

STOCK ASSESSMENT OF COASTAL TUNA ALONG THE WEST COAST OF INDIA

N.G.K. Pillai, U. Ganga, G. Gopakumar, C Muthiah and
Somy Kuriakose
Central Marine Fisheries Research Institute, Kochi

ABSTRACT

The estimated average annual landings of tunas along the mainland coast of India during 1995-2002 was 36,720 t of which 75% was from the west coast. Major species landed are *Euthynnus affinis*, *Auxis thazard*, *A. rochei*, *Katsuwonus pelamis*, *Thunnus tonggol* and *Thunnus albacares*. Among these, *E. affinis* was the most abundant tuna species along the West coast with an average contribution of 42%. The southern States comprising Kerala, Karnataka and Goa contribute nearly 72% to the total *E. affinis* landing along the west coast, the rest contributed by Gujarat and Maharashtra. Other important coastal species include *A. thazard* on the Southwest coast and *T. tonggol* on the Northwest coast. An assessment of the stock of these dominant tuna species is presented here.

Introduction

The estimated average annual landings of tunas during the 1995-2002 period along the mainland coast was 36,720 t of which West coast accounted for 75 % of the total tunas landed. Drift gill net was the major gear employed while purse seines and hooks and lines also contributed to the catch. The coastal tunas dominating the landings were *Euthynnus affinis*, *Auxis thazard* and *Auxis rochei* while oceanic/neritic species included *Thunnus tonggol*, *T. albacares* and *Katsuwonus pelamis*. While *E. affinis* dominated the landings on the South west coast (Cochin to Mangalore-Goa belt) *A. rochei* was an important component on the extreme South west coast off Vizhinjam while *Thunnus tonggol* dominated the Northwest coast off Veraval-Dhamlej. Artisanal tuna fisheries of the West coast of India have substantially improved with introduction of motorisation, multiday fishing and recent introduction of gears such as ring seines and trolls for tuna fishing especially young ones of yellowfin.

Material and Methods

The data on catch, effort and species composition of tunas for the period 1995-2002 was obtained from National Marine Living Resources Data Centre (NMLRDC) of CMFRI. Length frequency of the major tuna species have been collected from major gears operated in the region. The length frequency data of *E. affinis* (purse seine, 1997- 2002), *A. rochei* (Hooks and line, 1992-2001) and *Thunnus tonggol* (drift gill net, 1997-2002) were raised to the annual average catches for the respective regions. ELEFAN method (Pauly,1980) was used to estimate growth parameters, mortality rates and sustainable yields.

Results

Thunnus tonggol

Catches of *T. tonggol* which had shown an increasing trend along the Northwest 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 the 1990-92 period. In each fishing season during the 1997-2002 period, size groups above 46 cm (FL) were mostly exploited. 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. Total mortality rate (Z) obtained for each of the seasons during the 1997-2002 period from which fishing mortality rates (F) were obtained for a range of M value (0.8-1) indicated increasing exploitation rates (0.3 during 1997-98 compared to 0.8 during 2001-02). 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 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. *T. tonggol* is supporting a seasonal fishery (September-May) 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 90s which was sustained for a 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 where further expansion of the fishery is to be done with caution.

Auxis rochei

The popularization of fibreglass-coated plywood built boats fitted with outboard motors along the South-west coast has resulted in the extension of fishing grounds to relatively distant areas. The bullet tuna, which was only an insignificant component of the tuna fishery of south Kerala coast (Vizhinjam) is now contributing nearly 70% of the total tuna species landed. The species forms 70-86% of the tuna catches by hooks and line with size range of 15-31 cm. Although the current exploitation rate of the species in the area (0.62) has not reached E_{max} (0.74), moderately high fishing pressure is being expended.

Euthynnus affinis

The present average annual yield (1995-2002) of *E. affinis* along the South-west coast is 8,800 t compared to around 15,000 t during 1990-1994 period. At present maximum exploitation of this species occurs in the 40-60 cm size range. The average annual standing stock of this species is estimated at 7,011 t against an average annual yield of 16,339 t. The advent of distant water multiday gillnet fishing leading to increase in catches of oceanic species has eased the fishing pressure on this coastal species. The declining catches are probably because of this development and not due to any excess fishing pressure.

Discussion

FAO (1993) while discussing the Reference Points (RP) used in fishery management like Maximum Sustainable Yield (MSY) reports that they have limited value in assessing highly migratory resources such as tunas. As regards to the small-scale tuna fishery in the Indian waters, the diverse gears used for tuna fishing and seasonality in the availability of the various species pose difficulties in arriving at conclusions regarding growth and mortality estimates and stock structure. Sudarsan (1993) has raised some pertinent questions related to tuna stock assessment and management. Pillai *et al.* (2002) opined that a strong database on the fishery, biology and fishery environment are the pre-requisites for evolving exploitation and management strategies for highly migratory scombroids like tunas and suggested that this would be possible through strengthening of inter-institutional and regional/international linkages. They also suggested restructuring of the

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present sampling design taking into consideration the shifting pattern of the fishery from traditional to motorised mechanized sector and multiday fishing in recent years with existing sampling fraction enhanced to 5% (from present 2.5%). The suitability of the existing production models (presently based on length frequency analysis) to assess the status of migratory stocks has to be critically evaluated and if necessary suitable new models may be developed. Some of these attempts include MULTIFAN-CL (Fournier *et al.* 1998) for tuna stock assessment in the western and central Pacific regions.

References

- FAO 1993. Reference points for fishery management. their potential application to straddling and highly migratory resources. *FAO Fish Circ.*, 864 : 52pp.
- Fournier, D.A., J. Hampton and J.R. Sibert 1998. MULTIFAN-CL: a length-based, age- structured model for fisheries stock assessment with application to South Pacific albacore, *Thunnus alalunga*. *Can. J. Fish. Aquat. Sci.*, 55 : 2105-2116.
- Pauly, D 1980. A selection of simple methods for assessment of tropical fish stocks. *FAO Fish. Circ.* 729 : 54pp.
- Pillai, N.G.K., P.P. Pillai, T.M. Yohannan and C. Muthiah 2002. Management of scombroid resources of India. In: N.G.K. Pillai, N.G. Menon, P.P. Pillai and U. Ganga (Eds.) *Managemem of Seombroid Fisheries*. Central Marine Fisheries Research Institute. Kochi : 240-249.
- Sudarsan, D. 1993. Tuna research in India - present status and future approach. In: D. Sudarsan and M.E. John (Eds.) *Tuna Research in India*. : 17-22.