

Flat Fish

Size at Maturity Review

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Introduction

Southern Inshore Fisheries and Conservation Authority (IFCA) has undertaken an extensive literature review, using published and grey literature, based upon 50% size of sexual maturity for commercial and recreational species in the Southern IFC District (“the District”). The information gathered will help inform the IFCA’s Minimum Conservation Reference Sizes (MCRS) Review.

Many commercial species caught within the District are subject to a MCRS, previously known as Minimum Landing Size or Minimum Legal Size. This statutory measure prevents fish or shellfish below a set size from being removed from the fishery and is therefore recognised as an effective tool for the sustainable management of fisheries. A MCRS for a species is often set based upon the size at which 50% of the population reaches maturity. This ensures at least 50% of juveniles have an opportunity to sexually mature and reproduce at least once before potential capture. Additional factors such as market size, existing legislation, stock status and reproductive strategies can also influence whether and how a MCRS is set.

The following tables (1-8) summarise the literature reviewed for 50% size at maturity (SOM) for 8 species of flat fish that are listed in Southern IFCA’s ‘Minimum Conservation Reference Size Byelaw’. Tables highlight key information from studies including study location, total number of individuals sampled overall, size range sampled, total number of individuals used to assess size at maturity, size of smallest mature individual, size at 50% maturity, size at 100% maturity, and age at 50% maturity. Information for each species varies depending on the available data.

Data for 5 of the 8 species listed below has been incorporated into detailed ‘Species Profiles’ where best available evidence on reproductive biology, life history and the social and economic value of each species has been summarised. Species with a Profile have been indicated below and linked to the IFCA website where all Species Profiles can be downloaded and viewed.

Important information to note about summarised data:

- Maturity values have been rounded
- Where possible data has been extracted from peer-reviewed scientific literature
- All values are recorded in **mm**
- L₅₀ - Length at 50% maturity
- Size at maturity estimates may vary between studies due to differences in maturity criteria used, sampling period and sample size
- Species reviewed are listed under Southern IFCA’s MCRS Byelaw. Consultation for this Byelaw took place in 2019/2020 and the Byelaw was made by the Authority in June 2020. At the time of writing this Byelaw is awaiting sign off by the Secretary of State.
- All efforts have been made to review the available literature as thoroughly as possible, however this is not an exhaustive list of maturity data. If you know of a relevant study, please provide details and the information can be incorporated into the review.

Brill (*Scophthalmus rhombus*)

MCRS: 300 mm [Species Profile](#)

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 (mm)					Size of smallest mature individual (mm)		Size at 50% maturity (L ₅₀) (mm)		Size at 100% maturity (mm)		Age at 50% maturity (years)		
		M	F	M	F		M	F	M	F	M	F	M	F	M	F	
North Sea Netherlands	5000	-	-	-	-	2706	979	1727	-	-	180	310	-	-	0.1	1.6	Hammen et al., 2013
Adriatic Sea Italy	149	-	-	-	-	-	-	-	230	370	-	-	-	-	-	-	Caputo et al., 2001

References

Caputo, V., Candi, G., Colella, S., and Arneri, E., 2001. Reproductive biology of turbot (*Psetta maxima*) and brill (*Scophthalmus rhombus*) (Teleostei, Pleuronectiformes) in the Adriatic Sea, Italian Journal of Zoology, 68 (2): 107-113

van der Hammen, T., Poos, J.J., van Overzee, H.M.J., Heesen, H.J.L., Magnusson, A., and Rijnsdorp, A.D., 2013. Population ecology of turbot and brill: what can we learn from two rare flatfish species? Journal of Sea Research, 84: 96-108

Dab (*Limanda limanda*)

MCRS: 230 mm

Study location	Total No. surveyed	No. of individuals (n)		Length Data		Size at Maturity Data										Reference	
				Size range (mm)		Total No. of individuals	No. of individuals (n)		Size of smallest mature individual (mm)		Size at 50% maturity (L ₅₀) (mm)		Size at 100% maturity (mm)		Age at 50% maturity (years)		
		M	F	M	F		M	F	M	F	M	F	M	F	M		F
North Sea	-	-	-	-	-	-	-	-	-	-	110	140	-	-	2	2-3	Bohl (1957) cited in Rijnsdorp et al., 1992
North Sea												150					Froese et al., 2013
North Wales	-	-	-	-	-	5808 (4002)	1427 (1219)	4381 (2783)	-	-	130	180	-	-	1.3	2.4	Seisay, 2001
Northumberland	208	-	-	55-340		-	-	-	-	-	190		-	-	2.6		Papadamakis, 2014
Irish Coast	2532	-	-	-	-	-	-	-	120	140	140	170	230	240	-	-	Langan, 2012

Values in brackets outline the number of mature specimens in sample.

References

- Froese, R., and Sampang, A., 2013. Potential Indicators and Reference Points for Good Environmental Status of Commercially Exploited Marine Fishes and Invertebrates in the German EEZ. World Wide Web electronic publication, available from <http://oceanrep.geomar.de/22079/>
- Langan, L.M., 2012. Ireland's understudied flatfish: Reproduction, age and growth of the dab *Limanda limanda* (L.) in Irish coastal waters. Masters thesis, Galway-Mayo Institute of Technology, Galway
- Papadamakis, P., 2014. Common dab (*Limanda limanda*) fisheries biology in the Northumberland coast (NE, England); Preliminary age and growth study in order to introduce a Minimum Landing Size (MLS) restriction for the future. Masters thesis, Newcastle University, Newcastle. 21P.
- Rijnsdorp, A., Vethaak, A., Van Leeuwen, P., et al., 1992. Population biology of dab *Limanda limanda* in the southeastern North Sea. Marine Ecology Progress Series, 91:1-3
- Seisay, M.B.D., 2001. Population ecology of dab (*Limanda limanda* L.) in the Eastern Irish Sea, North Wales. PhD Thesis, University of Wales, Bangor. 290P.

Flounder (*Platichthys flesus*)

MCRS: 270 mm [Species Profile](#)

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 (mm)					Size of smallest mature individual (mm)		Size at 50% maturity (L ₅₀) (mm)		Size at 100% maturity (mm)		Age at 50% maturity (years)		
				M	F				M	F	M	F	M	F	M	F	
Humber Estuary England	-	-	-	-	-	36	-	-	-	-	250-280		-	-	-	3	Lart, 1986
Plymouth England	-	-	-	-	-	-	-	-	-	-	280*	350*	-	-	-	-	Hartley, 1940
Bay of Biscay	-	-	-	-	-	-	-	-	-	-	247	300	-	-	3	4	Déniel, 1981

*Average length of mature specimens sampled not 50% maturity

References

Déniel, C., 1981. Les poissons plats (Te' le'oste'ens – Pleuronectiformes) en Baie de Douarnenez: Reproduction, Croissance et Migration des Bothidae, Scophthalmidae, Pleuronectidae et Soleidae. Ph.D. Thesis, Université de Bretagne Occidentale, Brest. pp. 1–476

Hartley, P.H.T., 1940. The Saltash tuck net fishery and the ecology of some estuarine fishes, J, Mar, Biol, 24

Lart, W., 1986. A study of the biology and population dynamics of the flounder (*Platichthys flesus*) in the Humber Estuary. Master's thesis, University of Wales., Wales

Lemon sole (*Microstomus kitt*)

MCRS: 250 mm

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 (mm)					Size of smallest mature individual (mm)		Size at 50% maturity L ₅₀ (mm)		Size at 100% maturity (mm)		Age at 50% maturity (years)		
				M	F				M	F	M	F	M	F	M	F	
West Coast of Ireland	1820	388	1410	170-370	190-410	-	-	-	170	200	-	-	-	-	-	-	King et al., 2006

King et al, (2006) did not calculate a size at 50% maturity but spawning males were observed amongst specimens ranging from 210-310 mm whilst spawning females ranged from 230-410 mm.

References

King, P.A., Hannan, J.F., McGrath, D., and Veldon, M., 2006. Population dynamics, age, growth and maturity of lemon sole *Microstomus kitt* (Walbaum, 1792) sampled between 2000-2002 off the west coast of Ireland. Irish Fisheries Investigations No.16 2006

Plaice (*Pleuronectes platessa*)

MCRS: 270 mm [Species Profile](#)

Study location	Total No. surveyed	No. of individuals (n)		Length Data		Total No. of individuals	No. of individuals (n)		Size of smallest mature individual (mm)		Size at 50% maturity (L ₅₀) (mm)		Size at 100% maturity (mm)		Age at 50% maturity (years)		Reference
				Size range (mm)			M	F	M	F	M	F	M	F	M	F	
				M	F												
Lyme Bay England	-	-	-	-	-	-	-	-	-	300	-	290-310	-	-	-	-	Horwood, 1990
Bristol Channel South-east Ireland	-	-	-	-	-	-	-	-	-	-	-	290-310	-	-	-	-	Horwood, 1990
North Sea	-	-	-	-	-	5042	2772	2270	-	-	220	340	-	-	-	-	Rijnsdorp, 1989
Irish Sea	2342	-	-	90-400	90-510	-	-	-	-	-	230	210	-	-	3	3	Doran, 2012
Cardigan Bay Wales	-	-	-	-	-	-	-	-	-	200	-	220-230	-	-	-	-	Horwood, 1990
Outside UK & Ireland																	
Brittany	-	-	-	-	-	1122	435	687	-	-	-	380-400	-	-	-	4	Brule, 1987

References

Brule, T., 1987. The reproductive biology and the pathological changes of the plaice *Pleuronectes platessa* (L.) after the 'Amoco cadiz' oil spill along the North-west coast of Brittany. J.mar.biol.Ass.UK., 67: 237-247

Doran, L.M., 2011. Age, growth and reproductive biology of Plaice, (*Pleuronectes platessa* L.) in Irish waters, 2003-2005. Masters Thesis, Galyway-Mayo Institute of technology, Ireland

Horwood, J.W., 1990. Fecundity and maturity of plaice (*Pleuronectes platessa*) from Cardigan Bay. *J.mar.biol.Ass.U.K.*, 70: 515-529

Rijnsdorp, A. D. 1989. Maturation of male and female North Sea plaice *Pleuronectes platessa* L). *J. Cons. int. Explor. Mer*, 46: 35-51

Sole (*Solea solea*)

MCRS: 240 mm [Species Profile](#)

Study location	Total No. surveyed	No. of individuals (n)		Length Data		Size at Maturity Data										Reference	
				Size range (mm)		Total No. of individuals	No. of individuals (n)		Size of smallest mature individual (mm)	Size at 50% maturity (L ₅₀) (mm)		Size at 100% maturity (mm)		Age at 50% maturity (years)			
		M	F	M	F		M	F		M	F	M	F	M	F		
North Sea	12,808	-	-	-	-	-	-	-	-	-	-	250	-	-	-	3	Mollet et al., 2007
Mediterranean	1643	549	1094	-	-	-	-	-	-	-	200	200	-	-	-	-	El-Aiatt et al., 2019
Aegean Sea	607	-	607	-	190-300	-	-	-	-	-	-	150	-	-	-	-	Cerim and Ates, 2019

References

Cerim, H., and Ateş, C., 2019. Reproductive biology of female common sole, *Solea solea* (Linnaeus, 1758) in the southern Aegean Sea. *Acta Biologica Turcica*, 32(3): 143-148

El-Aiatt, A.A.O., Shalloof, K.A.S., and El-Far, A.M., 2019. Reproductive biology of the common sole, *Solea solea* in Southern East Mediterranean, Bardawil Lagoon, Egypt. *Egyptian Journal of Aquatic Biology and Fisheries*. 23(1): 403-411

Mollet, F.M., Kraak, S.B.M., and Rijnsdorp, A.D., 2007. Fisheries-induced evolutionary changes in maturation reaction norms in North Sea sole *Solea solea*. *Marine Ecology Progress Series*, 351: 189-199

Turbot (*Scophthalmus maximus*)

MCRS: 300 mm [Species Profile](#)

Study location	Total No. surveyed	No. of individuals (n)		Length Data		Size at Maturity Data										Reference	
				Size range (mm)		Total No. of individuals	No. of individuals (n)		Size of smallest mature individual (mm)		Size at 50% maturity (L ₅₀) (mm)		Size at 100% maturity (mm)		Age at 50% maturity (years)		
				M	F		M	F	M	F	M	F	M	F	M		F
North Sea, Netherlands	10,000	-	-	-	-	3,943	1291	2652	-	-	180	340	-	-	1.1	2.2	Hammen et al., 2013
North Sea, UK	-	-	-	-	-	-	-	-	-	-	-	460	-	-	-	4.5	Jones, 1974
South-western Black Sea, Turkey	264	-	-	140-700		166*	32*	134*	-	-	250	200	-	-	2	2	Eryilmaz and Daylan, 2015

*all mature individuals sampled

References

Eryilmaz L., and Dalyan C., 2015. Age, growth, and reproductive biology of turbot, *Scophthalmus maximus* (Actinopterygii: Pleuronectiformes: Scophthalmidae), from the south-western coasts of Black Sea, Turkey. *Acta Ichthyol. Piscat.* 45 (2): 181–188

Jones, A., 1974. Sexual maturity, fecundity and growth of the turbot *Scophthalmus maximus* L. *J.Mar.Biol.Ass.U.K.*, 54: 109-125

van der Hammen, T., Poos, J.J., van Overzee, H.M.J., Heesen, H.J.L., Magnusson, A., and Rijnsdorp, A.D., 2013. Population ecology of turbot and brill: what can we learn from two rare flatfish species? *Journal of Sea Research*, 84: 96-108

Witch Flounder (*Glyptocephalus cynoglossus*)

MCRS: 280 mm

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 (mm)					Size of smallest mature individual (mm)		Size at 50% maturity (L ₅₀) (mm)		Size at 100% maturity (mm)			Age at 50% maturity (years)	
		M	F	M	F		M	F	M	F	M	F	M	F		M	F
Gulf of Maine USA	4721	-	-	-	-	-	-	-	-	-	240	340	-	-	4	6	Burnett et al., 1992

References

Burnett, J., 1992. Several biological aspects of the witch flounder (*Glyptocephalus cynoglossus* (L.)) in the Gulf of Maine-Georges Bank region. *Journal of Northwest Atlantic Fishery Science*, 12: 15-25