

POPULATION PARAMETERS: LONGTAIL TUNA (*THUNNUS TONGGOL*)

PREPARED BY: IOTC SECRETARIAT, 28 APRIL 2015

Longtail tuna (*Thunnus tonggol*) is an epipelagic species inhabiting tropical to temperate provinces of the Indo-Pacific, found almost exclusively in the neritic waters close to the shore, avoiding estuaries, turbid waters and open ocean (Figure 1) (Froese & Pauly 2015). It is one of the smallest species of the genus *Thunnus*, but relatively large compared with other neritic species with a maximum length of 145cm (Table 1). Longtail is primarily caught by gillnet fleets operating in coastal waters with the highest reported catches from Iran, Indonesia, Pakistan, Malaysia and, to a lesser extent, Oman, Yemen, India and Thailand (Pierre et al. 2014). Most research on longtail tuna 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. In terms of the different methods used to analyse growth, it has been suggested that length frequency analysis can be an unreliable method of determining growth due to the influence of size selectivity of the sampling gears and frequency of the sample collection (Griffiths, Pepperell, et al. 2010). There are also issues with studies investigating otolith microstructure, as some of these have been based on small sample sizes or limited length distributions (Itoh et al. 1999; Wilson 1981b) and there is some uncertainty regarding the time interval between the formation of consecutive growth rings given the tropical distribution and high mobility of the species enabling it to locate an optimal environment (Abdussamad, Said Koya, et al. 2012).

The studies have provided varied estimates of growth, with k values ranging from 0.18 (Ghosh et al. 2010) – 1.5 (Itoh et al. 1999) with the majority of estimates somewhere in between. Some of these differences may be due to the different estimation techniques, due to regional differences in the maximum size of fish in the areas and due to differences in the size selectivity of the different fish sampling methods. A comparison of the growth model parameters and growth curves derived from each study are provided in Table 1 and Figure 2. Estimates of mortality parameters and length-weight relationship are provided in Table 2.

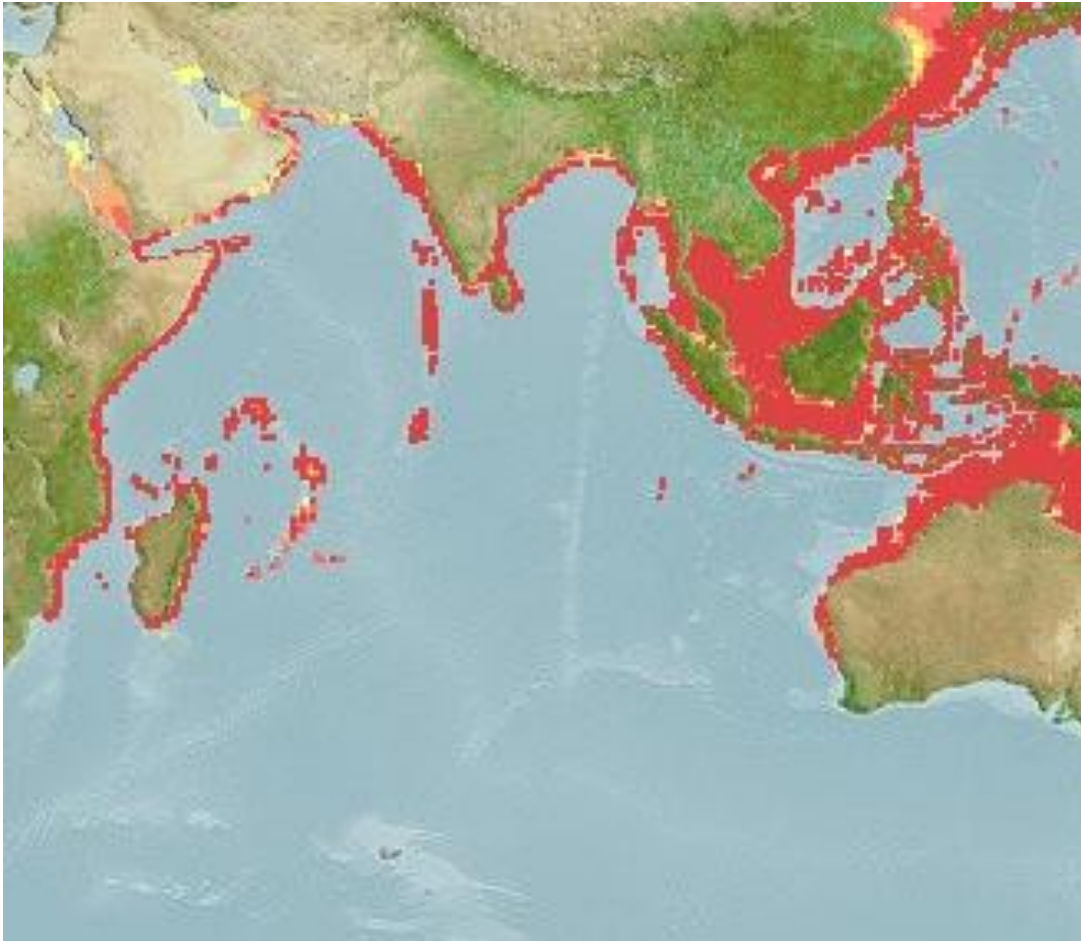


Figure 1. Distribution of *T. tonggol* in the Indian Ocean¹

¹ Reviewed distribution maps for *Thunnus tonggol* (Longtail tuna), with modelled year 2100 native range map based on IPCC A2 emissions scenario. www.aquamaps.org, version of Aug. 2013. Web. Accessed 27 Apr. 2015.

Table 1. Estimated growth parameters for longtail tuna (*Thunnus tonggol*) 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)				Ageing method	Analysis type	Reference	
	Lm50 (cm)	L _{max} (cm)	L _∞ (cm)	K (year ⁻¹)	t ₀ (years)	Yr 1	Yr 2	Yr 3	Yr 4				n
Australia	56.9	145	110(FL)	0.32	-0.36								Fishbase ²
Gulf of Thailand Andaman Sea	40.77(M), 42.16(F) 41.42(M), 40.25(F)									1493			(Hassadee et al. 2014)
Australia			135.4(FL)	0.23	-0.02	27	-	66	-	461	otoliths	Annual increments	(Griffiths, Fry, et al. 2010)
Persian Gulf and Sea of Oman		125	133.72 (FL)	0.35						4313	LF	ELEFAN	(Kaymaram, F., Darvishi, M. Behzadi, S. Ghasemi 2013)
India	51.1	111	123.5(FL)	0.51	-0.0319	51	80	97	108		LF	ELEFAN	(Abdussamad, Rohit, et al. 2012; Abdussamad, Said Koya, et al. 2012)
Papua New Guinea			122.9 (FL)	0.41	-0.032	42	69	87	99		LF	Modal lengths	(Wilson 1981a) ³
Papua New Guinea			131.8 (FL)	0.40	-0.035	44	72	87	96	46	otoliths	Daily increments	(Wilson 1981b)
India			93.0	0.49	-0.240	42	62	74	81		LF	ELEFAN	(Silas 1985)
Oman		116	133.6 (FL)	0.23	-	30	51	68	-		LF	ELEFAN	(Aghanshnikar & Dudley 1989)

² Parameters used in IOTC assessments in 2014

³ As cited in Yesaki (1989)

Region	von Bertalanffy growth parameters					Length at age (cm)				Ageing method	Analysis type	Reference	
	Lm50 (cm)	L _{max} (cm)	L _∞ (cm)	K (year ⁻¹)	t ₀ (years)	Yr 1	Yr 2	Yr 3	Yr 4				n
Gulf of Thailand			108.0 (FL)	0.55	-	46	72	87	96		LF	Modal lengths	(Yesaki 1989)
North Persian Gulf and Oman Sea		128	133.8(FL)	0.35	-						LF	ELEFAN	(Kaymaram et al. 2011)
India	-	-	94.0 (TL) (85 FL)	0.48	-						LF	ELEFAN	(James et al. 1993)
Veraval, India	-	98	107.4 (FL)	0.18	-0.0729					2976	LF	ELEFAN	(Ghosh et al. 2010)
Japan	-	49	55.0 (FL)	1.7	-0.089						otoliths	Daily increments	(Itoh et al. 1999)

Table 2. Mortality parameters and length-weight relationships

	Length-weight relationship					Reference	
	M (year ⁻¹)	Z (year ⁻¹)	Lifespan (y)	a	b		Units
	0.54		9	0.01427	3.00	(FL) cm - g	Fishbase
India	0.77	3.72		0.01480	3.00	(FL) cm - g	(Abdussamad, Said Koya, et al. 2012; Abdussamad, Rohit, et al. 2012)
Persian Gulf and Sea of Oman	0.44	1.82		0.00002	2.83	(FL) cm - kg	(Kaymaram, F., Darvishi, M. Behzadi, S. Ghasemi 2013)
India	0.80	1.22		0.00008	2.70	(TL) cm - g	(James et al. 1993)
Oman	0.43	1.78					(Aghanshnikar & Dudley 1989)
Iran				0.00004	2.70	(FL) cm - kg	(Darvishi et al. 2003) ⁴
Persian Gulf and Sea of Oman	0.44	1.82		0.00002	2.83	(FL) cm - kg	(Kaymaram et al. 2011)
Australia				0.00005	2.82	(FL) mm - g	(Griffiths, Fry, et al. 2010)
Veraval, India	0.4	1.12		0.357	2.51	(FL) cm - g	(Ghosh et al. 2010)
Thailand				0.012	3.10	(FL) cm - g	(Hassadee et al. 2014)

⁴ In Persian, as cited in (Abdussamad, Said Koya, et al. 2012)

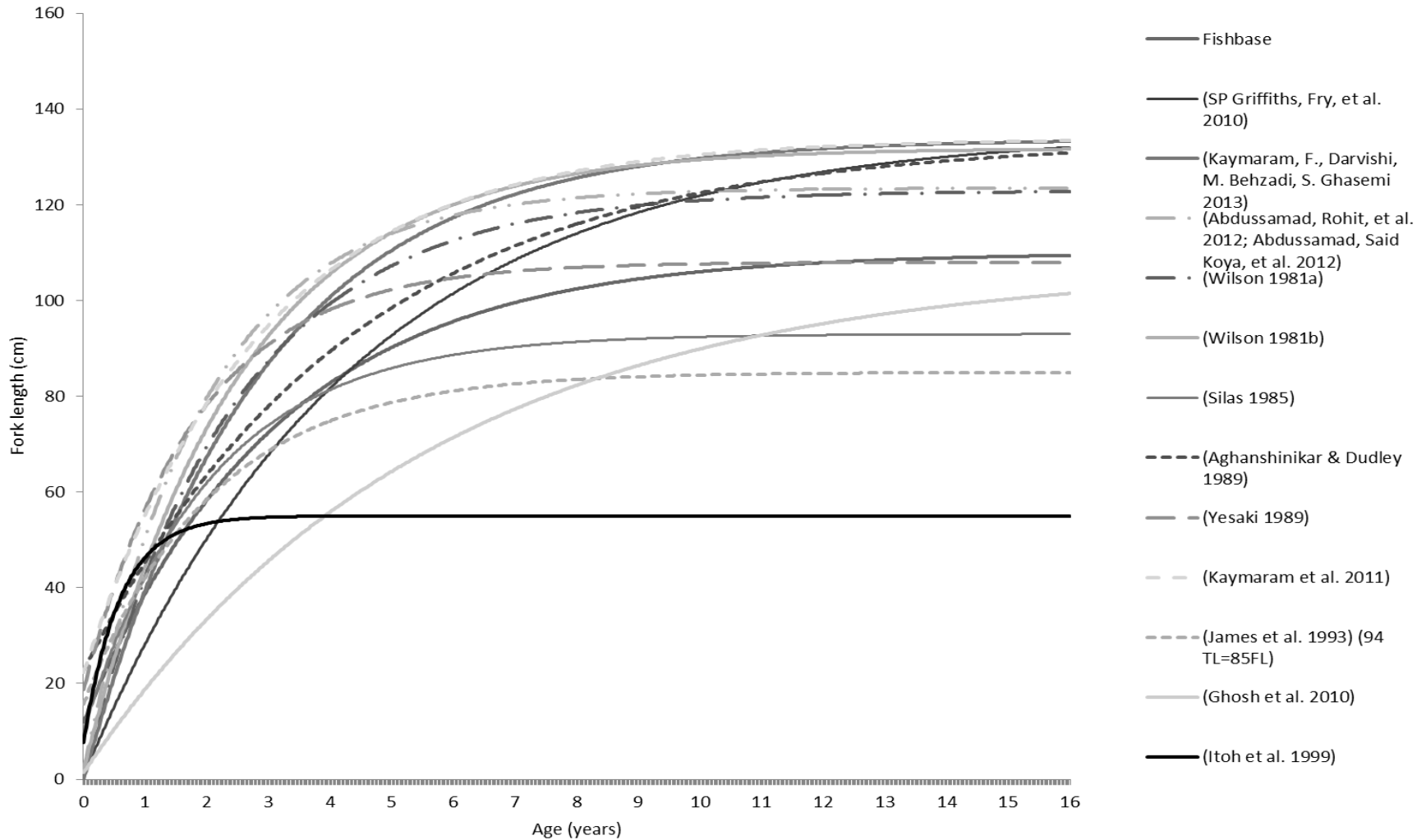


Figure 2. Length-at-age curves derived from ageing studies of longtail tuna (*Thunnus tonggol*) from different regions of the Indian Ocean.

References

- Abdussamad, E.M., Said Koya, K.P., et al., 2012. Fishery, biology and population characteristics of longtail tuna, *Thunnus tonggol* (Bleeker, 1851) caught along the Indian coast. *Indian Journal of Fisheries*, 59(2), pp.7–16.
- Abdussamad, E.M., Rohit, P., et al., 2012. Status and potential of neritic tunas exploited from Indian waters. *IOTC – 2012 – WPNT02 – 10 Rev _ 1*, (November), pp.19–21.
- Aghanshinikar, A.P. & Dudley, R.D., 1989. Age, growth and mortality rates of longtail tuna *Thunnus tonggol* (Bleeker) in Omani waters based on length data. *Indo-Pacific Tuna Development Management Programme*, IPTP/89(GEN/16), p.82.
- Darvishi, M. et al., 2003. Population dynamics of five Scombrid fish in Hormozgan Province (Iran). *Persian Gulf and Oman Sea Ecological Research Institute (In Persian)*, p.183.
- Froese, R. & Pauly, D., 2015. Fish Base.
- Ghosh, S., Pillai, N.G.K. & Dhokia, H.K., 2010. Fishery, population characteristics and yield estimates of coastal tunas at Veraval. *Indian Journal of Fisheries*, 57(2), pp.7–13.
- Griffiths, S., Fry, G., et al., 2010. Age and growth of longtail tuna (*Thunnus tonggol*) in tropical and temperate waters of the central Indo-Pacific. *ICES Journal of Marine Science*, 67(1), pp.125–134. Available at: <http://icesjms.oxfordjournals.org/cgi/doi/10.1093/icesjms/fsp223>.
- Griffiths, S., Pepperell, J., et al., 2010. *Biology, fisheries and status of longtail tuna (Thunnus tonggol), with special reference to recreational fisheries in Australian waters*,
- Griffiths, S.P. et al., 2011. Age and growth of longtail tuna (*Thunnus tonggol*) in tropical and temperate waters of the central Indo-Pacific.
- Hassadee, P. et al., 2014. Piyawan Hassadee, Anchalee Yakoh, Praulai Nootmorn, Patcharee Puntuleng, Niracha Songkaew and Udom Kruanium. , (June), pp.1–9.
- Itoh, T., Yuki, Y. & Tsuji, S., 1999. Spawning possibility and growth of longtail tuna, *Thunnus tonggol*, in the water around Japan. *Bulletin of the National Research Institute of Far Seas Fisheries*, 0(36), pp.47–53.
- James, P.S.B.R. et al., 1993. Fishery, biology and stock assessment of small tunas. In D. Sudarsan & M. E. John, eds. *Tuna research in India*. Fisheries Survey of India, Bombay, pp. 123–148.
- Kaymaram, F. et al., 2011. Population dynamic parameters of *Thunnus tonggol* in the north of the Persian Gulf and Oman Sea. *IOTC-2011WPNT01-18. First Working Party on Neritic Tunas, India, 14–16 November 2011*, pp.1–8.
- Kaymaram, F., Darvishi, M. Behzadi, S. Ghasemi, S., 2013. Population dynamic parameters of *Thunnus tonggol* (Bleeker , 1851) in the Persian Gulf and Oman Sea. *Iranian Journal of Fisheries Science*, 12(4), pp.855–863.
- Pierre, L., Geehan, J. & Herrera, M., 2014. Review of the Statistical Data Available for Bycatch Species. *IOTC-2014-WPNT04-07 Rev_1*, pp.17–19.



- Silas, E.G., 1985. Biology and stock assessment. *CMFRI Bulletin*, 36(The fisheries of the EEZ of India), pp.20–216.
- Wilson, M., 1981a. Some aspects of the biology and reproduction of longtail tuna in Oceania. In *Northern pelagic fish seminar*. Australian Government Public Service, pp. 24–44.
- Wilson, M., 1981b. *The biology, ecology and exploitation of longtail tuna, Thunnus tonggol (Bleeker) in Oceania*. Macquarie University, Sydney.
- Yesaki, M., 1989. Estimates of age and growth of kawakawa (*Euthynnus affinis*), longtail tuna (*Thunnus tonggol*) and frigate tuna (*Auxis thazard*) from the Gulf of Thailand based on length data. *IPTP-89-GEN-17 -AUG_1*, Indo-Pacif, p.Development Management Programme.