Sustain Fish

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Cochin, India

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Tuna resources of India - their potential and exploitation

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Abstract

The average estimated annual tuna landings during 1995 -2004 along the mainland coast of India was 40,292 t comprising species such as Euthynnus affinis, Auxis thazard, A.rochei, Katsuwonus pelamis, Thunnus tonggol *and* T.albacares. *Regionwise production indicated the southwest coast accounted for nearly 48 % of the tunas followed by the northwest (27 %), southeast (24 %) and northeast (1 %) coasts. Major portion of the catch was landed by drift gill nets followed by hooks and line. Oceanic skipjack* K. pelamis *is mainly landed in the Lakshadweep islands where the species forms 87 % of the tuna landed followed by yellowfin* T.albacares. *Pole and line is the main gear employed for fishing tunas in the Lakshadweep Islands. Catches of* E.affinis, *a coastal species and skipjack an oceanic species show less annual variations in landings compared to other species such as* Auxis thazard, A.rochei *and* T.tonggol. *While the annual potential yield of tunas in Indian waters has been estimated at 2.78 lakh tonnes the present average annual yield is only about 18 %. Seasonal patterns are indicated for the tuna stocks with pre-monsoon and monsoon periods most productive along the southwest coast and post-monsoon along the north-west coast, indicating seasonal shift in their concentrations along the coast. Stock assessment of the dominant species along the west coast of India accounting 75 % of the total tuna catches from the mainland indicates that the advent of motorisation and consequently distant-water multiday fishing has eased fishing pressure on coastal species such as* E.affinis *while stocks of* A.rochei *and* T.tonggol *are facing moderately high fishing pressure. Recent innovations in fishing technology and prospects and constraints experienced in exploiting this high valued but underexploited fish stock are discussed.*

Keywords: *Tuna resources, potential and exploitation, Tuna landings*

1. Introduction

Tunas are the second most important item, next only to shrimps, in the world seafood trade and therefore form specifically targeted fisheries globally by nations such as France, Spain, Thailand, Taiwan, Korea, Japan and USA. In the Indian Ocean which contributes 19 % of the world tuna catch, tuna fishing and fisheries have emerged as focal points to address issues of sustainable development and management of fishery resources, especially in the context of EEZ regulations, UNCLOS and other international conventions. In India,

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tuna fishing remains an artisanal activity except for a brief phase of chartered and joint venture tuna fishing by longliners during the 1990s. However, tuna catches have substantially improved by nearly 58 % during the 1990- 2002 period compared to the early eighties, mainly due to motorization of traditional crafts and adoption of progressive and innovative fishing techniques by the mainland fishermen. The status of exploitation and stock assessment of tunas and billfishes from the Indian EEZ have been reviewed earlier by James and Pillai (1993) James *et al.*,(1993), Somvanshi *et al.*, (2000) and Pillai *et al.*, (2002). In view of the recently announced Comprehensive Marine Fishing Policy (Anon. 2004), rapidly developing fisheries for tuna along the Indian mainland, and recent moves to further extend the EEZ limits of various maritime countries, an appraisal of the tuna fishery of India becomes critical in developing strategies towards sustainable management of the resource.

2. Material and methods

Region-wise data on tuna landings (gearwise and specieswise) during 1990 to 2004 period was obtained from National Marine Living Resources Data Centre (NMLRDC) of CMFRI, Cochin. Additional data input on the fishery like seasonal availability and details of craft and gear was obtained from Veraval-Dhamlej (northwest coast), Mangalore-Malpe, Cochin and Vizhinjam (southwest coast) Tuticorin and Chennai (southeast coast) and Minicoy (Lakshadweep UT) centres. Secondary information through review of literature was done to carry out comparison with the present status of the fishery and the tuna resources in Indian EEZ.

3. Results

The average annual tuna landings along the mainland during the 1990-2004 period was estimated at 40,292 t in which the region-wise contribution was southwest (48 %), northwest (27 %), southeast (24 %) and rest from northeast with constiuent species being *Euthynnus affinis*, *Auxis thazard*, *A. rochei*, *Katsuwonus pelamis*, *Thunnus tonggol* , *T. albacares*, *Sarda orientalis* and *Gymnosarda unicolor*. Drift gill nets remain the major gear contributing to the fisheries on the mainland while purse seines, hooks and line, long line, pole and Line and troll line are also operated. Pole and line is the most important gear in Lakshadweep islands followed by troll and hand lines.

James and Pillai (1993) have reported that during the 80s the landings along the mainland were mostly dominated by little tunny (*E. affinis*) and frigate tuna (*A. thazard*), whereas the average landings of longtail tuna (*T. tonggol)* being a mere 663 t and skipjack tuna(*K.pelamis*), about 5,000 t, was landed only from Lakshadweep waters.

In comparison, during the 1990-2004 period, skipjack tuna is regularly landed on the mainland and the average landings of *T. tonggol* show a manifold increase. Comparison of the species composition of the tuna landings during the 1990-94 and 1995-2002 period showed that *E.affinis* had declined by 10 % but *Auxis* spp. increased while landings of *T. tonggol* doubled.The landings of oceanic species like *K.pelamis* and *T.albacares* has also increased since 1995. Salient results of regionwise analysis were as follows,

3.1. Northwest region

The fishing season is during September to May with peak during October to December. Drift gill nets *(*145-400 mm mesh *Jada jal)* operated either from wooden or FRP canoes with out-board (OB) engines or plank built boats of 9-12 m OAL fitted with inboard (IB) engines are the major gear employed for tuna fishing. Long tail tuna, *T.tonggol* a neritic species dominates the landings followed by the coastal tuna *E.affinis* and juveniles of yellowfin tuna *T.albacares*, an oceanic species.

3.2 Southwest region

In this region, tuna fishing is at its peak during the monsoon period of June to September. The major gears employed are the drift gill nets, hooks and line and purse seine. The total tuna landings, which had peaked during 1990 showed a declining trend until 1995 and thereafter showed a revival. The landings are dominated by *E.affinis*, *Auxis* spp, skipjack and yellowfin (juveniles). When compared to the early nineties (1990-95), during the post 1995 period there has been a decline to the tune of 39 % with regards to catches of *E.affinis*, while landings of *T.albacares* and *K.pelamis* has increased. *A.rochei* is another important tuna species in this region especially along the Mangalore and Vizhinjam coasts whose contribution has increased in the post motorisation period reflecting the change in fishing grounds.

3.3 East coast

The peak fishing for tunas along this coast is June- September and January –March off the southeast (Tamilnadu, Pondicherry) and north east (Visakhapatnam) coasts respectively. Gears employed in the fishery include drift gill nets such as *paruvalai* (mesh 80-160 mm) and *podivalai* (mesh 35-75 mm), long lines, hooks and lines and shore seines of which specieswise abundance is in the order of *E.affinis*, *Auxis* spp. and *K.pelamis*. Recently, efforts to tap the rich tuna fishing grounds in the upper north east coast off Visakhapatnam has been initiated by traditional fishermen.

3.4 Lakshadweep Seas

During the period 1980 to 2001, annual tuna landings from Lakshadweep has estimated to be between 1,760 t (1980) to a peak of 12,300 t (1998) with an average of 7,000 t during 1990-2000 and about 9,500 t during 2002. Agatti, Minicoy, Suheli, Androth, Kavratti, Bitra and Kiltan Islands are the major tuna landing centres of Lakshadweep. The major tuna species landed are skipjack *K. pelamis* (86 %) followed by yellowfin *T. albacares* (12 %) and little tunny *E. affinis*. Three gears, pole and line (P and L), troll line and hand line have been used for tuna fishing and recently drift gill netting has been adopted in certain islands such as Androth. Difficulty in manoeuvering larger sized boats within the lagoon is perceived as bottleneck in introducing larger boats with higher fish hold capacity. Baitfish (caesionids and sprats) fishing forms an important component of the pole and line tuna fishing of Lakshadweep and its availability in sufficient quantities is perceived as the major constraint by traditional pole and line fishermen. Fish Aggregating Devices (FADs) have been considered as a technology with potential to develop the tuna fishery in many tuna fishing countries such as Maldives in the Indian Ocean region. FADs had been introduced in Lakshadweep waters during 2002 in the open sea as well as lagoons in a study conducted by the Central Marine Fisheries Research Institute to understand the tuna aggregation dynamics and behaviour. Data buoys for Arabian Sea Monsoon Experiments- Phase-II deployed by the National Institute of Ocean Technology (NIOT), 16-26 nautical miles off Minicoy, also functioned as FADs aggregating tunas. As mainly juvenile tunas (mainly yellowfin) are reported to aggregate, further monitoring of the fishery is in progress. In recent years, besides canned tunas, frozen tuna export and tuna pickle preparation has also been picking up under the Lakshadweep Development Corporation.

3.5 Andaman seas

The Andaman and Nicobar islands are some of the best tuna fishing grounds but their contribution to tuna fishery of India is not significant. In 1999, the production of tuna and tuna -like fishes contributed 5 % of the total marine fish landings of 26,673 t (Anon., 1999).

4. Discussion

The revalidated potential yield of tunas (2.78 lakh t) from the Indian EEZ were coastal tunas (0.65 lakh t) yellowfin (1.15 lakh t) Big eye (0.13 lakh t), and skipjack (0.85 lakh t) (Anon.,2000) while average annual landings during 1995-2004 period indicate that only about 18 % of this is exploited. James and Pillai (1993) analysed the tuna

landing trends during the 1983-87 period and indicated that along the mainland, the southwest and southeast coasts contributed 68 % and 21 % respectively of the total tuna landings followed by the northwest coast with 11 %. The present scenario suggests that while southwest coast is still leading in tuna landings, substantial development of tuna fisheries has occurred in the northwest and southeast coasts also. Motorization of country crafts along with multiday fishing has been reported all along the coast which has resulted in increased mobility to offshore tuna fishing grounds and significantly contributed to the increased tuna landings (Mohan Rajan and George Mathai, 1988; Gopakumar and Sarma, 1989; Yohannan and Balasubramanian, 1989; Pravin *et al.*, 1998; Modayil *et al.*, 2003).

Species composition of the tuna landings through the period from 80s to late 90s are indicating a shifting of fishing grounds to more offshore areas with representation of oceanic species such as skipjack and yellowfin; and neritic species such as frigate tuna *A.rochei* and long tail tuna *T. tonggol* showing an increase. Currently the production of coastal tuna species such as *E.affinis* has almost stabilized at around an annual average of 17,000 t and the species is optimally exploited in the presently fished grounds. The increasing share of oceanic and neritic species on the mainland can be attributed to motorization and adoption of multiday resource specific fishing which has acted as a catalyst in augmenting tuna production. Gopakumar *et al.*, (1994) also reported that at Vizhinjam *A.rochei* became the most abundantly exploited species instead of *E. affinis*, which dominated the fishery prior to motorization. At Cochin, *Pablo* type mechanised boats of 7.6 to 9.4 m OAL were engaged in single day operations at depths upto 50 m during the eighties (Jayaprakash *et al.*, 2002). But presently with most of these boats having facilities like GPS, mobile phones and enhanced ice storage capacities, multi day fishing trips of 7-20 days at 100 m depths and beyond are common. Since 1996 skipjack and yellowfin tuna landings by drift gill netters along the southwest coast has increased. Drift gillnetters here are mainly targetting oceanic species such as skipjack and yellowfin (juveniles) in rich tuna fishing grounds off Calicut, around Lakshadweep waters and Karwar-Honnavar coast in the north. On the northwest coast multiday fishing operations by drift gill netters as well as the operation of gill nets during the monsoon from temporarily modified trawlers by removal of deck fittings like winch and gallows has been reported (Pravin *et al.*,1998). On the east coast also considerable progress has been achieved in motorization of traditional catamarans with introduction of OB engines and fitting of in-board engines to many artisanal plank built boats in Tamil Nadu since 1990s (Mahadevan Pillai *et al.*, 1994, Thirumilu *et al.*, 1994).

Balasubramanian (2000) has reported the conversion of nearly 30 shrimp trawlers for drift gill net fishing at Tharuvaikulam, Gulf of Mannar and its impact on tuna fisheries like availability of tunas round the year compared to a seasonal fishery earlier. Sujatha and Deepti (MS) have reported that currently 500-700 t of tunas comprising mainly of skipjack and yellowfin tunas are being exploited by traditional sector using troll line, hand line and gill nets off Visakhapatnam coast. The Association of Indian Fishery Industries (AIFI) in association with MPEDA and Ministry of Agriculture has also taken up a pilot project involving conversion of an idling shrimp trawler fleet (23- 27 m OAL) off upper east coast for monofilament tuna longlining and aims at eventual upgradation of around 30 trawlers for tuna fishing which may create a positive impact on tuna production from Indian waters (Dixitulu, 2002).According to Marine Products Export Development Authority (MPEDA), tuna exports from India during 2001-02 was 834 t of frozen yellowfin and 322 t of skipjack tuna valued at about Rs. 3 crore which is very modest beginning.

The pole and line tuna fishery of the Lakshadweep seas has been reported in detail by Jones and Kumaran (1959) and after mechanisation by Silas and Pillai (1982), Madan Mohan *et al.*, (1985), Silas *et al.*, (1986), Yohannan *et al.*, (1993), Sivadas (1998, 2002) and Said Koya *et al.*, (2003). This is the main gear used in tuna fishery and is concentrated in four areas: the southern island of Minicoy, the islands of Suheli, Agatti and nearby islands and at Cheriyapani and Valiyapani in the north (Nasser *et al.*, 2002a). Sivadas (2002) has described the recent innovations employed in tuna fishing of Lakshadweep such as mechanical splashers (3.8 hp pump), bait storage tanks, use of GPS *etc.* During earlier years most of the boats had only compass but are now equipped with GPS and can venture further away from base islands. However, a major constraint here is that fishes of an average size of about 50-60 cm (5-6 kg) only are amenable to capture by P and L while large sized fish are abundantly available and can be caught only in gear such as troll lines and gillnet. Multi gear operations like drift gill net cum pole and lining in these islands are suggested as a viable option but fishermen of Minicoy islands prefer only P and L fishing, as they believe that the gillnets operation may frighten away tunas from the fishing grounds. However, gill net fishing has been adopted by certain fishermen at Androth while mainland fishermen are also venturing to Lakshadweep waters and using gill nets successfully to catch oceanic tunas. Compared to tuna catch of neighbouring island nations such as Maldives and Sri Lanka, exploitation from Lakshadweep waters are very low (Nasser *et al.*, 2002) while stock structure analysis of skipjack indicate that total mortality effected by pole and line fishing on the population is negligible and catches are

below the maximum sustainable yield level (Yohannan *et al.*, 1993; Sivadas, 2002). The present annual tuna production from Lakshadweep waters which is only about 20 % of the estimated potential of the area can be enhanced by adoption of innovative fishing techniques and judicious deployment of fishing units. Said Koya *et al.*, 2003 (in press) suggested the usage of FADs, drift gill net fishing and deep long lining, deployment of more units in specific fishing grounds, mother-ship and dory fishing operations and erection of artificial reefs close to the islands for increasing tuna production from Lakshadweep waters.

Availability of required quantities of preferred livebaits (sprats, apogonids, caesionids and pomacentrids) in nearby lagoons to attract tunas and capture them by the chumming process is another serious constraint faced by fishermen of Lakshadweep. Protecting the habitat of baitfish therefore is of prime importance in sustaining the tuna fishery of these islands. In the FAD tuna fishing, the individual sizes of tunas aggregated were found to be smaller than those in natural schools. Assured catches from these grounds are encouraging the fishermen to venture to these fishing grounds with GPS but further monitoring of the fishery is desirable. It is also necessary to overcome constraints such as availability of adequate quantity of ice and fuel which limits the targets set by the fishermen for catching skipjack tuna and to ensure a good export market for tunas so that the fishing fleet is adequately utilized for exploiting the rich tuna fishing grounds in this sea.

The potential yield of tunas in Andaman and Nicobar waters has been estimated at one lakh t (George *et al.*, 1977) and about 90,000 t by FSI. Talawar(1990) has documented the various species available in these waters as *T.albacares, T.obesus T.alalunga, K.pelamis, T.tonggol, E.affinis, Sarda orientalis* and *Gymnosarda unicolor* . Peak tuna fishery is reported to be during March to August. The fishing fleet mainly comprises plank-built crafts (25 –35 feet OAL) with in-board motors(8-15 HP) and dug-out canoes of 10 –22 feet size operating with drift gill nets, shore seines and hooks and line. Among the potential fishery resources, coastal and oceanic tunas and tuna – like fishes are the major contributors with yellowfin, skipjack tuna and big eye tuna dominating the tuna landings (Madhu *et al.*, 2002). The vessel capabilities, infrastructure and expertise available at Andaman and Nicobar Islands are inadequate to effectively tap the rich tuna and tuna - like resources occurring in these waters and hence suitable strategies have to be evolved to expand tuna fishing, preferably involving the idling shrimp trawlers from the mainland coast. The required infrastructure facilities also will have to be developed with support from the local fisheries administration.

5. Conclusion

It is evident that tuna fisheries have evolved rapidly since the 80s and more of the highly valued oceanic species are represented in the catches. However most of these developments have occurred as a result of the initiatives taken by fishermen in the small scale sector. They face many constraints right from adoption of a technology (longlining on mainland, gill netting in Lakshadweep waters) to infrastructure availability (adequate fuel and ice) and finally getting a reasonable price for their catch. Although tuna is the second most important item in world seafood trade the contribution by India is negligible. Fishing for tuna is not pursued seriously by the fishermen who perceive the returns as inadequate. Part of this situation emerges due to the fact that the tuna catch is not of *sashimi* grade (which require immediate freezing at -60 °C) for which the fishing vessels lack onboard/onshore infrastructure facility and also because tuna is less preferred in the domestic market. Hence it may be considered worthwhile to develop at least a small fleet specifically for tuna fishing with appropriate market linkages so that it becomes an economically viable proposal for fishermen/entrepreneurs who wish to venture for tuna fishing. This in turn will ease the fishing pressure on coastal fishery resources and may be even ease the conflicts between the various fishing sectors in India to a greater extent.

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