. Measurements given in cm and figures rounded. Refer to the Appendix for more information.

Location	$L_{50}$		$DW_{50}$		Reference
	Male	Female	Male	Female	
UK*	51	63	34	42	McCully et al., 2012
North Sea & English Channel	60	60	40	40	Walker et al., 1997
North Sea, Netherlands	-	58-64	-	39-43	van Steenbergen, 1994
Irish Sea	54	57	36	38	Gallagher et al., 2005

\*ecoregions of Celtic Sea and North Sea combined

The minimum size for spotted ray in the Southern IFC District is 40 cm and refers to disc width (wing tip to wing tip) rather than total length. Using the CEFAS conversion presented in McCully et al. (2012) the current minimum size for total length is 60 cm. The literature review infers the SOM of spotted rays in the British Isles is around, if not below, the current minimum size (table 1). Therefore, immature spotted rays within the District are afforded some protection with a large proportion of the population having an opportunity to reproduce at least once before removal from the fishery.

## Southern IFCA Fishery

### Fishing activity

Spotted ray is caught by commercial fishers in the District but due to its smaller size in comparison to blonde and thornback ray it is not as highly valued. Ray fisheries across the District use gill, entangling and trammel nets to catch various species of ray and spotted ray is also taken as bycatch in fisheries targeting species such as sole and plaice. Spotted ray is more prevalent in the western English Channel and is mainly caught around the Portland area (Leblanc et al., 2014). It is similar in appearance to the blonde ray (*Raja brachyura*) and occupies a similar geographic range, therefore the two species can be confused (Leblanc et al., 2014; Simpson, 2018). A clear distinction can be made once individuals have reached their maximum size as blonde rays are considerably bigger at 110-120 cm compared to the spotted ray at 80 cm.

The wings of skates and rays are usually removed at sea rather than landed whole (excluding undulate rays which must be landed whole) because it is not always practical to retain the whole fish due to their size and market prices are based upon wing weight. The remaining parts of the tail and central body cavity aren't wasted as they can be used as bait for crab pots.

### Recreational

Spotted ray can be caught throughout the year but the main season for recreational fishers occurs from early May to September. The Southern IFC District encompasses two of the largest charter boat ports in the UK at Weymouth and Poole (Williams and Davies, 2018). Many of these boats provide specialised trips to target skates and rays, including the spotted ray. A recent review undertaken by the MMO to map recreational sea angling activity in England found skates and rays to be the most valued species

for charter boats operating in the South Inshore marine planning area (Devon and Severn, Southern and Sussex IFCA districts) and amongst the top three most valued species across England (MMO, 2020a). The vast majority of skates and rays caught recreationally are released.

## Landings & Value of Fishery

In 2019, 2,000 tonnes of skates and ray (mixed species) worth £2.6 million was landed by UK vessels into England (MMO,2019). Since 2017 landings have increased by 200 tonnes year-on-year, previous to this, landings remained around 1,600 tonnes between 2014 to 2017. Southern IFCA do not hold effort or catch data for the spotted ray fishery but landings data from the MMO can help indicate the scale of the fishery within the Southern IFCA district over time. Figure 1. shows landings and the value of spotted ray into ports within the district since 2009. Before this point spotted ray landings were recorded under a general category of skates and rays.

Over the last 10 years (2009-2019) spotted ray landings into ports in the district have ranged between 4.6\* to 10\* tonnes per year (figure 1). From 2010 to 2012 landings were consistently around 6 tonnes before almost doubling in 2013 to over 10 tonnes. Following 2013, landings declined slightly to 7 tonnes per year before falling further to their lowest level (previously seen in 2009) of 4.6 tonnes in 2016 and 2017. Total landings once again increased in 2018 to 7 tonnes and in 2019 approximately 10 tonnes of spotted ray worth £9,935\* was landed into ports across the District. The value of the spotted ray has declined since 2012 from around £1,470 per tonne to £980 per tonne in 2019.

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

The value of the recreational spotted ray fishery or the quantity of retained catches in the district is not known.

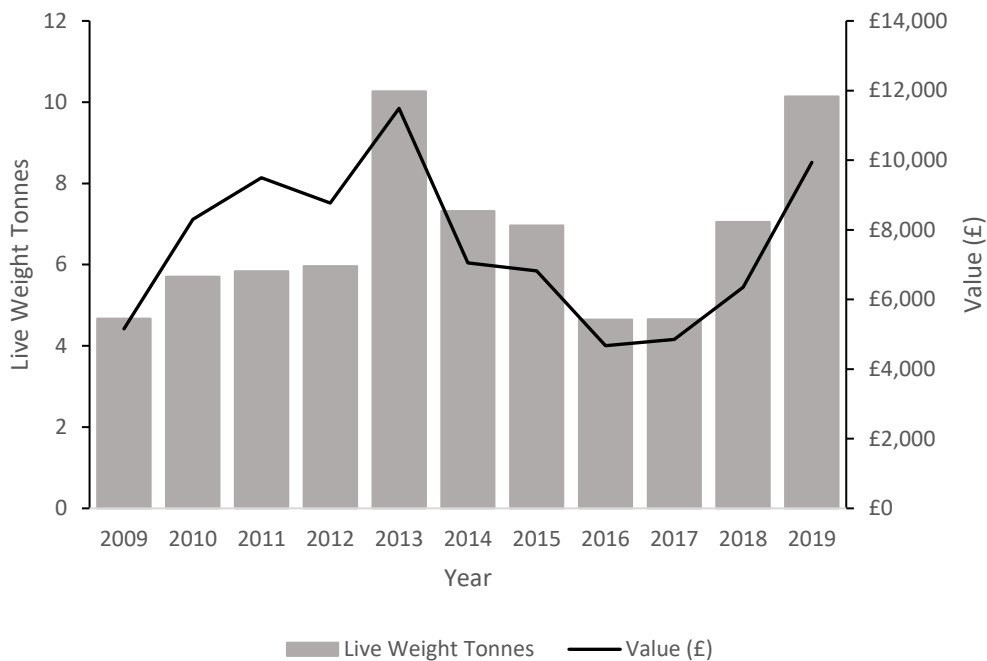


Figure 1. Landings of spotted ray (*Raja montagui*) in the Southern IFC district from 2009 to 2019. Data sourced from the Marine Management Organisation (MMO).

Spotted ray is listed by the IUCN as a species of Least Concern as populations appear to be stable across the species' range despite being commonly landed in fisheries (Ellis et al., 2007). However, the stock size within the English Channel is unknown therefore ICES advises a precautionary approach to landings. In the eastern English Channel (7.d) the advised total landings is combined with the North Sea, Skagerrak and Kattegat where no more than 301 tonnes should be landed in each year of 2020 and 2021 (ICES, 2019). Whereas advised landings in the southern Celtic Seas and western English Channel for 2021 and 2022 are much higher at 1,041 tonnes per year (ICES, 2020).

## Associated management

Spotted ray caught within the Southern IFC District is subject to a minimum size byelaw 'Skates and Rays – Minimum Size'. The byelaw prohibits the retainment of any species of skate or ray that measures less than 40 cm between the extreme tips of the wings or any detached wing that measures less than 20 cm in its maximum dimension. There are no minimum landing sizes for skates and rays on a national/EU level but some IFCA's have introduced minimum size byelaws within their districts (table 2). Kent and Essex IFCA's minimum size for skates and rays is 40 cm measured from the extreme tips of the wings and 19 cm for a detached wing measured in a straight line from the tip of the wing to the centre of the cut edge. North Western IFCA apply a minimum size within a certain area of their district, as introduced under the former Cumbria Sea Fisheries Committee District. Any skate or ray caught from Havrigg Point in Cumbria to the Scottish border in the Solway Firth must not measure less than 45 cm between the extreme tips of the wings and 22 cm based on maximum dimensions for detached wings.

Spotted rays are part of a mixed Total Allowable Catch (TAC) under the European Union’s Common Fisheries Policy (CFP). 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. Skates and rays (excl. undulate rays) caught in the English Channel are currently exempt of the Landings Obligation based on their survival rates (MMO, 2020b). Cefas have assessed the health condition of 17,259 individual skates and rays caught as bycatch from various projects and found 100%, 98% and 95% survived fishing capture in longline, otter trawl and net fisheries, respectively (Cefas, 2018). Further research is required to understand survival rates of captured skates and rays once they are released.

Table 2. Minimum Conservation Reference Size (MCRS) for spotted ay (*Raja montagui*) in Inshore Fisheries and Conservation Authority (IFCA) Districts in England. All measurements in cm measured wing tip to wing tip.

<b>IFCA</b>	<b>Minimum Landing Size (MLS) (cm)</b>	
Northumberland	-	
North Eastern	-	
Eastern	-	
Kent & Essex	40	Detached wing: 19*
Sussex	-	
Southern	40	Detached wing: 20*
Devon & Severn	-	
Cornwall	-	
Isles of Scilly	-	
North Western	45	Detached wing: 22 * **

\*Please note detached wings are measured differently depending on the byelaw

\*\*North Western IFCA MLS only applies to a certain are of the district (from Haverigg Point in Cumbria to the Scottish border in the Solway Firth)

## References

- Ajayi, T., 1982. Food and feeding habits of raja species (Batoidei) in Carmarthen Bay, Bristol Channel. *J.mar.biol.Ass.U.K*, 62: 215-223
- Cefas, 2018. Survivability of discarded skates and rays in English inshore otter trawl fisheries. Part of ASSIST MF1232. Ref.Ares (2019)
- Ebert, D.A., and Stehmann, M.F.W., 2013. Sharks, batoids, and chimaeras of the North Atlantic FAO Species Catalogue for Fishery Purposes. No. 7. Rome, FAO. 523 pp.
- Elliott, S.A.M., Carpentier, A., Feunteun, E., and Trancart, T., 2020. Distribution and life history trait models indicate vulnerability of skates. *Progress in Oceanography*, 181: 102256
- Ellis, J., Ungaro, N., Serena, F., Dulvy, N., Tinti, F., Bertozzi, M., Pasolini, P., Mancusi, C. and Noarbartolo di Sciara, G., 2007. *Raja montagui*. The IUCN Red List of Threatened Species 2007: e.T63146A12623141. <https://dx.doi.org/10.2305/IUCN.UK.2007.RLTS.T63146A12623141.en>. Downloaded on 30 November 2020.
- Ellis, J. R., A. Cruz-Martínez, B. D. Rackham, and S. I. Rogers., 2005. The Distribution of Chondrichthyan Fishes Around the British Isles and Implications for Conservation. *J. Northw. Atl. Fish. Sci.*, 35: 195-213. doi:10.2960/J.v35.m485
- Gallagher, M.J., Nolan, C.P., and Jeal, F., 2005. Age, growth and maturity of the commercial ray species from the Irish Sea. *J.Northw.Atl.Fish.Sci.*, 35: 47-66
- Holden, M.J., Rout, D.W., and Humphreys, C.N., 1971. The rate of egg laying by three species of ray. Fisheries laboratory, Lowestoft, England
- ICES. 2019. Spotted ray (*Raja montagui*) in divisions 3.a and 7.d (North Sea, Skagerrak, Kattegat and eastern English Channel). In Report of the ICES Advisory Committee, 2019. ICES Advice 2019, rjm.27.3a47d-<https://doi.org/10.17895/ices.advice.4839>.
- ICES. 2020. Spotted ray (*Raja montagui*) in divisions 7.a and 7.e–h (southern Celtic Seas and western English Channel). In Report of the ICES Advisory Committee, 2020. ICES Advice 2020, rjm.27.7ae-h. <https://doi.org/10.17895/ices.advice.5813>.
- Leblanc, N., Tetard, A., Legrand, V., Stephan, E., and Mace, L.H., 2014. RAIMOUEST: the French fishery of rays in the western English Channel (VIIe), 2014 update. Working document for ICES WGEF, June 2014
- McCully, S.R., Scott, F., and Ellis, J.R., 2012. Lengths at maturity and conversion factors for skates (Rajidae) around the British Isles, with an analysis of data in the literature. *ICES Journal of Marine Science*, 69(10): 1812-1822
- MMO, 2019. UK sea fisheries statistics, 2019

- MMO, 2020a. Mapping recreational sea anglers in English waters. A report produced for the Marine Management Organisation, MMO Project No: 1163, February 2020, 129pp
- MMO, 2020b. Fishing gear requirements and landing obligation exemptions 2020. Applicable to demersal towed gears fishing in the English Channel (excluding beam trawlers). Document No V2 March 2020
- Ryland, J.S., Ajayi, T.O., 1984. Growth and population-dynamics of 3 raja species (Batoidei) in Carmarthen Bay, British-Isles. *J. Cons.Int. Exp. Mer* 41, 111–120
- Saglam, H., and Ak, O., 2012. Reproductive biology of *Raja clavata* (Elasmobranchii:Rajidae) from Southern Black Sea coast around Turkey. *Helgol Mar Res*, 66: 117-126
- Van Steenbergen, J.J., 1994. Reproductive strategies of *raja radiata*, *raja naevus*, *raja montagui* and *raja clavate* in the North Sea. Netherlands Institute for Sea Research (NIOZ), The Netherlands
- Walker, P., Howlett, G., and Millner, R., 1997. Distribution, movement and stock structure of the three ray species in the North Sea and eastern English Channel. *ICES Journal of Marine Science*, 54: 797-808



## Appendix

Table A. Size at maturity estimates ( $L_{50}/DW_{50}$ ) for spotted ray (*Raja montagui*) in studies undertaken around and outside the British Isles. Male and female total length ( $L_{50}$ ) has been converted to disc width ( $DW_{50}$ ) using conversion factors ( $DW=0.6605L_{50} + 0.2841$ ) presented in McCully et al., 2012. Measurements given in cm. Number of individuals in brackets represents the number of mature individuals within sample.

\*North Sea and Celtic Sea ecoregions combined

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 ( $L_{50}$ )		Size at 50% maturity ( $DW_{50}$ )		Size range of mature individuals		
		M	F	M	F		M	F	M	F	M	F	M	F	M		F
UK*	3675	1900	1775	10-67	10-76	3686 (394)	1911 (310)	1775 (84)	40	49	50.9	62.5	33.9	41.5	-	-	McCully et al., 2012
North Sea and English Channel	587	-	-	-	-	-	-	-	-	-	60	60	39.9	39.9	-	-	Walker et al., 1997
North Sea, Netherlands	109	55	54	-	-	-	-	-	-	-	58-64	-	39-43	-	-	Steenbergen, 1994	
Irish Sea	468	274	194	-	-	-	-	-	-	-	53.7	57.4	35.7	38.2	-	-	Gallagher et al., 2005
Carmarthen Bay, Wales	2005	986	1019	-	-	-	-	-	56.2	57.3	-	-	-	-	-	-	Ryland, 1984