Management of Scombroid Fisheries

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Status of tuna fishery in Minicoy, Lakshadweep

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ABSTRACT

The status of tuna fishery at Minicoy is discussed based on the data for the period 1989 - '99. Pole and line using livebaits and troll operate for its fishery of which the former contribute more than 90% of the total tuna catch. The total tuna catch fluctuated from 307 t in 1991 to 1,243 t in 1995 with an average of 864 t. The effort in boat days varied from 2,265 in 1996 to 3,896 in 1989 with an average of 2,915. The C/E ranged from 152.2 kg in 1991 to 408.8 kg in 1995 coinciding with the lowest and highest catches respectively. In troll the catch ranged from 9 t in 1997 to 28 t in 1994 and C/E varied from 8.5 kg in 1997 to 27.7 kg in 1994 corresponding with the lowest and highest catches respectively. Though the pole and line units are operated from September to May in general, the success of tuna fishery depend upon the higher catches in two or three months. The skipjack and yellowfin tuna formed the main species and the former dominated in pole and line with its percentage contribution ranging from 82 t in 1995 to 94 t in 1990.The size of skipjack in pole and line catches varied from 24 to 74 cm with the size group 40 to 50 cm forming the bulk of the catch in all the years. In the feeding condition empty stage dominated in almost all the months. Natural food item consisted of fishes, crustaceans and molluscs. The sex ratio of mature fishes showed domination of either of the sexes in different years. The size of yellowfin from pole and line ranged from 20 to 80 cm. Sizes above 60 cm were rare and all were immature. Their food content almost conformed to that of skipjack. The recent development in tuna pole and line fishery and plausible causes of fluctuation of the catch are also discussed, along with suggestions for improvement of the fishery.

INTRODUCTION

The pole and line fishing for tunas using live bait has an important bearing on the socio-economic status of Lakshadweep islanders. Hence an attempt is made to study the tuna fishery of Minicoy based on the data for the period 1989 - '99 so as to derive an idea of the magnitude of exploitation and biology of species in question.

The pole and line tuna fishery prior to mechanisation has been reported in detail by Jones and Kumaran (1959) and the biology by Raju (1964). The fishery after mechanisation have been reported by Silas and Pillai (1982), Madan Mohan *et al.* (1985), Silas *et al.* (1986), James *et al.* (1987), Yohannan *et al.* (1993) and Sivadas (1998). Pole and line using livebait and troll are the gears employed in the fishery of which the former contribute more than 90% of the total tuna catch. These have already been described by Jones and Kumaran (1959), Silas and Pillai (1982) and Madan Mohan *et al.* (1985).

Even now, no drastic change has occurred to the craft and gear.

Fishery

The catch and effort showed wide fluctuation in both pole and line and troll (Figs.1 & 2) without any definite trend. The pole and line effort varied from 2,265 to 3,898 units with an average of 2915 units. During 1989-'99 the pole and line effort showed fluctuations although the maximum and minimum efforts did not coincide with the maximum and minimum catch .The catch varied from 364 t (1991) to 1,243 t (1995). Whereas the lowest CPUE of 152.2 kg coincides with the minimum catch and highest CPUE of 408.8 kg coincides with highest catch in 1995.There was a gradual increase in CPUE from1991 till 1995, after which it fluctuated.

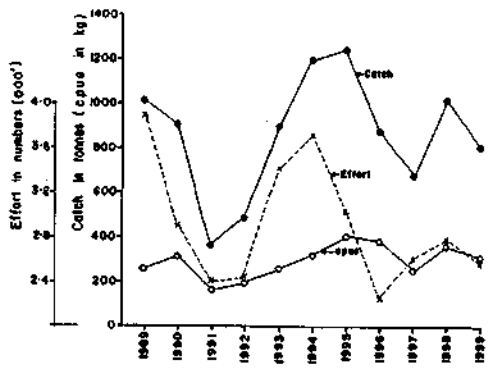

Fig. 1. Catch, effort and CPUE of pole and line fishery

In troll, the catch was only nominal with the maximum of 28 t (1994). The CPUE for most of the years ranged between 20 and 28 kg.

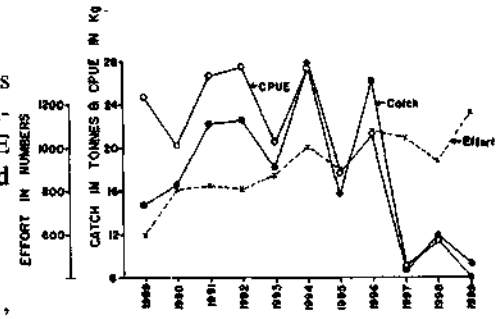

Fig. 2. Catch, effort and CPUE of troll fishery

Species composition

In pole and line , skipjack, *Katsuwonus pelamis* and yellowfin, *Thunnus albacares* formed the major species, constituting almost the entire tuna catch in all the years. The percentage composition of the former ranged from 82.8 to 94.3 and for the latter from 5.6 to 17.4.

In troll also, skipjack and yellowfin were the major species, although yellowfin formed the dominant species in most of the years.

Seasonal variation

The catch, effort and CPUE had a maximum in November followed by October and December. Though the number of units operated during January to April remained more or less same as that for the period October to December, the catch and CPUE were less. The average monthly variation

in effort, catch and CPUE in troll showed the maximum catch and effort in August and that of CPUE in September. As expected the effort was more from June to August and February when better catches were obtained. The CPUE showed a gradual increase from March to September and then decreased in the next month.

Biology

Katsuwonus pelamis

The size in pole and line ranged from 24 to 72 cm. In each year more than one size group dominated, but, in general major modes were between 40 and 56 cm. The month-wise data indicate that though the size groups below 30 cm occurred almost throughout the year, its preponderance was found during October to December.The younger size group is always associated with flotsam. Moreover, during January –February the modal groups were generally highest being 50 cm or above whereas in other months it varied . Notwithstanding this, almost all size groups were available in all the months. But there was no progressive reduction or increase in the size group of *K.pelamis*.

The food and feeding studies revealed that empty stomach dominated in almost all the months. The natural food consisted of fishes, cephalopods and crustaceans. The main species of fishes found were *Decapterus* spp., *Trichiurus* spp., *Triacanthus* spp., *Canthigaster* spp., *Cypsilurus* spp., *Tetradon* spp., *Stolephorus* spp., sardines and caesionids. Crustaceans were chiefly represented by *Leptochela* spp. and *Thalassocaris* spp., while the cephalopods were constituted by squid alone. Of the above mentioned species all were not found in all the months and years. While *Decapterus* spp., and squid were found in almost all the months, the prawns, especially *Leptochela* spp., was seen mainly during October to December and *Thalassocaris* spp., during June to August. Occurrence of other species was sporadic. *Trichiurus* spp., was observed during October –December in 1993 only while *Stolephorus* spp., was observed only once in August 1998.

The sex ratio of mature fishes showed monthly and annual variations. The length-weight relationship was found to be: Log W= -5.11041 + 3.2092 Log L (n =383, r =0.987, L= fork length in cm and W = weight in kg.)

Thunnus albacares

In pole and line, only juveniles (immature) were landed and the size varied from 20 to 80 cm. In almost all the years the dominant size group was found between 40 and 50 cm. The food and feeding habit almost conform to *K.pelamis*. In troll, generally, bigger size groups are caught in small numbers. The size ranged from 50 to 175 cm. The sizes above 150 cm were

mostly males. Their stomach contents comprised of pelagic crabs. The length-weight relationship was found to be Log W= - 4.6890 + 2.939785 Log L (n= 266, r= 0.997, L= fork length in cm, W= weight in kg).

Environmental factors

Meteorological parameters such as rainfall and humidity showed positive correlation with pole and line tuna catch. It was seen that the humidity was more in the month of peak landing compared to the preceding and succeeding months . Similarly the rainfall was more either on peak month of tuna catch or in the preceding month. The salinity and temperature did not show much variation.

Recent developments in tuna fishery

Some noticeable changes have occurred in the tuna fishery in terms of durability of craft, communication facility, water splashing etc.

Durability of craft

Earlier the crafts were made of wood only. As an innovative measure the wooden hull was coated with fibre on the bottom and sides. Although this is very effective, leakage that might develop in the wooden hull might not be visible and the exact point of damage need not be at the place where leakage is seen. Therefore instead of fibre coating, a coating of the hull with epoxy paint is preferred. In order to make it more strong and durable, first a coating of epoxy is applied over which another coating of epoxy mixed with sawdust is applied. Upon this a cloth is spread and again a coating of epoxy is applied over the cloth. An advantage with respect to epoxy is that the leakage is seen from the point of damage only.

Bait storage tank

The *'labari'* made of cane and cane like wood and those made of tin and wood were gradually replaced by storage tanks made of PVC or fibre.

Mechanical splashers

Instead of manual splashing of water in pole and line operation, now mechanical splashers (3.8 HP pump) are fitted in most of the boats .The advantage is that the splashing will be continuous and more effective. This could reduce manpower requirement in each boat from 9 to 5 or 6. This pump could also supply water to the bait tank.

Global Positioning System

Earlier the boats had only compass whereas now most of the boats have GPS with which they are able to go far off from the base island for fishing.

V H F

From 1998, the boats are provided with VHF system because of which they are able to contact other boats as well as base station in the Island at the time of emergency.

DISCUSSION

The success of pole and line fishery depended upon the abundance of tuna in two or three months. The peak landing was in November with fairly good catches in the preceding and succeeding months. On some occasions, the peak was also seen in March. In other months, the catch would either be normal or poor. It was also observed that October to December was the peak period of occurrence of flotsams. The flotsams usually encountered were nylon net pieces, nylon rope with floats and logs. Moreover during this period, the stomachs of tunas were mostly filled with the bathypelagic shrimps indicating their abundance in the ground. Rao and Jayaraman (1966) have observed upwelling around Minicoy due to divergence in the vicinity of the island during late November and suggested that the phenomenon may have considerable impact on the peak landing of tuna between December and March. According to Pillai and Perumal (1975) it is likely that the divergence zone which leads to a favourable environment is shifting from one area to another depending on the direction of prevailing current, geographic locale of the islands, bottom topography of atolls etc. They also opined that probable fishing areas for skipjack could be predicted sufficiently in advance by keeping a constant watch on the formation and shifting of divergent zones around the islands during September to April, the season for skipjack fishery. The potential fishing zone advisories brought out by National Remote Sensing Agency (NRSA) give indications of the presence of thermal boundaries originating out of divergence and resultant upwelling, current boundaries etc. during this period (Pillai,1998). So the divergence and its associated changes may have a bearing on the abundance of tuna . Here, in addition to south-west monsoon, north - east monsoon is also equally active and sometimes even more vigorous than the former. Then the fishery during October to December is very much affected resulting in the plummeting of the catch.

But it is seen that the average catch per unit effort over the years have not undergone any perceptible decrease. Moreover, the average size groups also did not show any decrease over the years. Besides, majority of the skipjack caught by pole and line were in the size groups above 40 cm inferring that the fishes were caught at least after one spawning. So all these point to the scope for augmenting the production. Since there is a very good fishery from the shoals associated with flotsams, construction and installation of cheaper and long lasting fish aggregating devices as suggested by Pillai and Pillai (1998) would enhance the production. Now much time is wasted on scouting especially when tunas are not present within the vicinity.

As it has already been shown a positive relationship between PFZ and occurrence/abundance of tuna in Minicoy (Pillai, 1998), timely receipt of PFZ forecast should be ensured as earlier the forecasts sent through telegrams were mostly received after the forecast period. So arrangement has to be made to resume the receipt of forecast in time. The FADs and PFZ forecasts would definitely help increase the production. In addition to this, both the above arrangements would help reduce the searching time and thus save fuel. As pointed out by Silas and Pillai (1982), James *et al.* (1987) and Yohannan *et al.* (1993), the pole and line has its inherent limitations such as availability of desired live bait in sufficient quantity, biting response of tuna, expertise of fishermen etc. in tapping all the fishes present in a shoal. Moreover it cannot catch tuna above a particular weight and hence diversification of the gear is warranted. Big skipjack of more than 6 kg weight, large yellowfin and sharks present in a Sri Lankan boat confiscated in January, 1999 while fishing with longlines and gill nets in Minicoy waters further fortifies this. So along with pole and line, multiday fishing of at least one week duration employing gillnet and longlining from medium size boats of 52 feet and above can be tried as is done in neighbouring countries like Sri Lanka. In order to convince the fishermen of the viability of this fishing, initial demonstration has to be done by engaging expert fishermen from mainland with local participation. But as there is no local market for very big yellowfin and sharks, sustained marketing facility with reasonable price to the fish has to be ensured prior to the introduction of such fishing methods. Once this is assured, the production could be substantially increased without any major infrastructural facilities.

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