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Fishery of yellowfin tuna *Thunnus albacares* (Bonnaterre, 1788) in the Indian EEZ with special reference to their biology and population characteristics

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ABSTRACT

The fishery and population characteristics of yellowfin tuna, *Thunnus albacares* were monitored during 2006-'10. They were being caught as bycatch along the coasts of Indian mainland and island territories by several coast-based fishery for a long time. Their landings by coast-based fishery was very nominal (4,171 t year^{-1} average for 1985-2000) with considerable annual fluctuations until targeted fishery for the species developed during the last decade. This resulted in considerable improvement in landings to a peak of 37,963 t in 2007. The production declined thereafter due to shift in the target resource of these vessels from yellowfin tuna to billfishes and elasmobranchs. The annual average catch in oceanic fishery during 2006-'10 was 85,928 t. The coast-based fishery exploit mainly surface tunas in the outer shelf, adjacent oceanic areas and seamounts. At national level, the pooled catch was supported by 22 - 202 cm fishes with 66.3 cm as annual mean. Relatively large fishes of 40 to 202 cm with 83.4 cm as mean length and dominated by 58-102 cm groups supported the catch in line fishery. The gillnet fishery comprised 22 to 123 cm fishes dominated by 44-82 cm size and other gears landed 26 to 110 cm size fishes dominated by 42 to 80 cm size. Length at capture was 44.8 cm in gillnets, 60.3 cm in hooks and lines and 42.7 cm in other gears. The length at first maturity was 57.6 cm and optimum length for exploitation was 61.1 cm. They spawn round the year with peak during August-January. The mean relative fecundity was 4,36,330 ova per kg body weight and it varied with size of the fish. Study shows that stock of yellowfin tuna in Indian waters remain very healthy with large proportion of spawning stock biomass. Exploitation range of coastal based fishery being very limited and oceanic fishery concentrated mainly in international waters, large area of Indian EEZ remain unexploited by the country. Overall assessment of fishery scenario indicates possibility of large proportion of yellowfin tunas, especially larger ones remain inaccessible to Indian fishers and hence considerable scope for expanding the fishery.

Keywords: Exploitation, Growth, MSY, Oceanic tuna, Sexual maturity, Yellowfin tuna

Introduction

Yellowfin tunas (*Thunnus albacares*) have been exploited along the Indian coast since time immemorial mainly as bycatch in several coastal fisheries. Their exploitation has however been influenced greatly by local consumer preferences and marketing demands. Recent increase in demand for "sashimi" grade tuna from international markets combined with improved fishing efficiency through modernisation which increased the endurance of the fishing crafts have resulted in extension of fishing activities to distant waters for exploiting hitherto unexploited large oceanic resources. Targeted fishery for oceanic tuna in the Indian EEZ dated back to mid-eighties and initiated with the introduction of large vessels under charter scheme for tuna longlining. They undertake long duration fishing trips, staying at sea for extended periods of time, rarely return to registered port and believed to transship the catches in the mid-sea. They fish mainly in international waters and occasionally in the Indian EEZ. In the recent past, hundreds of mechanised trawlers and thousands of traditional crafts, modified or specially designed for exploiting yellowfin tuna were also pressed into tuna fishing from mainland and its island territories. These fleets generally operate combination of gears like longlines, handlines, troll lines, pole and lines, gillnets *etc.* and fish mainly in the outer shelf areas, adjacent oceanic waters and around oceanic seamounts. This resulted in increased landings of yellowfin tunas and other large pelagics.

Several studies were conducted in the past on the biology, fishery, stock assessment and distribution of yellowfin tunas in Indian seas based on experimental as well as exploratory surveys and also based on commercial fishery (Mohan and Kunhikoya, 1985; John and Reddy, 1989; Pillai *et al*., 1993; John, 1995; Gopakumar and Ajithkumar, 2005; Premchand *et al.,* 2005; Sivaraj *et al.,* 2005; Abdussamad, *et al*., 2008; Prathibha *et al.,* 2008). Somvanshi *et al*. (2003) made a synoptic review of the studies carried out on the yellowfin tuna in the Indian seas. Though yellowfin tuna fishery gained importance over the years, except limited information provided by the above workers on their fishery, biology, some aspects of population characteristics and distribution, only little is known on the population dynamics, stock characteristics and potential in the Indian EEZ. The present study, therefore concentrated on monitoring and documenting their fishery and biology in Indian EEZ including island waters. Such information may aid in developing guidelines for tapping the unexploited oceanic tuna potential of the country.

Materials and methods

Yellowfin tuna fishery was monitored along the five geographical fishing regions, north-west (NW), south-west (SW), south-east (SE), north-east (NE) and Lakshadweep coasts of India during 2006-2010. Catch data of Andaman and Nicobar Islands were collected from the Department of Fisheries of the islands. Data on effort, catch, length composition and biology of yellowfin tuna in the landings were collected. The national fishery data collected by Central Marine Fisheries Research Institute (CMFRI) from the mainland coast was used as the baseline data in the study. Details on fishing were collected from the fishers through enquiry. Length composition in the catch by line and gillnet fishery was collected separately for each region and also at national level. A total of 1,867 fishes were analysed for biology at weekly intervals. Feeding behaviour was studied by gut content analysis as in Pinkas *et al.* (1971). The length at first maturity (L_m) was determined using logistic curve by considering fishes with ovaries at stages IV and V as mature. Fecundity was estimated using gonads at the advanced IV and V stage of maturity alone.

Population parameters were estimated from the length frequency data using FiSAT software (Gayanilo *et al*., 1997) and probability of capture and size at capture by logistic curve (Pauly, 1984). Modal progression analysis and VBGF model was used to evaluate age and growth. Empirical relationship proposed by Froese and Binohlan (2000) was used to estimate optimum size and age for exploitation of the species. The empirical equation $\log_e (M) = -0.0152 -0.279 \log_e (L_\infty) + 0.6543 \log_e (K) +0.463 \log_e (T)$ was used to estimate the instantaneous natural mortality rate (M) (Pauly, 1980); where T is the annual mean water temperature of the region (28 ^{0}C). Catch curve analysis (Beverton and Holt, 1957) was used to estimate the instantaneous total mortality rate (Z). Yield per recruit (Y/R) and spawning stock biomass per recruit (SSB/R) were assessed using the Beverton and Holt (1957) model.

Results and discussion

Fishing fleet

Yellowfin tunas were targeted by varieties of craft and gear combinations operated from several major and minor fishing harbours of the mainland and island coasts of India (Table 1). Coastal based fishing was undertaken by thousands of traditional fleets and several mechanised fishing fleets of varying specifications. Traditional fishermen of mainland targeted the species from artisanal crafts like catamarans/fiberglass teppas/ wooden boats/ fiberglass boats using small longlines, handlines, troll lines and gillnets. Duration of such fishing is generally short for a day and restricted mainly to shelf waters, but often beyond 200 m depth. Several motorised and non-motorised fleets from Lakshadweep are engaged in tuna fishing using pole and line/hand line/gillnets and from Andaman and Nicobar Islands using handline/gillnets. Recently, longlining was also introduced in Lakshadweep waters on trial basis.

Table 1. Fishing fleet targeting mainly tunas from mainland coast and island territories of India

Category of vessel	Fleet strength (No.)
Mainland	
Traditional crafts	4,000-4,500
Converted trawlers (<24 m OAL)	812
Converted trawlers(>24 m OAL)	48
Large longliners	80-110
Gillnetters	28
Lakshadweep	
Pole & line/handline/gillnets	295
Traditional units (motorised and non-motorised)	370
Andaman & Nicobar Islands*	
Motorised - Hooks & line/gillnets	523
Non-motorised- Hooks & line/gillnets	1,334

* *Source: ANDFISH-2005*

Coast-based mechanised tuna fleets were represented by 28 drift gillnetters based at Tuticorin and 812 medium (<24 m OAL) and 48 large (>24 m OAL) longliners operated from different fishing ports along the mainland coast. They operate in the outer shelf and adjacent oceanic waters and seamounts with fishing duration of 1-3 weeks. In addition to the above gears, they frequently operate other gears also depending on the ground conditions. Gillnets, handlines and small longlines are also very often operated by deepsea trawlers during different seasons for yellowfin tunas and large pelagics.

About 80 to 110 large vessels are engaged in longlining for yellowfin tuna (Pramod, 2010). They undertake long duration fishing trips, operate very large longlines in international waters as well as Indian EEZ, stay at sea for extended periods of time and often transship their catch in the mid-sea and with no proper reporting system.

Fishery

Yellowfin tuna was the second dominant component of coastal based tuna fishery and most dominant component in oceanic fishery during 2006-'10 (Fig. 1, Table 2). They formed 24.5% of the total tuna catch in coastal fishery with an average annual production of 27,277 t during 2006-2010. In oceanic fishery, they represent 94.6% with an average production of 82,526 t during the same period. Their production from coastal based fishery was very nominal with considerable annual fluctuations until 2005 (Fig. 2). It improved considerably since 2006, owing to targeted exploitation by longliners and reached the highest production of 37,963 t in 2007 (Table 2). The production declined continuously thereafter and yield dropped to 20,167 t by 2010. Annual growth rate of yellowfin tuna in catch was 39%, in 2007. The production registered negative growth thereafter in the order of 28%, 13.7% and 14.5% in 2008, 2009 and 2010 respectively. The annual harvest by oceanic fleet during the period ranged between 74,641 t in 2010 and 94,851 t in 2008.

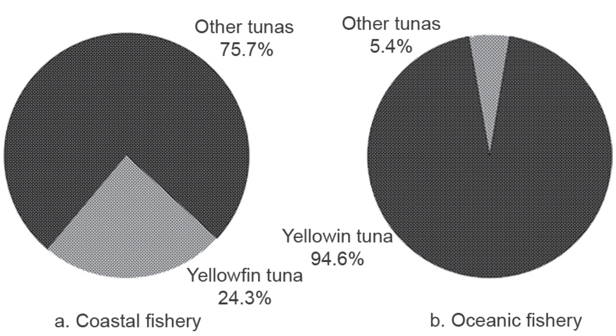

Fig. 1. Yellowfin tuna (%) in the (a) coastal based tuna fishery and (b) oceanic fishery of India during 2006-‘10

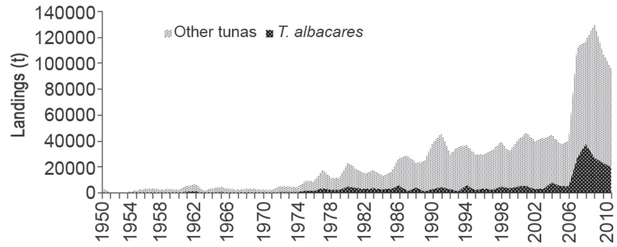

Fig. 2. Trend in yellowfin and other tuna landings along the Indian coast during 1950-2010 (Landings from the island territories were included from 2006 onwards)

Though fishing by modified vessels initially produced positive results, innate limitations of these vessels in longline operation and quality maintenance of tuna catch, coupled with increased return from bycatch forced them to shift the prime target towards more lucrative billfishes, elasmobranchs, perches and carangids resulting in poor tuna catch in later years than expected.

Fishery was throughout the year with peak during July-November and January-April along the mainland and September-December and February-March along Lakshadweep coast. Along the west coast, peak fishery was during August-November and January-April and along the east coast during January-July and November.

Yellowfin tunas were caught either as targeted catch or as an incidental catch in many gears mainly from outer neritic region and from around sea mounts. Major share of the catch was realised in gillnets (54.8%) and hooks and lines (30.4%) (Fig. 3). Other gears, which landed the species are trawls, purse seines, ring seines, bagnets, pole and line and troll lines.

Table 2. Tuna harvest (t) by coastal based fleets and oceanic fleets during 2006-2010

Fishery and group	2006	2007	2008	2009	2010	Average
Coastal fishery						
Yellowfin tuna	27,319	37,963	27,338	23,600	20,167	27,277
Total tuna	112,049	116,867	129,801	107,735	95,372	112,365
Oceanic fishery						
Yellowfin tuna	83,260	80,573	94,851	78,741	74,641	82,526
Total tuna	88,016	85,770	100,268	83,238	78,904	87,239
Total catch						
Yellowfin tuna	114,012	122,444	126,099	105,587	97,885	113,205
Total tuna	200,065	202,637	230,069	190,973	174,276	199,604

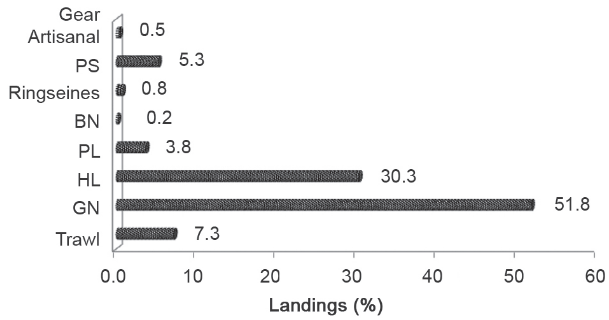

Fig. 3. Yellowfin tuna landings (%) along the Indian coast by different gears during 2006-'10

PS: Purse seine; BN: Bagnet; PL: Pole and line; HL: Hook and line; GL: Gillent

Yellowfin tunas were caught from the entire coast of mainland and island territories. More than 61.5% of the catch was from east coast with Andhra Pradesh being the major contributor (41%) to the national catch (Fig. 4 and 5).

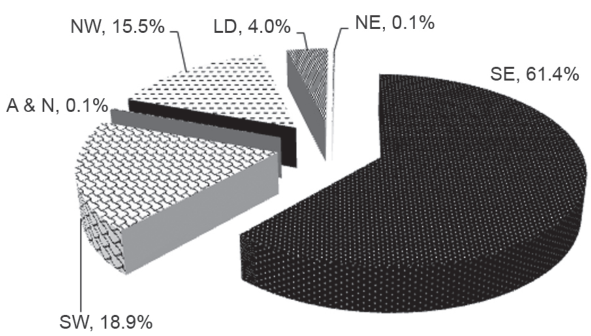

Fig. 4. Contribution of different regions to total yellowfin tuna landings (%) during 2006-'10

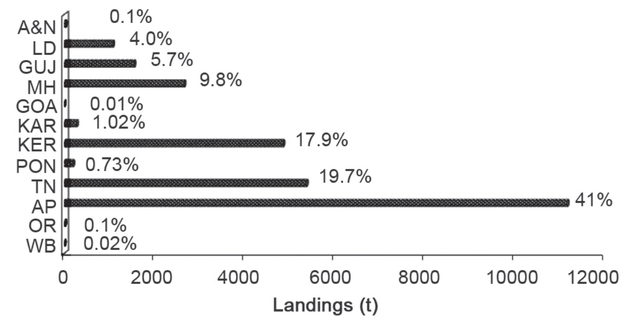

Fig. 5. Contribution of yellowfin tuna (%) by maritime states and island territories during 2006-'10

A&N : Andaman and Nicobar; LD : Lakshadweep, GUJ : Gujarat; MH : Maharashtra; GOA : Goa; KAR : Karnataka; PON : Pondicherry; TN : Tamil Nadu; AP : Andhra Pradhesh; OR : Odisha and WB : West Bengal

Other major contributors were Tamil Nadu (19.7%), Kerala (17.9%), Maharashtra and Lakshadweep. It is to be noted that contribution from island territories are very low, despite estimates of large potential.

Biology

Length distribution in the catch

Length composition of the species in the catch varied with the fishing methods and area of fishing (Fig. 6, Table 3). Pooled landings at national level was supported by 22 - 201 cm fishes with major share by 44 - 82 cm size groups, which represent 80.9% of the catch in number. Mean size in the catch ranged between 61.7 cm in December and 78.6 cm in August with an annual mean of 66.3 cm. Catch in gillnet was represented by smaller size groups of

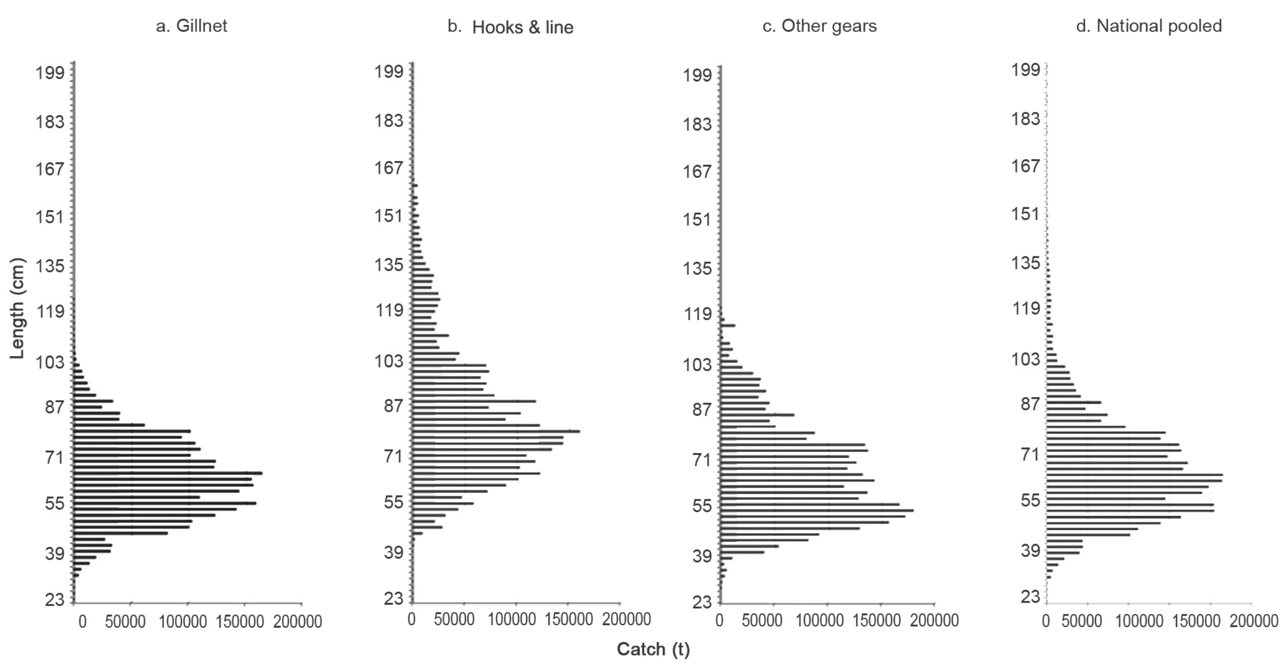

Fig. 6. Size distribution of *Thunnus albacares* in the landings by different gears during 2008-2010

Table 3. Average size (cm) composition of yellowfin tuna in the catch by different gears (2008-'10)

Gear	Length range	Major size group and (%)	Mean	Modes	L_{50}
Hooks & line	40-202	58-102 (75.7)	83.4	67, 79, 89, 111	60.8
Gillnet	22-123	44-82 (86.6)	62.9	49, 53, 65, 75, 85	44.8
Other gears	26-110	42-80 (80.3)	64.5	51, 63, 73, 85	42.7
Pooled	22-202	44-82 (80.9)	66.3	47, 53, 65, 75, 79, 89	45.2

22 - 123 cm with major share by 44 - 82 cm and 62.9 cm as mean. In hooks and lines, it was by 40-202 cm fishes with major share by 58 - 102 cm and 86.8 cm as mean and in other gears by 26 - 110 cm fishes with major share by 42 - 80 cm and 64.5 cm as mean.

Fishery from the north-west coast was supported by 39-155 cm fishes with 76.3 cm as mean and 59, 63, 85 and 99 cm as major modes. In the south-west coast the fishery comprised of 43-182 cm fishes with 87.7 cm as mean and 69, 93 and 119 cm as major modes and along the south-east coast 39-181 cm with 89.1 cm as mean and 47, 65, 79, 89 and 101 cm as modes. Along the Lakshadweep coast, fishes of 22 - 171 cm with 59.7 cm as mean and 41, 53, 59, 71 and 91 cm as major modes formed the fishery.

The size and age of the species at first capture varied with gear (Table 3). It was small (42.7 cm) for purse/ ringseine catch and large, 60.8 cm for hooks and line catch. Corresponding age of the species at these sizes were 9.4 and 14.4 months respectively. It was 44.8 cm (9.9 months) and 45.2 cm (10 months) respectively for gillnet catch and national pooled catch for the period.

Earlier reports show that large share of the yellowfin tuna caught from oceanic waters beyond 300 m depth belonged to large size group (Gopakumar and Ajithkumar, 2005; Premchand *et al.,* 2005; Sivaraj *et al*., 2005). However, their counter parts landed by the coast based fishing units were constituted by small size groups. Presently, the species were exploited from around seamounts or from other relatively shallow waters, predominated by smaller surface tunas. This suggests that large yellowfins remain in deeper waters.

Length-weight relationship

The length-weight relationship of the unsexed population can be expressed as $W = 0.0208 * L^{2.986}$ (Fig. 7). The intercept indicates that the species follow isometric pattern in growth.

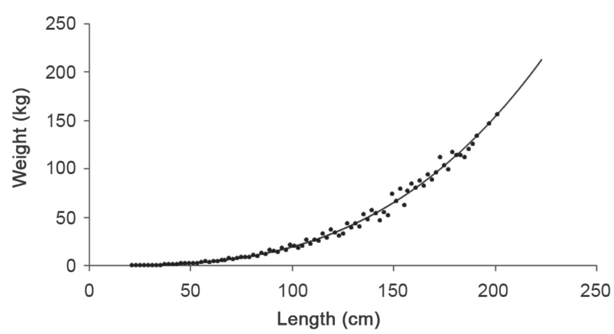

Fig. 7. Length-weight relationship of yellowfin tuna, *T. albacares* exploited along the Indian EEZ

Food and feeding

Considerable variation was observed in the gut content of the species collected from different areas, indicating that they are nonselective, opportunistic feeders, feeding on the available prey. Feed consists of mainly teleost fishes (69.9 %), crustaceans (17.4%) and cephalopods (12.7%). Carangids dominated the fish component and are represented by *Decapterus* spp. and *Selar* spp. Other fish

Table 4. Estimates of mortality and exploitation rates of yellowfin tuna

Region	F (Fishing mortality)	M (Natural mortality)	Z (Total mortality)	E (Exploitation rate)	L_{c50}
Gillnet					
South-west	0.839	0.461	1.300	0.646	61.5
North-west	0.859	0.461	1.320	0.651	52.8
South-east	0.919	0.461	1.380	0.666	40.2
Lakshadweep	1.239	0.461	1.700	0.729	32.1
Pooled	0.889	0.461	1.350	0.659	44.8
Hooks and Line					
South-west	0.358	0.461	0.819	0.437	68.3
South-east	0.505	0.461	0.966	0.523	57.6
Pooled	0.434	0.461	0.892	0.480	60.8

components were tunas (*Euthynnus affinis, Auxis thazard* and *Auxis rochei*), flying fishes, hemiramphids, belonids, priacanthids, lizardfishes, ribbonfishes, clupeids and myctophids. Crustacean component in the gut was represented by pelagic (*Portunus* spp.) and demersal (*Charybdis* spp.) crabs and occasionally deepsea prawns and *Acetes* sp. Oceanic squids and octopus represent the cephalopod component in the gut.

Age and growth

Growth parameters were estimated from pooled national length frequency data for the period 2008-2010. Estimate of asymptotic length (L_{∞}) is 211.1 cm (FL), growth constant (K) is 0.27 year^{-1} and age at zero length (t_o) -0.056 years. The von Bertalanffy equation shows that the fish grow relatively fast and attain about 50, 88.3, 117.3, 139.5, 156.5 and 196.9 cm by the end of 1st, 2nd, 3rd 4th, 5th and 10th year (Fig. 8). It requires about 11.3 years for attaining 201 cm, the L_{max} observed.

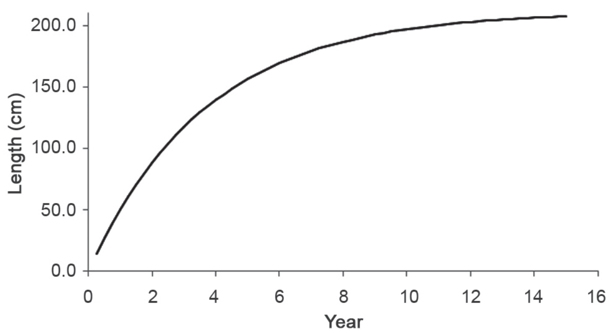

Fig. 8. Growth curve of yellowfin tuna

The age length data suggests that landings were supported by fishes of 40.35 to 11.3 year old fishes with major share of the landings by 0.8 - 1.8 year group.

Sexual maturity and spawning

Sexual maturity and spawning was monitored by observing the condition of gonads of the species in the catch. Gonadal maturity was assessed based on the size, external morphology and colouration of the gonad. Fishes at all stages of gonadal development were observed throughout the year in the catch (Fig. 9), indicating year round spawning in the species with peak during August-January.

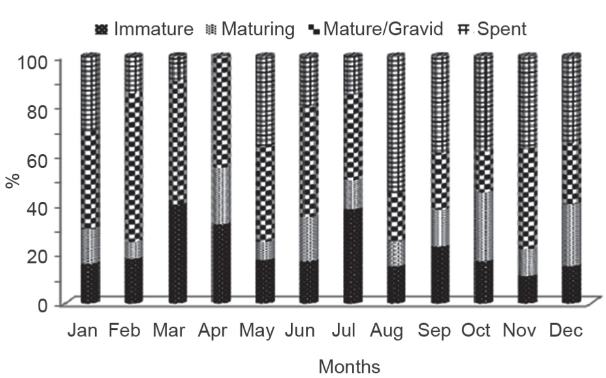

Fig. 9. Seasonal pattern of maturity (%) in yellowfin tuna along the Indian coast

The species show full sexual maturity from 50 cm onwards and spawn at a much smaller size at an age of around one year in Indian waters. Females with spent gonads were observed in the catch from 53 cm and 50% maturity was observed at 57.6 cm (Fig. 10). Age of the species at this size was 13.5 months. Earlier reports suggests that they attain sexual maturity and spawn at size above 100 cm FL and age over two years (Kailola *et al.,*1993; Wild, 1994; Mooney-Seus and Stone, 1997). In Philippine waters they were reported to spawn at 50 cm size (Collette and Nauen, 1983), which is smaller than that observed in the present study.

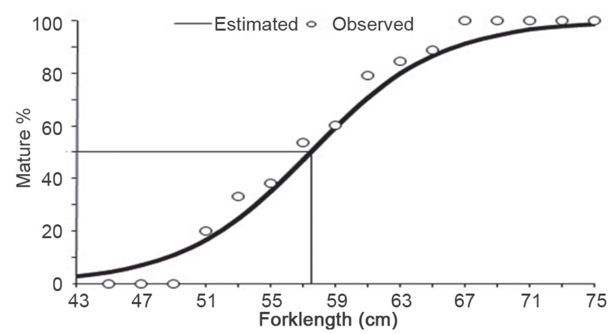

Fig. 10. Logistic curve for estimating size at maturity of yellowfin tuna (females) along the Indian coast

In mature ovaries, three distinct batches of eggs at different stages of development with different ova diameters were observed. Fecundity varied widely with size of the fish examined. It ranged from 17,49,700 to 390,98,700 for fishes weighing between 6.85 and 48.2 kg and measuring between 74 and 138 cm in fork length. The relative fecundity varied between 1,97,263 and 8,14,557 with larger fishes having higher values.

Based on the size at maturity, the optimum size and age for exploitation of yellowfin tuna was estimated as 61.1 cm and 14.5 months respectively. Length distribution of the species in the landings indicates that, 40.3% of the catch in number by gillnets and 42.7% in purse/ring seine was by immature fishes. They form nearly 36% of the national catch. At the same time, their mean size in all gears was much larger than size at maturity and L_{opt}. This shows that large share of the yellowfin tunas in the Indian EEZ are getting atleast a chance to mature and spawn, before being caught.

Recruitment pattern

Recruitment pattern indicate that recruits enter the fishery almost round the year along the Indian coast, with peaks in January, May/June, August and October (Fig. 11). Their recruitment follow the sequence observed in spawning pattern.

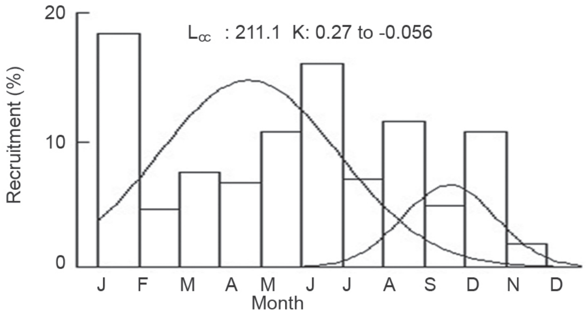

Fig.11. Recruitment pattern of yellowfin tuna along the Indian coast

Mortality and exploitation

Natural mortality of the species was 0.4609 (Table 4). The fishing mortality by gillnets ranged between 0.839 (south-west coast) and 1.239 (Lakshadweep). Fishing mortality was 0.869 for west coast, 0.919 for east coast and 0.849 at national level. It was nearly twice or more of the natural mortality. Exploitation rate by the gillnet also varied accordingly for each region with lower value (0.6455) for south-west region and higher value (0.729) for Lakshadweep region. It was 0.654 and 0.666, for west and east coast respectively and 0.659 at national level. The exploitation rate which will provide maximum yield (E_{max}) for the species was estimated as 0.485.

Though, the yellowfin tuna fishery along the Indian coast is at its infancy covering only selected areas, study provide relatively large exploitation rates and small sizes at capture in gillnets, the major gear landing tunas throughout its exploitation ranges (Table 4). At the same time, the exploitation rate is small and size at capture is relatively large in hooks and line. Gillnet catches surface tunas consisting mainly of smaller size groups whereas in line fishing, catch comprise of mainly larger size groups. So the large values for fishing mortality and exploitation rates in gillnets can be attributed only to large proportion of small fishes in the catch and is not driven by the actual pressure on the stock. Silas *et al.* (1985) obtained similar large values for fishing mortality and exploitation rate, when length frequency data of yellowfin tuna which comprised mainly of small length groups landed by pole and line were used. However, the small size at capture, smaller than their size at first maturity and optimum size of exploitation in gillnet is an indicator of size overfishing.

Yield per recruit and biomass

Relative yield per recruit (Y/R) increased steadily with the exploitation until the exploitation rate reached 0.476 (Fig. 12). Thereafter it declined with increasing exploitation. Relative biomass per recruit was reduced to 50% of the pre-exploitation level at an exploitation rate (E) of 0.288. It further declined to 27.5% at the E_{max} level and to 10% at the present level of exploitation. If the exploitation maintains at the E_{max} level, the biomass/recruit will remain around 60% of the pre-exploitation level.

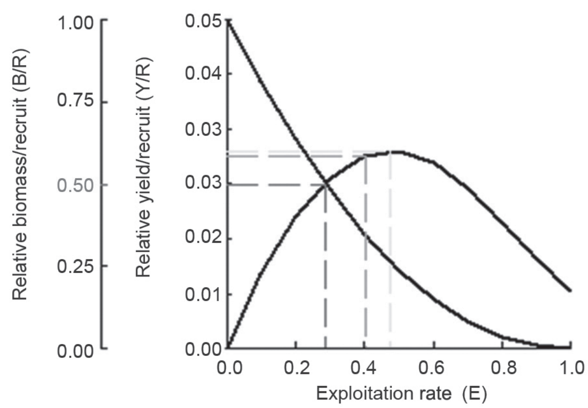

Fig. 12. Relative biomass per recruit and yield per recruit of *T. albacares* stock exploited along the Indian coast

Estimates of standing and spawning stock biomass in the exploited grounds of each region and national level shows the presence of large proportion of spawning stock biomass sufficient to ensure successful reproduction and recruitment in the EEZ. It ranged between 63.3% along Lakshadweep region and 93% along the south-west region with 85.8% at national level. This further indicates that the stock is robust, healthy and not overfished. Early maturity

Table 5. Estimates of standing and spawning stock biomass in the exploited grounds

Region	Spawning stock biomass (t)	Standing stock biomass (t)	Total yield (t)	Recruitment (Nos.)
North-west coast	3,282 (53.6%)	6,118	4,225	9,21,726
South-west coast	4,122 (56.2%)	7,339	5,149	6,91,237
Lakshadweep coast	773 (51.8%)	1,493	1,082	7,53,200
South-east coast	14515 (62.0%)	23,414	16,766	45,40,283
West coast (+LD)	8,177 (54.7%)	14,950	10,456	19,86,770
East coast	14,577 (62.1%)	23,475	16,790	37,10,479
Indian EEZ	22,754 (59.2%)	38,425	27,277	61,14,826

and high fecundity also indicate that the present fishing level will not affect the recruitment. One of the management measures which can be implemented with care may be the establishment of a minimum legal size for exploitation, if spawning stock biomass is depleted below optimum level. The same objective can also be accomplished by implementing closed areas for fishing where small fishes aggregate in large numbers. From the results of the present study, the status of yellowfin tuna stock can be considered robust and healthy in Indian waters.

Exploitation of yellowfin tuna and large pelagics were in vogue by thousands of artisanal fishing units using short longlines/troll lines/handlines/gillnets in many areas along the mainland coast for quiet long time. However, present study shows that the fishery by coastal based fleets is restricted to limited areas and vast area of EEZ waters remain inaccessible to them. Information gathered from different sources further indicates that oceanic fishery concentrate mainly in the international waters and fish only occasionally in the Indian EEZ. The overall assessment of fishery scenario indicates that oceanic areas of Indian EEZ, except around island territories and seamounts, remain largely unexploited by Indian fishers and hence have considerable scope for expanding their fishery. However, since no authentic information is available on the effort and catch by oceanic fleets from Indian EEZ, reliable stock assessment is practically difficult.

This situation warrants sincere effort to exploit the untapped yellowfin tuna potential from deeper waters. As has been discussed earlier, the present tuna fleets (modified trawlers) have operational limitation for fishing in oceanic waters. Since most of our inshore and deepsea trawlers have such limitations, their redeployment for deepsea fishing should be made with utmost care. So, large longlining vessels with deepsea going facilities and adequate carrying capacity need to be introduced. Also skill of the fishing crew must be enhanced through proper training on tuna longlining and creating scientific awareness on the behaviour and distribution pattern of yellowfin tunas. As rightly suggested by Silas (1985), augmenting tuna production from coastal waters was taken up by central and state agencies and catches considerably increased. But regarding large boats for oceanic fishery, country is still in infancy compared to other smaller countries like Seychelles, Sri Lanka, Taiwan, and Thailand. By allowing licensing of foreign vessels, these countries are catching tunas to the tune of 80,000 to 300, 000 t annually.

However, being a straddling stock enjoying transboundary distribution, there will be considerable influence on the extent of exploitation of the fishery in other places. Such impacts will be more visible when juveniles and young ones are exploited on a large scale. The recent decline in the abundance and catch of yellowfin tuna from Indian ocean will have similar impact on the abundance of the species in Indian EEZ also. IOTC reports shows that nearly 30-40% of the total Indian ocean yellowfin catch during 2005-'10 was contributed by purse seiners alone (IOTC, 2010, 2011). Being a pelagic gear, with help of FAD's they catch large numbers of small yellowfin in association with skipjack tuna and juvenile bigeye tuna. It can be assumed that, the catch in number will be several times that of larger yellowfins caught together by all other gears. The major cause of decline in the yellowfin catch from the Indian ocean and global waters can be attributed to such indiscriminate removal of smaller fishes. In order to sustain the resource and fishery at regional and international level, sincere efforts must be made by all regional states to phase out purse seines from yellowfin tuna fishery.

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