STATUS OF LONGTAIL TUNA, *THUNNUS TONGGOL* FISHERY ALONG THE NORTHWEST COAST OF INDIA

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ABSTRACT

Landings of longtail tuna, *Thunnus tonggol,* along the North-west coast of India have increased from 19 t (1990) to as high as 7,452 t (2000) with the average landings during 1990-94 and 1995-2002 being 2,175 and 4,654 t respectively. The species formed only about 29% of the total tuna landings during 1990-94 period, and their share increased to an average of 47% during the next five year period. *T. tonggol* is landed by drift gill nets with peak fishery during September to January. The size composition of the landings indicated that the contribution by the 1 year class which was 35% during 1997-98 fishing season has steadily increased to 92% during 2001-02 season. Exploitation rate (E) has also increased steadily and is presently attained 0.81 compared to 0.35 during 1997-98. Thomson and Bell yield analysis indicated an average annual catchable yield of 7,900 t for the North-west coast.

Introduction

Longtail tuna, *Thunnus tonggol,* is a neritic species with continuous distribution along the continent of Asia from Iran to mainland China (Yesaki, 1993). The average landings during the 1995-2002 period along the Indian coast was about 5970 t of which 78% was contributed from the North-west region. Although the species has so far been reported to be exploited marginally only, since 1998 there has been a perceptible intensification of fishing activities mainly due to technological advancements all along the Indian coast and especially so along the North-west coast (Anon., 1996). Catches of *T. tonggol* which has shown an increasing trend along the North-west coast since the early 90s peaked during 2000 and subsequently showed a sudden decline with catches as low as when the fishery was just developing during 1990-92 period.

Material and methods

Data on tuna landings during the 1990-2002 period was obtained from the National Marine Living Resources Data Centre (NMLRDC),CMFRI,

Cochin. The annual length frequency data (1997-2002) of longtail tuna from drift gill nets along Veraval-Dhamlej coast, Gujarat was smoothed and raised to the catches for the North-west sector for stock assessment studies. Natural mortality (M) was estimated based on age at maximum cohort biomass or critical length L* concept (Cubillos, 2003). Lengthcohort analysis was carried out and yield at different fishing rates were estimated using the Thomson and Bell yield model (Sparre and Venemma, 1998).

Results and Discussion

The contribution of *T. tonggol* to the total tuna landings in this sector varied from 19 t (24%) in 1991 to 7,452 t (60%) in 2000 to consequently decline to about 36% in 2002. While the species contributed about 29% of the average total tuna landings during 1995-2002 period it had increased to an average of 47%. The landings of this species along the North-west coast showed an increasing trend since 1991, with a peak in 2000 and declining drastically thereafter (Fig.1).

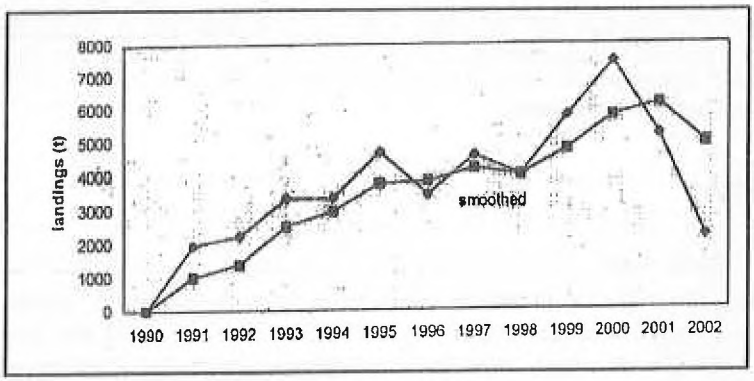

Fig.1 Estimated landings of *T. tonggol* along North-west coast

This is consistent with the technological developments reported in the drift gill net fishing sector along this coast. Gill net fishing for tunas off Gujarat coast is done using Poly Amide (PA) or Poly Ethylene (PE) monofilament nets of dimensions 6000-8000 cm x 300-600 cm and 35-40 mm mesh (Hathiya jaal, jada jaal) or 4500-6000 cm x 700-800 cm with 12-14 cm mesh (Rachh jaal). Wooden or FRP canoes of OAL 700-1000 cm fitted with Outboard Motors (OBM) and plank built crafts of OAL 900-1200 m with Inboard Motors (IBM) are used for fishing operations at 10-80 m depths. An average 80-100 shots are taken by IBM crafts compared to 30-40 shots taken by OBM boats (Pravin *et al.*, 1998). The trend has been towards adoption of FRP canoes, motorization of traditional crafts

with outboard motors and addition of new mechanized units during the mid 90's (Anon.,1996) and culminating in increased multi-day fishing operations and monsoon drift gill net fishing from temporarily modified trawlers by removal of fittings, line winch and gallows (Pravin *et al.*, 1998)

Fishing season for tunas in this region is from September to May with peak landings during October-December. Temperature and associated features like thermocline, thermal fronts and currents play an important role in the distribution and migration of tunas. The study by Beenakumari *et al.* (1993) on satellite remote sensing for tuna fishing off Gujarat coast had indicated a fishery optima between 27° and 29°C. The month-wise Sea Surface Temperature (SST) isotherm charts indicate that the 27° to 29°C temperature regime to be during October to December off the North-west coast (Silas and Pillai, 1982). Monthly catch per unit effort (CPUE) trends by drift gill net units during the 1997-2002 period is given in Fig.2. CPUE was highest during 1999-2000 and 2000-01 fishing seasons followed by a drastic decline during 2001-02 season. However, considering the various types of gill nets used for tuna fishing along the North-west coast, these trends may only be considered indicative of the availability of the resource until effort is standardized for comparison of catch rates.

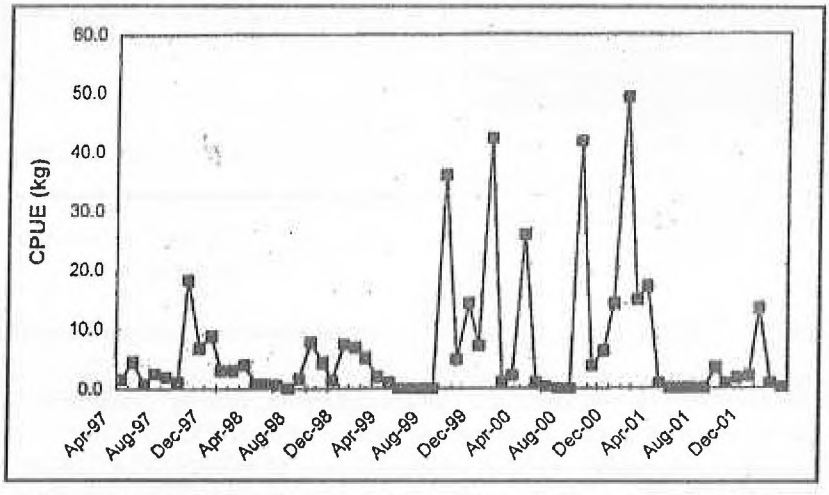

Fig.2 Trend in CPUE of *T. tonggol* in Drift gill nets at Veraval-Dhamlej

Studies on growth of *T. tonggol* by Yesaki (1989) and Wilson (1981) using length frequencies and otolith increment counts respectively came to the same conclusion of a fast growing growth curve which was later corroborated by tag recovery studies (Yesaki, 1993). According to these studies, *T. tonggol* attained a length of around 70 cm at end of two years and 95 cm around 4 years of age. In the present study, size-wise composition of the catches during the

period was studied which indicated progressive increase in the number of small fish (<46 cm FL) caught and a decline in the annual mean size of fish landed. In each fishing season during the 1997-2002 period, size groups of about 46 cm FL were exploited mostly. However, the number of fishes above 70 cm FL in the landings declined from 80% to 30% during 2001-02 compared to the 1997-98 season. Smaller size groups (46-72 cm FL) increased from 35% (1997-98) to 92% during the 2001-02 season indicating increased exploitation of younger fishes (Fig.3). The size range of fishes landed was 36-100 cm until 2000-01 and 36-84 cm only during 2001-02 season with mean size declining from 76.1 to 64.1 cm (Fig.4). Pravin *et al.* (1998) has reported that smaller meshed (140-260 mm) nets are being used for fishing various resources in the offshore waters. Besides, environmental factors and recruitment success may also be determining the annual variations in size classes and abundance of *T. tonggol* in the Indian waters.

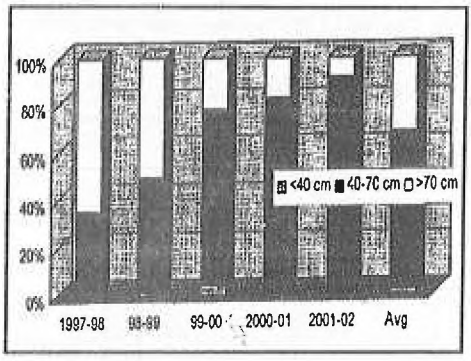

Fig.3 Length composition of the catches

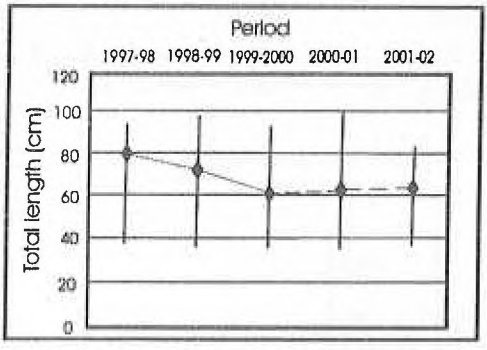

Fig.4 Size range and mean size range of *T. tonggol* in various fishing seasons

Pauly's (1980) empirical equation based on growth parameters and mean water temperatures has been used by various authors to estimate natural mortality coefficients of 0.429 at mean water temperature of 25.5°C (Prabhakar and Dudley, 1989) and 0.803 with mean water temperature of 29.4°C (James *et al.*, 1993). In the present study, natural mortality was estimated according to the method given by Cubillos (2003) as 0.9. Total mortality (Z) was obtained from the length converted catch curve for each of the seasons during the 1997-2002 period from which fishing mortality rates (F) were obtained for a range of M value which indicated increasing exploitation rates (Table 1). Length Cohort analysis and Thomson and Bell yield prediction with the growth parameter inputs $L\infty$ = 108 cm and K 0.55 yr-1 and M values from 0.8 to 1.2 was carried out which indicated an average long-term annual yield of 7900 t for the North-west coast with minor fluctuation in the yearly catches to be expected (Fig.5).

Table 1 : Mortality estimates for fishing seasons 1997-98 to 2001-02

Mortalities	Period				
	1997-98	1998-99	1999-00	2000-01	2001-02
Z	1.237	1.440	1.485	1.963	4.214
M	0.8	0.8	0.8	0.8	0.8
F	0.437	0.640	0.685	1.163	3.414
E=F/Z	0.353	0.445	0.461	0.592	0.810
M	1	1	1	1	1
F	0.237	0.440	0.485	0.963	3.214
E=F/Z	0.191	0.306	0.326	0.491	0.763
Length range selected for mortality estimation	74-94 cm	68-98 cm	52-90 cm	56-96 cm	64-80 cm

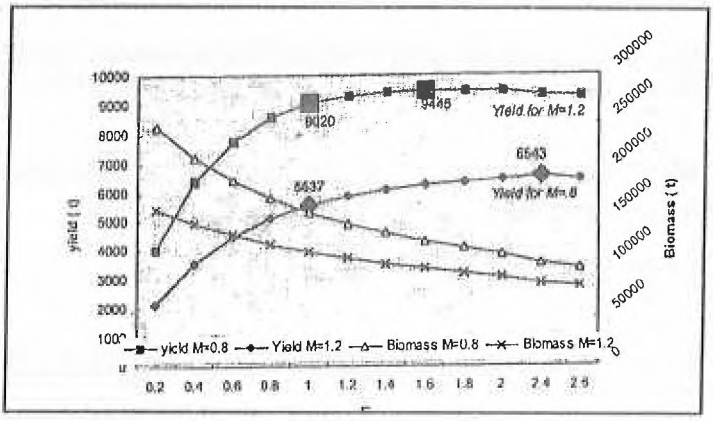

Fig.5 Yield and biomass of *T. tonggol* off North-west coast

Discussion

T. tonggol support a seasonal fishery along the North-west coast and in recent years due to intensification of fishing effort, the exploitation pressure on the stock has also increased. A rapid increase in the catches during the early 90's which was sustained for few years and presently showing signs of stabilization along with declining mean size of *T. tonggol* in the landings can be taken as a sign when further expansion of the fishery is to be done with caution. While the average annual long term yield has been estimated at 7,900 t, annual fluctuations in the fishery are to be expected. The species is essentially neritic with most of its life cycle confined to the continental shelf and at present fishing grounds located in the shelf area are exploited to the optimum, further significant increase in the landings may be limited. However, it would be desirable to consider avenues for value addition to this species while the catches are optimally exploited and maintained at sustainable levels.

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