

TUNA RESEARCH IN INDIA

Edited by

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KEYNOTE ADDRESS

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I feel greatly honoured that I should be invited to participate in this Colloquium and give a Keynote address. Being a research focused conference, I have chosen the topic "Tuna Research to meet critical information needs". I would consider 1989 and 1990 are significant years in the development of tuna fisheries in India. The first marks the year in which a record catch of 45000 tonnes of tuna and tuna-like fishes was harvested from our coastal waters and the Bay Islands of Lakshadweep and Andaman and Nicobar. The second marks the catch of more than 10000 tonnes of yellowfin and bigeye tuna in the longline fishery under charter arrangements. It was most gratifying to see an editorial leader in *Fishing Chimes* dated June 1991 entitled "Entrepreneurs tilt towards Tuna : A major Milestone" emphasising the trend towards Indian ownership of tuna longliners and purse seiners. It is a long awaited commitment and augurs well for Indian tuna fisheries. In this scenario of our involvement with tuna fisheries for coastal and oceanic species, taking stock of research needs and priorities assumes importance.

We are dealing with species which are highly migratory and caught in neritic and oceanic waters in surface and subsurface fisheries using diverse types of crafts, gears and methods. Commercial tuna fisheries has been underway in the Indian Ocean commencing from 1952 when the Japanese longliners started operations in the eastern Indian Ocean. Today with the annual tuna production in the Indian Ocean approaching 0.6 million tonnes, we are faced with many resource management issues which demand

intensive research support. Before going into specifics, I would like to highlight some of the major issues which should have our priority attention.

Tuna Fisheries Interactions

Till recently interaction between related oceanic fisheries activities in the Indian Ocean was not a matter of serious concern. The rapidly developing purse seine fishery in the Western Indian Ocean was a new element which by 1986 pointed to the need for studying and monitoring interactions with the established longline fishery, particularly for the yellowfin tuna. The available data indicates that the yield per recruit (Y/R) for yellowfin tuna will not result in any increase in the longline fisheries while there is scope for increase in the surface purse seine fisheries. The latter though harvesting larger quantities of skipjack tuna also depends to a large measure on juvenile and partly adult yellowfin catch. Expansion of the purse seine fishery will further increase the take of juvenile yellowfin. The Coastal States have programmes of development of their artisanal fisheries which will include improvement and enhancement of the operational range and efficiency of their drift gill net fisheries and setting up of artificial reefs and fish aggregating devices (FADs) which are also bound to tap juvenile yellowfin tuna. At present the problem is enigmatic. In spite of a steep increase in the purse seine catch in the Western Indian Ocean from 39000 tonnes in 1983 to 151000 tonnes in 1989 no imbalance has been detected in the CPUE and abundance of yellowfin tuna. The ITPP has recently (January, 1992) suggested five alternative hypotheses for explaining the trend in standardized CPUE for yellowfin tuna in the longline fisheries which merits reiteration. They are :

1. "only a part of the population- which is independent of the abundance of the earlier population - is available to the longline fisheries
2. an increased productivity of the stock
3. an extremely large population
4. a biased measure of fishing effort, or
5. a combination of the above-mentioned factors"

The point is whether any disequilibrium resulting from an over-exploitation of juveniles by purse seining could affect recruitment to the large adult yellowfin taken in longline fishery and consequently contribute to a reduction in effort in the latter fishery or ultimately phase it out of

operation if the fishery is not economically viable. Though the above is a possibility, a great deal of work is going to be centered around the problem until sustained production for the different fisheries, viz., purse seining and longlining are established. Stabilization is vitally necessary in view of the large capital investments involved with tuna purse seining and longlining. "Research effort in monitoring the catch and effort, determining the mortality rates and estimating recruitment at different levels into the fisheries have to be intensified. Simulation models may be designed to look at the processes of interaction to suggest correction courses, if necessary, for sustained production in the various sectors" (Silas, 1989. 2nd Int. Billfish Symp. Proc., Hawaii).

Movement and Distribution Patterns

We have to reckon with the highly migratory behaviour of tunas. Unlike in the Pacific and Atlantic Oceans this pattern may differ in the Indian Ocean which is land-locked in the north. Today perhaps the highest priority is the initiation of a national level large scale tagging programme for tunas. From the early eighties tagging of tuna has been done sporadically in parts of the Indian Ocean. On the basis of 240 recoveries out of 6081 yellowfin tuna tagged Dr. Yesaki and Waheed (1991 : IPTP Consultation, Vol. 6 : 1-6) suggest a homogenous yellowfin tuna stock for the Central and Western Indian Ocean. More recently (IPTP, Jan. 1992) IPTP has expressed concurrence with the Shimizu Working Group hypothesis that only a single yellowfin tuna stock is present in the Indian Ocean. We must admit that though commendable, the effort in tagging tuna in the Indian Ocean has so far been disjunct and subminimal as compared to programmes in the Pacific and Atlantic Oceans. Here the focus has been on yellowfin tuna. Whether there could be a grey area in the Eastern Indian Ocean still merits consideration.

I would like to enlighten our participants that the South Pacific Regional Tuna Tagging Project designed to get answers to tuna fisheries interactions and tuna catch during a three-year period had tagged in the first year (1990) using mainly one pole and line vessel 48263 tuna comprising 16909 YFT, 30841 SKJ, 865 BET and 8 LTT. In the second year (1991) 74850 tuna were tagged comprising 13225 YFT, 56860 SKJ, 4801 BET and 74 LTT. By December end 1991, out of a total of 115000 tag releases the tag

recoveries numbered 9071 (YFT 2391 or 7.9% of release; SKJ 6473 or 8.1% release; and BET 207 or 4.1% of release and 2 LTT). Viewed in this context, I feel it is imperative that we take up a similar large-scale tagging programme. This should also help improve our data base. I am sure IPTP will play a supportive role in a large scale programme to be taken up in India. This Colloquium should consider the type of vessels to be used, the time and areas for starting the programme, the species to be tagged, the training of manpower for undertaking this task, the financial, material and other infrastructure needed for the programme. Dissemination of information publicizing tagging to help recoveries may be done at the national level and at the international level through the good offices of the IPTP.

Tracking of pelagic fish such as tunas with ultrasonic telemetry techniques, in short, sonic tracking, helps considerably to enhance our knowledge on the behaviour and physiological capabilities of the fish and movement in relation to anchored fish aggregating devices and in relation to ocean features. The use of pressure sensitive transmitters could give much information on depth and temperature tolerance and spatial and vertical movements. Tracking could be done from smaller boats which will make it less expensive. I have seen a successful on-going programme in Hawaii for tunas and billfishes.

Needless to say, tagging and sonic tracking for better understanding of tuna behaviour will involve considerable research and financial inputs.

The Lost Year - Concerning Early Life History

There is a major information gap from spawning to juvenile stage in the tuna life history. This applies to all species of tuna and tuna-like species. The available information is very fragmentary. Hardly anything is known about the part played by environmental factors on the spawning and nursery grounds, productivity of the grounds for good larval and juvenile survival at all critical stages, role of extraneous factors such as pollution in the spawning and nursery grounds, the broodstock strength and spawning potential and adult mortality. A considerable amount of information is necessary to bridge this major gap. Information generated should throw more light on the biology, age and growth, food chain dynamics, predator-prey relations and interactions, schooling behaviour and so on of the species.

Enhancing Resource Data Base

A few years back I had started the National Marine Living Resources Data Centre at the Central Marine Fisheries Research Institute. It has a strong data base on coastal fisheries, exploited fish stocks, types of craft and gear in operation, effort expended, data on socio-economic aspects and so on. Strengthening and making it a useful tool for quick dissemination of information to policy and decision makers, the fishing industry and the fishermen is necessary. Constant updating of data is necessary and this can be done only through effective coordination and continuous feedback from other organizations involved with fishery and environmental data collection. With the present focus on tuna fisheries, the Centre should also be receiving data from commercial, tuna operations in our EEZ and exploratory surveys. Processed data from the IPTP should also be obtainable on diskettes for inclusion in the National Data Centre (NMLRDC) on a continuous basis. I am glad that Dr. Ardill and Dr. Yesaki from IPTP are with us, and I am sure, the D. G., FSI, the Director, CMFRI and the participants will interact with them on this. Only with such a networking and data can we effectively be of service to our fishing industry and expect a free flow of feedback from them.

Low Energy Fishing

At present the artisanal fisheries has substantially improved with motorisation and introduction of innovative fishing methods. Today, tuna and tuna-like fishes form an important component in the fisheries, the marketability of which has considerably improved in the country. In Cochin, young yellowfin, longtail tuna, and the bonito (*Sarda orientalis*) fetch around Rs. 30-40/kg. Exercises in setting up artificial reefs and FADs have been undertaken along the Kerala coast and in the Lakshadweep, but no serious effort has gone into this. There is good scope for using such methods along the south west coast of India, the Lakshadweep and Andaman & Nicobar Islands as is in vogue in Indonesia and the Philippines. In addition, new techniques of fishing with light luring purse seining as in Thailand, and use of sail cum engine combination to increase fuel efficiency and use of improved gears are necessary. Equally important are information on cost benefit, direct operational costs, product development for higher value realisation, improved processing and marketing strategy. Low energy fishing

also needs R & D for improved technologies to be developed. It is also important that in the Lakshadweep we think of a second generation larger pole and line live-bait fishing boat with a greater range of operation, endurance, capacity and use of additional facilities such as water spraying and scouting devices. Thus research inputs on improved technologies and more efficient monitoring of the catch and other relevant parameters should come within the purview of your deliberations.

Some Biological and Fisheries Management Research Needs

Many aspects of the ecology, biology and population dynamics of neritic and oceanic species of tunas and tuna-like fishes from our EEZ are yet to be studied. This list below should be considered only as indicative :

- i. Collection and analysis of statistical data on stock structure and dynamics, catch and effort, seasons and areas of occurrence, methods of capture, sex ratio in relation to age.
- ii. Genetic approach to study tuna populations for understanding their homogeneity.
- iii. Absence of females in larger adult size groups-e.g. yellowfin tuna - study the possibilities of sex differential growth problems for juvenile and adult males and females separately.
- iv. Diet preferences in relation to age, area, season, time of capture and type of gear.
- v. Maturity, gonad indices - geographical area-wise, season-wise and year-wise.
- vi. Physiology and ethology.
- vii. Estimation of natural mortality in relation to age and if possible by sex.
- viii. Use of remote sensing and aerial surveys for obtaining rapid data on sea surface temperature (SST), identification of oceanographic features associated with tuna aggregations such as sea fronts, slicks, current boundaries, seamounts, areas of convergence and divergence and tuna forage abundance.
- ix. Study of tuna associated species such as pelagic sharks, other fishes, sea birds, and marine mammals, and their interactions.
- x. A greater research focus on the bigeye tuna and the albacore.

A whole array of specific problems to be solved could be listed. However, many of these could come within the ambit of the major issues discussed here.

Tunas know no national boundaries or areas of extended jurisdiction.

Similarly, tuna research cannot be restrictive. The time has come when Regional and International cooperative research programmes and projects should be considered. As a starter, tagging could be one such programme.

In retrospect, 1992 marks many anniversaries. It is 40 years since the first influx of tuna longliners into the Indian Ocean. It also signifies 30 years when I had the privilege of convening in 1962 the symposium on Scombroid Fishes which triggered considerable interest in research on tuna and tuna-like fishes in the country. It also marks a decade since the "Resources of Tunas and Related Species and their fisheries in the Indian Ocean" by myself and Dr. Pillai was published. This colloquium should be a landmark to develop strategies for tuna research in the light of four decades of ocean-wide tuna fisheries research and development linked with changing patterns of resource exploitation and utilization.

I wish the two day deliberations all success and look forward for a proper action plan to be developed for speedy implementation.