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PROBLEMS AND PROSPECTS OF MARINE FISHERIES AT LAKSHADWEEP

P.P. Pillai, A.K.V. Nasser, G. Gopakumar, T.M. Yohannan, K.P. Said Koya, M. Sivadas and P. Livingston

Central Marine Fisheries Research Institute
Kochi - 682 014

ABSTRACT

The prime resource, which supports the marine fisheries production at Lakshadweep is tunas, the average landing of which has been estimated as 6345 tonnes, which contributes about 87% of the total marine fish landing in the insular realm (7323 tonnes). In the live-bait pole and line fishery, skipjack contributes 89% of the total catch and in the troll line fishery young yellowfin tuna dominates. Other major groups which are fished from this area are pelagic sharks, perches, carangids, belonids and seerfishes. Studies on the island-wise marine resource production data (1985-1994) indicate that tunas, other food-fishes and live-baits can be economically trapped further by the employment of efficient surface gears and by judicious exploitation of the stocks. A system approach is imperative at this juncture.

In the present paper, the *status quo*, problems and prospects of marine fisheries of Lakshadweep are briefly described and options open for expansion of production in the marine fisheries sector in the islands and contiguous oceanic waters suggested.

INTRODUCTION

The Lakshadweep sea is estimated to have an annual fishery potential of about 90,000 tonnes while the present yield is only about 6000 tonnes. Endowed with vast lagoons and tuna-rich oceanic waters, fishing is an important component of the economy of Lakshadweep. Tunas form 87% of the fishery and is caught mainly by the pole-and-line technique. This method involves locating the tuna shoals, then attracting by chumming with live bait and water spraying, and finally, catching the fish using poles and lines with barbless hooks.

Apart from tuna, a wide variety of fishes such as perches, sharks, garfish and carangids are also caught from the lagoon and reef areas. The major fishing methods employed are trolling, handling and gill netting.

Inspite of tremendous improvement in catches of fishes in other countries of the region, the fishery from Lakshadweep, although showing an increasing trend, has not made significant strides in improving the catch from this area. This paper, therefore, is an attempt to analyse the catch data from 1985 to 1994 with a view to understanding the present position and to suggest methods for its improvement.

DATABASE

The catch details for all islands except Minicoy were obtained from the Directorate of Fisheries, Kavaratti. At Minicoy, the Central Marine Fisheries Research Institute, regularly collects data on the pole-and-line fishery for tuna and also on the catch of other fishes by different gears.

RESULTS

The tuna production in Lakshadweep increased from 3775 tonnes in 1985 to 11566 tonnes in 1994 (Table 1). Agatti contributed 38% of the catch followed by Minicoy (16%) and Suheli (12%) (Fig. 1). The catch per unit effort for the pole-and-line fishery at Minicoy varied from 152 to 321 kg while in the troll fishing it was only 12 to 28 kg (Table 2). *Katsuwonus pelamis* was the major species of tuna caught (Fig. 2).

Landings of fishes other than tuna ranged form 889 to 1392 tonnes (Table 3). The group comprising goat fishes, silver biddies and perches caught mainly from the lagoon by gill and cast nets formed 62% of

TABLE 1

ISLAND-WISE TUNA LANDINGS FROM 1985 TO 1994 (Figures in Tonnes)

Islands	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Total
Agatti	2013	1937	3141	2095	2838	1914	1808	908	1717	6361	24732
Amini	123	91	103	108	228	159	80	78	193	193	1356
Androth	183	334	198	322	286	261	430	272	335	761	3382
Bitra	185	526	465	387	410	392	645	761	549	112	4432
Chetlat	329	151	144	231	259	439	162	800	185	262	2962
Kadmat	113	39	37	63	78	81	32	85	76	104	708
Kalpeni	133	134	58	91	93	143	68	38	52	100	910
Kavaratti	118	273	303	259	450	146	400	586	537	821	3893
Kiltan	173	103	256	260	353	679	162	211	367	391	2955
Minicoy	289	946	1192	1329	1133	1268	839	635	1091	1629	10351
Suheli	116	74	632	709	300	1098	1175	1699	1134	832	7769
Total	**3775**	**4608**	**6529**	**5854**	**6428**	**6580**	**5801**	**6073**	**6236**	**11566**	**63450**

TABLE 2

CATCH, EFFORT AND CPUE OF TUNAS AT MINICOY

Year	Pole-and-line			Trolling		
	Effort (Trips)	Catch (kg)	CPUE (kg)	Effort (Trips)	Catch (kg)	CPUE (kg)
1985	2544	578598	227	642	13746	21
1986	2730	702364	257	792	22309	28
1987	3207	959419	299	374	4628	12
1988	3340	993620	298	511	12721	25
1989	3896	1018887	262	596	14778	25
1990	2908	908799	313	808	16441	20
1991	2393	364121	152	835	22424	27
1992	2449	494195	202	816	22552	28
1993	3419	896713	262	879	18404	21
1994	3726	1195420	321	1001	27993	28

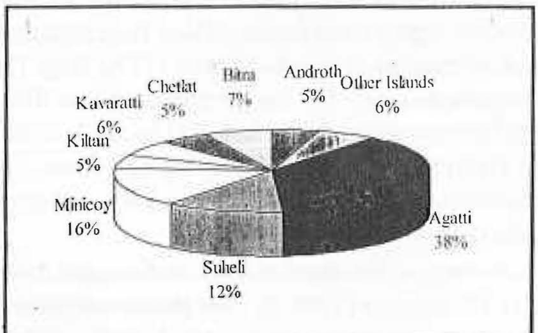

Fig.1 Island-wise tuna landings in percentage from 1985 to 1994

the catch. Other important groups were the belonids caught by shore seines and sharks taken by hook and line. Kavaratti, Androth, Bitra and Agatti contributed more than 50% of the catch of fishes other than tuna (Fig. 3).

At Minicoy, the CPUE for reef fishes by pole-and-line averaged only 2.8 kg while by trolling it was higher with 9.0 kg. The other important gears used are hook and line, shore seine and gill net. Some of the common species that contribute to the fishery are *Strongylura leiura, Lethrinus lentjan, Lutjanus gibbus, Caranx sexfasciatus, Sphyraena*

TABLE 3

CATCH, EFFORT AND CPUE OF FISHES OTHER THAN TUNA AT MINICOY

Year	Pole-and-line			Trolling		
	Effort (Trips)	Catch (kg)	CPUE (kg)	Effort (Trips)	Catch (kg)	CPUE (kg)
1985	2544	2781	1.1	642	6416	10.0
1986	2730	3439	1.3	792	5279	6.7
1987	3207	2608	0.8	374	8279	22.1
1988	3340	12201	3.7	511	5528	10.8
1989	3896	16846	4.3	596	2570	4.3
1990	2908	8416	2.9	808	2126	2.6
1991	2393	12543	5.2	835	4786	5.7
1992	2449	11926	4.9	816	5991	7.3
1993	3419	6708	2.0	879	7705	8.8
1994	3726	8321	2.2	1001	9289	9.3

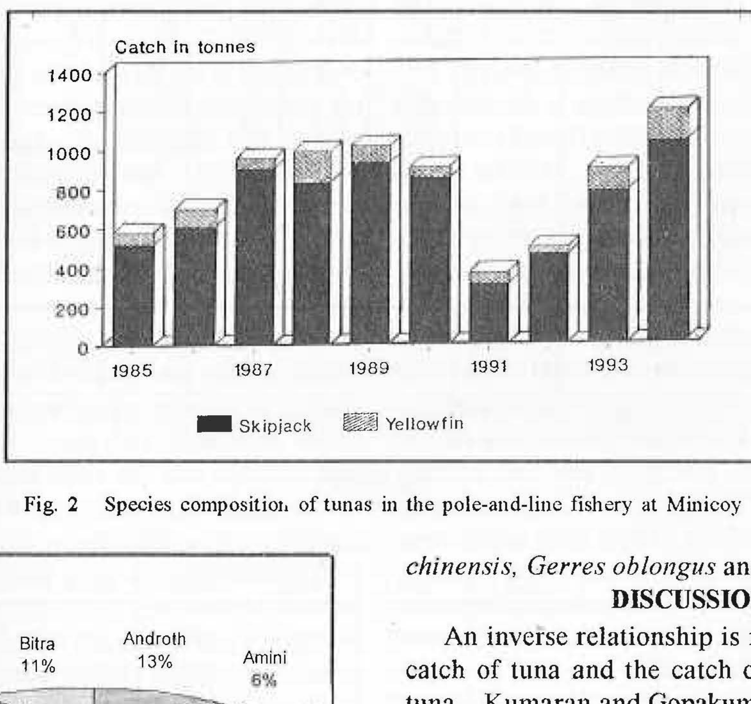

Fig. 2 Species composition of tunas in the pole-and-line fishery at Minicoy

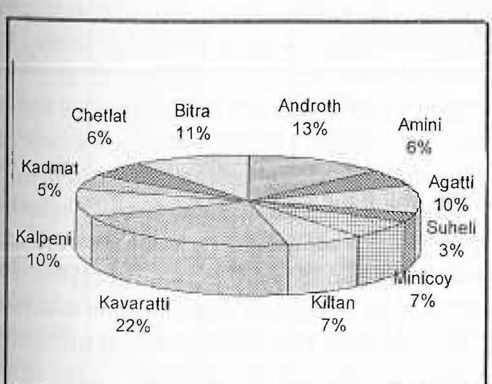

Fig. 3 Island-wise landings of fishes other than tuna in percentage from 1985 to 1994

chinensis, *Gerres oblongus* and *Upeneus vittatus*.

DISCUSSION

An inverse relationship is noticed between the catch of tuna and the catch of fishes other than tuna. Kumaran and Gopakumar (1986) noticed a similar trend and attributed it to the fluctuation in the availability of tuna shoals around the islands. When the tuna catch is poor in a particular period such as the monsoon season, the effort expended for other groups of fish is increased resulting in good catch. Although, tuna caught by pole-and-line method continues to be the major fishery of Lakshadweep, this study shows that the contribution by the fishes other than tuna is also important.

The fishery for fishes other than tuna is concentrated mainly in the northern islands. At Minicoy, reef fishery is of considerable importance during the monsoon months. The fishing is mainly on the eastern side of the island with tuna being the major group landed during the day while carangids are important in the light fishing carried out at night. Deploying small gill nets in the lagoon and the reef areas and increasing the units for longlining can vastly improve the catch. The strategies for future development of this sector include the provision of credit facilities by financial institutions, adoption of suitable preservation techniques and development of marketing facilities in the mainland to fetch higher prices (Kumaran and Gopakumar, 1986).

The tuna catch showed a gradual increase with minor fluctuations till 1994. In 1994, the catch was a record 11,566 tonnes, mainly due to the increased landings at Agatti. Eventhough, variation in the catch rate is regularly observed in different islands of Lakshadweep, the stock structure analysis carried out clearly indicate that there is considerable scope for expansion of tuna fishery (James and Pillai, 1994; Yohannan and Pillai, 1994). Data for subsequent years will reveal whether this high catch in 1994 is a stray phenomenon or a beginning of increased catch rates from the islands. Another factor that has to be considered is the inaccuracy of the data being collected as indicated for Maldivian tuna fishery (Hafiz and Anderson, 1994). At present, the information obtained from different northern islands do not contain important information such as the effort employed, amount of live-bait utilised, length, weight and biology of tunas landed and the economics of the fishery. There is an urgent need to streamline the collection of data and to regularly publish the data in the form of statistical bulletins. Yohannan et al. (1993) while reviewing the status of skipjack stocks from Minicoy, state that more data from the northern islands are required for meaningful analysis.

Potential resources of tunas in the seas around Lakshadweep has been estimated to be 50,000 tonnes by George et al., (1977) and 90,000 tonnes by Chidambaram, (1987). But the average production for the last ten years is only about 6000 tonnes. Strategies for development and management of tuna fishery to increase the production has been documented earlier (James and Pillai, 1993; Varghese and Shanmugham, 1993; Yohannan et al, 1993; Yohannan and Pillai, 1994). The major developmental plans suggested were: introduction of new generation boats with adequate navigational, chilling and storing facilities for 2-3 days, fishing which would enhance the area and duration of fishing, experimental fishing by purse seines, construction of Fish Aggregating Devices which would reduce scouting time and effective utilisation of tuna waste by converting them to fish meal.

The area that needs immediate attention is monitoring the environment of tuna fishing grounds. This would help in understanding the factors that affect the changes in abundance of skipjack. A range of environmental factors that are mutually inter-dependent such as temperature, thermocline, coastal currents, upwelling, primary and secondary production and abundance of forage organisms play important roles in the fluctuations of tuna catch (Rajagopalan et al., 1993). Tuna-environmental study is considered as one of the thrust areas with a view to locating productive fishing grounds and for prediction of areal and temporal abundance of tunas (James and Pillai, 1994). Among the environmental parameters, temperature is considered to be important as it directly influences the distribution and abundance of tuna (Nair and Muraleedharan 1993; John and Sudarsan, 1994).

Hafiz and Anderson (1994) observed that yellowfin, frigate tuna and little tuna tend to show increased catch rates in El-Nino years, while skipjack shows decreased catch rates. But analysis of our data indicate that the catch was generally higher during the El-Nino years of 1987 and 1992. There are only a few reports on the hydrography of Lakshadweep region (Rao and Jayaraman, 1966; Kesava Das et al., 1979; Varkey et al., 1979). Maldeniya and Dayaratne (1994) noticed the catch rates of tuna in Sri Lankan waters to be dependent on monsoonal conditions prevailing in the area. The information on tuna-environment of Lakshadweep is meagre and the only work reported from the region is that of Mathew and Gopakumar (1986). Regular monitoring of the tuna-rich waters for understanding the physical and biological environment is, therefore, an immediate necessity. Also of probable importance are the mapping of seamounts of the area. Seamounts have long been reputed as having a significant attractive power on tunas

(Pianet, 1994). For example, south of Agatti there is a shallow area, probably a seamount, known as 'Mankunnu'. Fair abundance of tuna is reported from this area.

The success of pole-and-line tuna fishery depends on availability of adequate baitfish. Fishermen, especially at Minicoy, complain about shortage of bait during certain periods. Conservation of the coral ecosystem and culture are some of the measures suggested to enhance production of baitfishes. James and Pillai (1994) summarised the work being undertaken by CMFRI to study the baitfishes of Lakshadweep. The major objectives and technical programmes are: to assess the relative abundance of naturally occurring stocks of baitfishes and their population biology in all islands of Lakshadweep and to evaluate the availability and abundance of other fish species that show promise as alternative baitfishes and to conduct field tests with these species.

TABLE 4

LANDING OF FISHES OTHER THAN TUNA AT LAKSHADWEEP (Figures in Tonnes)

Year	BAR	CAR	SEF	SAF	GAR	RAY	SHA	OTH	TOTAL	TUNA	G TOTAL
1985	31	41	32	21	149	5	39	64	956	3775	4731
1986	46	37	19	13	179	4	37	595	929	4607	5536
1987	25	40	68	18	154	3	39	694	1042	6528	7570
1988	25	43	34	18	137	3	39	690	989	5855	6844
1989	39	44	24	12	118	2	34	946	1219	6429	7648
1990	32	57	34	22	143	4	33	612	935	6580	7515
1991	23	39	37	13	167	5	459	651	1392	5800	7192
1992	28	32	28	13	132	6	38	655	931	6074	7005
1993	23	39	26	13	159	3	40	600	903	6235	7138
1994	35	38	24	13	187	3	36	554	889	11567	12456
Average	**31**	**41**	**33**	**16**	**168**	**4**	**79**	**606**	**978**	**6345**	**7323**
%	**3.2**	**4.2**	**3.4**	**1.5**	**17.2**	**0.4**	**8.1**	**62.0**	**100**		

Abb: BAR-Barracuda, CAR-Carangids, SEF-Seerfish, SAF-Sailfish, GAR-Garfish, SHA-Sharks, OTH-Others.

TABLE 5

ISLAND-WISE LANDINGS OF FISHES OTHER THAN TUNA IN 1994 (Figures in kg)

ISLAND	BAR	CAR	SEF	SAF	GAR	RAY	SHA	OTH	TOTAL
Agatti	1819	5361	1900	925	21906	430	7745	59488	99574
Amini	765	2530	1580	760	12656	-	300	35182	53773
Androth	8006	6122	2763	1046	17489	150	258	75447	111281
Bitra	8470	4013	3385	974	12533	-	2833	65846	98054
Chetlat	612	1312	670	710	9919	-	200	38868	52291
Kadmat	971	1824	1388	700	4642	-	328	33779	43632
Kalpeni	8981	4035	2614	541	9870	1829	500	57650	86020
Kavaratti	820	9810	1991	4872	88233	315	10046	82995	199082
Kiltan	1180	720	1229	585	10205	-	430	44912	59261
Minicoy	3250	2684	2994	1523	1692	-	1920	49611	63674
Suheli	-	-	3230	-	-	-	11530	10011	24771
Total	34874	38411	23744	12636	189145	2724	36090	553789	891413

A recent trend in tuna fishery in the coastal waters of India is the use of satellite imagery provided by the National Remote Sensing Agency (NRSA), Hyderabad. The direct relationship between tunas and environmental parameters is used to deduce the presence of tunas from available environmental variables such as sea surface temperature (SST). Beena Kumari et al. (1993) in a study off Gujarat concluded that a temperature range between 27^0 C and 29^0 C may indicate tuna potential areas. At Minicoy, the data received from NRSA were passed onto the fishermen. But the feedback received was that these areas contain only dolphin shoals or whales. However, this is only a preliminary observation and systematic study on the success rate of predictions is necessary to understand the importance of tuna catch and thermal fronts.

An analysis of data from 1985-1994 revealed that there is considerable scope for enhancing the fishery of tuna and fishes other than tuna at Lakshadweep. Management options for pole-and-line tuna fishing include introduction of new generation boats with multi-day fishing ability and experimental fishing by purse seines. The future strategies for the traditional sector involving fishes other than tuna are, the provision of credit facilities and development of markets in the mainland. Adequate attention should be given to monitoring the tuna-environment and satellite data should be used for increasing the tuna catch of the area.

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