

## GROWTH PARAMETERS ESTIMATED FOR YELLOWFIN TUNA OCCURRING IN THE INDIAN EEZ

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### ABSTRACT

*In the Indian EEZ Yellowfin Tuna (YFT) *Thunnus albacares* is the pre-dominant species among the larger growing oceanic pelagics. During the exploratory surveys length frequency data of yellowfin tuna are collected by the institute from the different sectors of the Indian EEZ. In the paper growth parameters for *Thunnus albacares* yellowfin are calculated following von Bertalanffy growing equation. The growth parameters calculated are  $L_{\infty} = 193.93$  cm and  $K = 0.20$  per year. The growth performance indices obtained in the present study when compared to the earlier study of John and Reddy (1989) does not show significant difference. The result in the present study suggest of slower growth rate of yellowfin tuna in Indian waters.*

### INTRODUCTION

In Indian waters, the Yellowfin Tuna (YFT) *Thunnus albacares* is the most predominant species among the large oceanic pelagics. The exploratory surveys conducted by Fishery Survey of India since 1983 in the oceanic sector of the Indian EEZ has revealed the abundance of this species in the North West coast, east coast and in waters of Andaman & Nicobar waters. However very limited work has been carried out for the growth characterization and estimation of growth parameters of this highly migratory species occurring in the Indian part of the Indian Ocean. This is in contrast to the extensive work carried out to estimate the growth parameters of the coastal tunas in Indian waters. The oceanic fishery for Yellowfin tuna in Indian waters is exclusively by long lining. The growth parameters of YFT are estimated from Indian seas. Earlier John and Reddy (1989) have reported their work on growth analysis of Yellowfin tuna based on data collected during the period, 1984 – 86 using length frequency data. In this paper, the length frequency data of Yellowfin tuna collected through the exploratory surveys undertaken by the institution in different sectors of the Indian EEZ. An attempt has been made here to analyse the length – frequency data and estimate, the growth parameters  $L_{\infty}$  & 'k' of the Yellowfin tuna.

### MATERIAL AND METHOD

The length frequency data of Yellowfin *Thunnus albacares* collected from the Tuna longliners, *Blue Marlin* and *Yellow Fin*, operating along the North West Arabian waters during the period 1994 – 2002 are used for the analysis. The data was pooled together from both the regions on quarterly basis. The total sample size was 2997.

The Length frequency samples were subject to cohort analysis following Bhattacharya method (1967) using FISAT, to obtain the different modes and estimate the mean modal values. The results obtained from Bhattacharya method were used for modal progression analysis to identify growth pattern and establish growth curve for the species. The mean lengths are plotted against time axis and those

mean lengths appear to correspond to the same cohort have been connected in growth curves.

The growth parameters k and  $L_{\infty}$  were computed following Gulland and Holt (1959) plot. These values were derived from

$$K = -b \text{ and}$$

$$L_{\infty} = -a/b$$

Estimation of growth performance index 'phi-prime' (Pauly and Munro, 1984) was computed following  $\theta = \text{Log } k + 2 \text{ log } L_{\infty}$ .

### RESULTS

#### GROWTH PARAMETERS

The pooled data on length frequency of YFT month-wise for the period mentioned is given in Table. 1. The length frequencies for the entire period of observation for Arabian Sea and Andaman and Nicobar waters is depicted in Fig. 1. The growth parameters  $L_{\infty}$  and k estimated following Gulland and Holt plot in the present case are 193 cm (TL) and  $k = 0.20$  / years.

From the growth curve established, the growth increments were calculated for the species at different age following Von Bertalanffy Growth Equation (VBGE) (Table-2). The Yellowfin tuna (YFT) is found to attain a length of 35.15 cm at the end of one year. The length attained at the end of 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> year are found to be 63.9 cm, 87.5, 106.8, 122.6, and 135.5 cm respectively. The growth increment registered during the first year is 28.8 cm followed by 23.5 cm during second year, 19.2 cm during 3<sup>rd</sup> year, 15.8 cm during 6<sup>th</sup> year. Thereafter the growth increment showed a slow rate achieving 1-2 cm every year. The growth during the early year's upto 10 years is rather fast but subsequently stabilizes a best at slow rate as the fish grows further.

The growth curve and estimated growth parameters of the YFT obtained during the present study and those reported by John and Reddy (1989) are given in Fig 2. The length attained at different age and the corresponding growth

increments in respect of the present study and those obtained by John and Reddy (1989) are given in Table 2.

#### PHI PRIME

Growth performance index obtained based on growth parameters in the present study and John and Reddy (1989) are as follows.

John & Reddy, 1989 - 3.94

Present study - 3.88

The value does not show significant difference.

#### DISCUSSION

These had been several studies elsewhere on the growth of

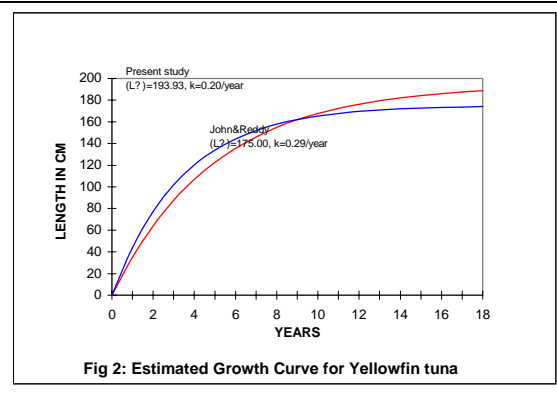
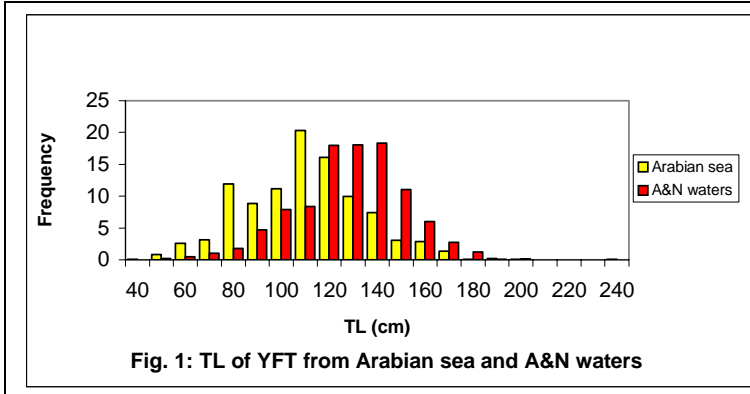
juvenile Yellowfin and there are two distinct schools of thought, one suggesting a fast growth rate and the other a slow growth rate. Reviewing the various estimations based on Length frequency studies as well as otoliths observations and drawing evidence from migration model, Anderson (1988) suggested that a growth rate of  $2.9 \pm 0.4$  cm per month would be nearest to the true rate for the YFT. However the growth of 2.40 cm / month during second year and 1.97 cm / month during third year of Yellowfin tuna in the present study is suggestive of slower growth rate in Indian waters. The growth performance index ( ) value in the present study as compared to the earlier reported value is found comparable.

#### REFERENCES:

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Length group (cm)	No. of observation in different months												Total
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
40	0	1	0	0	0	0	0	0	0	0	0	0	1
50	0	3	3	0	0	0	0	1	0	5	0	1	13
60	17	3	2	2	0	2	1	0	0	1	7	6	41
70	0	13	11	2	0	5	0	2	6	7	7	5	58
80	31	57	17	9	6	5	1	3	9	16	11	17	182
90	29	24	34	9	14	11	21	13	3	6	11	18	193
100	43	18	57	22	12	10	24	24	11	4	19	34	278
110	67	36	152	22	9	5	18	19	17	16	28	14	403
120	61	48	143	52	33	47	40	29	9	13	21	19	515
130	55	59	80	31	38	33	45	34	12	28	7	16	438
140	114	52	65	16	36	22	17	24	14	17	7	27	411
150	60	30	25	7	17	13	14	31	10	15	1	7	230
160	20	13	18	16	14	4	5	17	7	12	4	10	140
170	8	12	7	10	0	4	2	12	4	1	0	4	64
180	4	1	0	3	0	3	2	4	4	0	0	1	22
190	0	1	1	0	0	0	0	0	0	0	2	0	4
200	0	2	1	0	0	0	0	0	0	0	0	0	3
210	0	0	0	0	0	0	0	0	0	0	0	0	0
220	0	0	0	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0	0	0	0
240	0	0	0	1	0	0	0	0	0	0	0	0	1
<b>Total</b>	<b>509</b>	<b>373</b>	<b>616</b>	<b>202</b>	<b>179</b>	<b>164</b>	<b>190</b>	<b>213</b>	<b>106</b>	<b>141</b>	<b>125</b>	<b>179</b>	<b>2997</b>

Table1: Pooled length frequency distribution of YFT from the Indian waters



Age (Yr)	Present study			John & Reddy	∅'	
	Length at age (cm)	Growth Increment (cm)	Length at age (cm)	Growth increment (cm)	Present study	John&Reddy
1	35.153545	28.78128842	44.053876	32.96391018	3.8765	3.9485
2	63.934833	23.56412594	77.017786	24.66569303		
3	87.498959	19.29267458	101.68348	18.45643946		
4	106.79163	15.79550598	120.13992	13.81028124		
5	122.58714	12.93226651	133.9502	10.33373031		
6	135.51941	10.5880443	144.28393	7.732353907		
7	146.10745	8.668757482	152.01628	5.78583872		
8	154.77621	7.097378342	157.80212	4.329332322		
9	161.87359	5.810841915	162.13145	3.239481649		
10	167.68443	4.757514977	165.37094	2.423986096		
11	172.44194	3.89512382	167.79492	1.813780484		
12	176.33707	3.189057658	169.6087	1.357185855		
13	179.52612	2.610979578	170.96589	1.01553273		
14	182.1371	2.137689276	171.98142	0.759886144		
15	184.27479	1.750191951	172.74131	0.568595117		
16	186.02499	1.432935974	173.3099	0.425459011		
17	187.45792	1.173188749	173.73536	0.318355477		
18	188.63111	0.960525708	174.05372	0.238213805		
19	189.59164	0.786411936	174.29193	0.178246712		
20	190.37805	0.643859637	174.47018	0.13337552		
21	191.02191	0.527147685	174.60355	0.099800043		

Longevity = 3/k

Present study, longevity = 15

John&Reddy, longevity = 10.3448

Table2: Comparison of growth rate of Yellow fin tuna in Indian waters