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POPULATION PARAMETERS: NARROW-BARRED SPANISH MACKEREL (*SCOMBEROMORUS COMMERSON*)

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The Narrow-barred Spanish mackerel (*Scomberomorus commerson*) (Lacépède, 1800) is part of the Scombridae family. It is an epipelagic predator which is distributed widely in the Indo-Pacific region (Figure 1) from shallow coastal waters to the edge of the continental shelf where it is found from depths of 10-70m (McPherson 1985). It is relatively large for a neritic species with a maximum fork length of 240 cm.

Narrow-barred Spanish mackerel is primarily caught by gillnet fleets operating in coastal waters with the highest reported catches form Indonesia, India and Iran (Pierre et al. 2014). Most research has been focussed in these areas where there are important fisheries for the species, with the most common methods used to estimate growth being through length-frequency studies, although a number of otolith ageing studies have also been undertaken.

Estimates of growth parameters *for S. commerson*, using either length or age-based information, vary between geographic locations. Estimate of the growth parameter K of the von Bertalanffy equation range from 0.12 (Edwards et al. 1985) to 0.78 (Pillai et al. 1993). However, the majority of studies suggest relatively rapid growth of juveniles. Differences may be due to regional differences in growth patterns, but may also be due to the different selectivity patterns of gears used to obtain the samples as a variety of drifting gillnets, hooks and lines, trolling and trawl gear are used to catch Narrow-barred Spanish mackerel. A summary of the results of studies which have investigated the age and growth of this species is provided in Table 1 and Figure 2. Estimates of mortality parameters and length-weight relationship are provided in Table 2.

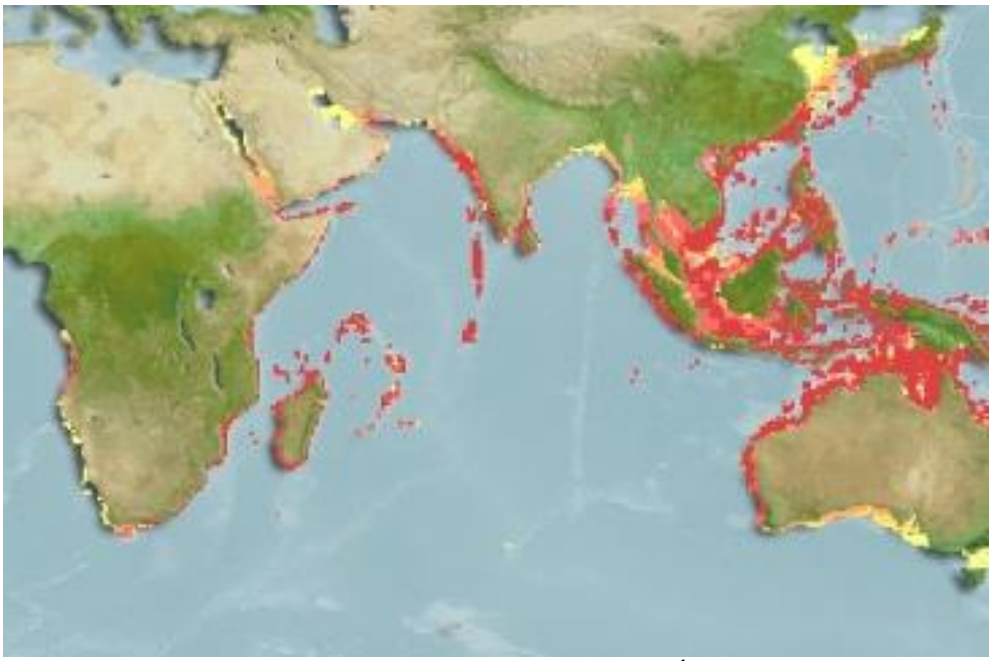

Figure 1. Distribution of *S. commerson* in the Indian Ocean region[1]

[1] Computer generated distribution maps for *Scomberomorus commerson* (Narrow-barred Spanish mackerel), with modelled year 2100 native range map based on IPCC A2 emissions scenario. www.aquamaps.org, version of Aug. 2013. Web. Accessed 23 Mar. 2015.

Table 1. Estimated growth parameters for Narrow-barred Spanish mackerel with details of the type of analysis from which they have been determined and the region. LF – length frequency studies and ELEFAN: Electronic Length Frequency Analysis.

Region	Von Bertalanffy growth parameters					Length at age (cm)				n	Ageing method	Analysis type	Reference
	Lm50 (cm)	L_{max} (cm)	$L\infty$ (cm)	K ($year^{-1}$)	t_0 (years)	Yr 1	Yr 2	Yr 3	Yr 4				
Saudi Arabia	**76.5**	**240**	**153(TL) 138(FL)**	**0.38**	**-0.28**								**Fishbase.org**[2]
Oman	85	240	119(FL)	0.6	-0.18								Fishbase.org
Australia	-	127(M) 155(F)	127.5M (FL) 155F (FL)	0.25(M) 0.17(F)	-					-	Otoliths	Daily increments	(McPherson 1992)
Persian Gulf and Oman Sea	-	132	140 (FL)	0.42	-0.26					14,698	LF	ELEFAN	(Shojaei et al. 2007)
Persian Gulf and Oman Sea	-	164	175.26(FL)	0.45						1995	LF	ELEFAN	(Darvishi et al. 2012)
Persian Gulf and Oman Sea	83.6									1120			(Kaymaram et al. 2010)
Oman	75-80	-	226.0 (FL) 193.6 (FL) 138.3 (FL) 131.2 (FL)	0.280 0.292 0.362 0.614	-0.85 -0.678 -1.16 -0.438					172 172 37 209	LF LF Otoliths Otoliths & LF	ELEFAN Modal prog Daily increments & annuli Annuli & modal prog	(Dudley et al. 1992)
Oman	-	166	140.44F (FL) 118.80M (FL)	0.309 0.595	-1.501 -0.730					962 1244	Otoliths & LF	Daily increments & ELEFAN	(McIlwain et al. 2005)

[2] Parameters used in IOTC assessments in 2014

Region	Von Bertalanffy growth parameters					Length at age (cm)				n	Ageing method	Analysis type	Reference
	Lm50 (cm)	L_{max} (cm)	$L\infty$ (cm)	K (year^{-1})	t_0 (years)	Yr 1	Yr 2	Yr 3	Yr 4				
Oman	-	-	164 (FL)	0.34	-						LF	ELEFAN	(Dudley & Aghanshinikar 1989)
Southern India	-	194	208 (TL) (187 FL)	0.18	-0.16	40	73	96	119		Otoliths & LF	Modal progression	(Devaraj 1981)[3]
Southwest India	-	-	146 (TL) (131 FL)	0.78	0	80	113	132	141	460	LF	Modal progression	(Pillai et al. 1993)
South east India	-	120	178 (FL)	0.38	-0.23						LF	Modal progression	(Thiagarajan 1987)
Djibouti, Ford Watford	-	-	151 (TL) (136 FL)	0.21	-						LF	Modal progression	(Bouhlel 1985)
Gulf of Aden, Yemen	-	-	230 (FL)	0.12	0.01						vertebrae	increments	(Edwards et al. 1985)
Saudi Arabian Gulf	-	-	184 (TL) (165 FL)	0.26	-						LF	ELEFAN	(Kedidi et al. 1993)
Sri Lanka	-	-	146 (FL)	0.37	-	45.2	76.3	97.9	-		LF	ELEFAN	(Dayaratne 1989)
Persian Gulf and Oman Sea	-	156	189 (FL)	0.24	-0.29					500	LF	modal progression	(Taghavi Motlagh & Shojaei 2009)
North Persian Gulf and Oman	-	138	151 (FL)	0.46	-					475	LF	ELEFAN	(Kaymaram et al. 2013)

[3] As cited in IOTC–2014–WPNT04–29 Rev_1

Region	Von Bertalanffy growth parameters					Length at age (cm)				n	Ageing method	Analysis type	Reference
	Lm50 (cm)	L_{max} (cm)	$L\infty$ (cm)	K ($year^{-1}$)	t_0 (years)	Yr 1	Yr 2	Yr 3	Yr 4				
Southern Arabian Gulf	723 M(FL) 86 F(FL)	135 (FL)	139 (all) 136 F 126 M (FL)	0.21 (all) 0.24 F 0.22 M	-1.9(all) -1.7 F -2.3 M					277 3149	Otoliths LF	Annual increments	(Grandcourt et al. 2005)
Persian Gulf and Oman Sea	83.6	-	156 (FL)	0.24	-					-	LF	ELEFAN	(Kaymaram, Niamaimandi, Ghasemi, et al. 2014)
Dar es Salaam, Tanzania Pangani, Tanzania	74F (TL) 77M (TL) 75F (TL) 79M (TL)	119 (TL)	122 (TL) (110 FL)	0.68 0.3	0.17 0.15					-	LF	ELEFAN	(Johnson et al. 2014)
Oman	-	-	146 (FL)	0.216	-2.62					1244	otoliths	Daily increments	(Govender et al. 2006)
Gulf of Oman Arabian Sea	84.6 M 80.7 F 76.1 M 70.7 F	170 (FL)	131 M (FL) 154 F (FL) 119 M (FL) 133 F (FL)	0.33 M 0.17 F 0.65 M 0.41 F	-1.74 M -2.98 F -0.62 M -1.12 F					778 313	otoliths	Daily increments	(Claereboudt et al. 2005)

Table 2. Mortality parameters and length-weight relationships

Region	M (year^{-1})	Z (year^{-1})	Lifespan (y)	Length-weight relationship			Reference
				a	b	units	
Australia			4.8y	0.0099	2.95	cm-g	Fishbase
Iran	0.49	1.47		0.0076	2.98	cm-g	(Shojaei et al. 2007)
Persian Gulf and Sea of	0.5	1.98					(Darvishi et al. 2012)
Persian Gulf and Sea of				0.0119(F) 0.0113(M)	2.9(F) 2.9(M)	cm-g	(Kaymaram et al. 2010)
Oman	0.49(M) 0.38(F)	0.89(M) 0.90(F)		3.53x10^{-3}(M) 5.03 x10^{-3} (F)	3.173(M) 3.093(F)	cm-g	(Govender et al. 2006)
North Persian Gulf and Oman Sea	0.54	1.93					(Kaymaram et al. 2013)
Persian Gulf and Oman	0.35	1.65		0.0244	2.73	cm-g	(Taghavi Motlagh & Shojaei 2009)
Persian Gulf and	0.50	1.98					(Darvishi et al. 2012)
Southern Arabian Gulf	0.26	0.88		9x10-6	2.96	cm - kg	(Grandcourt et al. 2005)
Persian Gulf and Oman	0.43	1.13					(Kaymaram, Niamaimandi, Mohammadi, et al. 2014)[4]
Dar es Salaam,	0.74 0.43	2.7 1.44					(Johnson et al. 2014)
Southwest India	0.78	3.288		0.0154	2.81	cm-g	(Pillai et al. 1993)
South east				0.0138	2.83	cm-g	(Thiagarajan 1987)
Saudi	0.36	1.59		0.0056	2.979	cm-g	(Kedidi et al. 1993)
Sri Lanka	0.605	1.63					(Dayaratne 1989)

[4] As cited in (Kaymaram, Niamaimandi, Ghasemi, et al. 2014)

Oman	0.376(F) 0.490(M)	0.901(F) 0.892(M)	9.41×10^{-6}(F) 1.15×10^{-5}(M)	2.950(F) 2.909(M)	cm - kg	(McIlwain et al. 2005)
Gulf of Oman	0.44					(Dudley et al. 1992)
Oman	0.526	1.151				(Dudley & Aghanshinikar 1989)

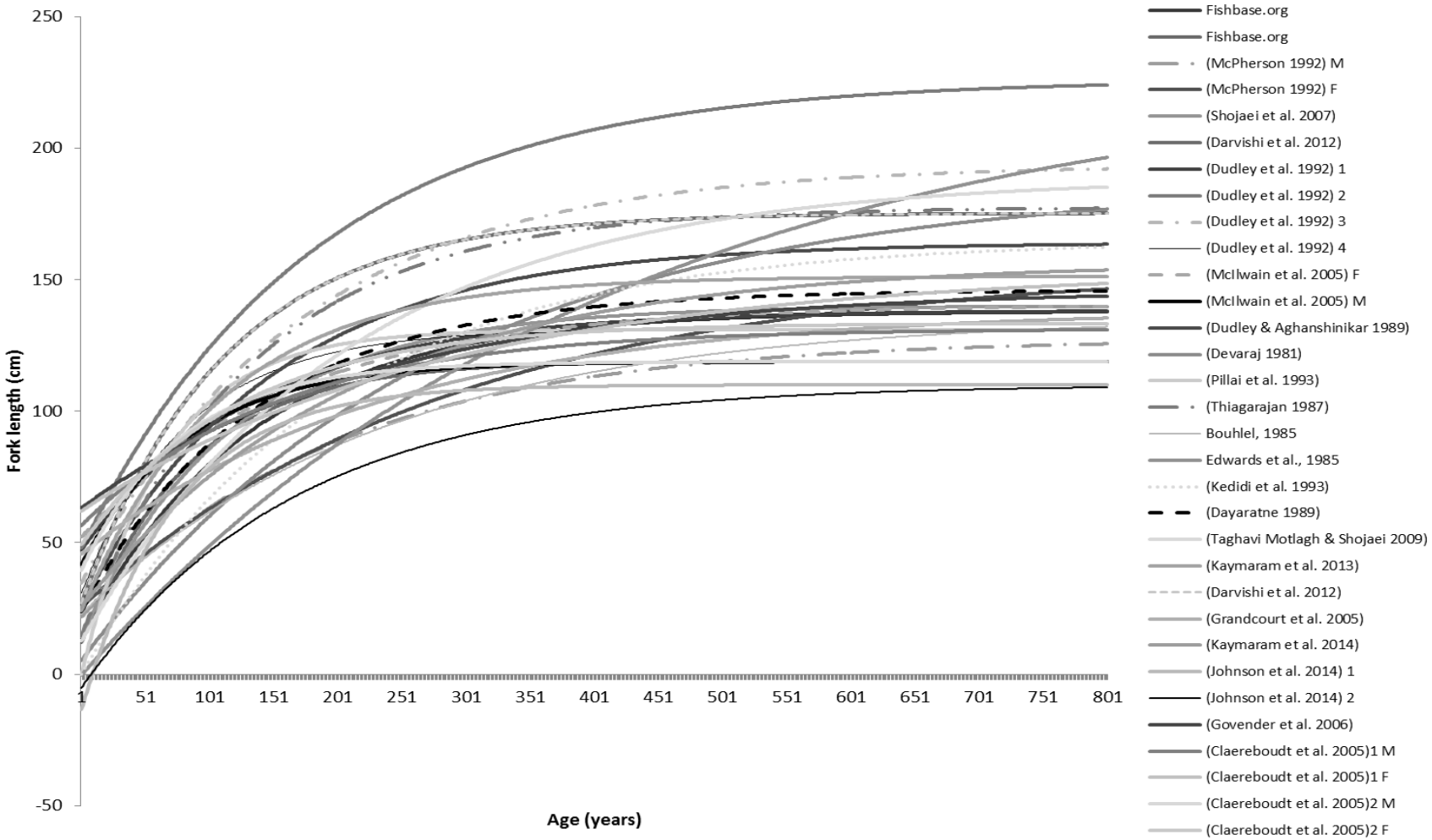

Figure 2. Length-at-age curves derived from ageing studies of Narrow-barred Spanish mackerel (*Scomberomorus commerson*)

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