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LIVE-BAIT RESOURCES : PRESENT STATUS AND MANAGEMENT

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ABSTRACT

The live-bait fishes play a pivotal role in the development and success of the pole-and-line fishery in Lakshadweep. The total live-bait fish catch from this insular area is estimated to be 125 t in recent years. The major groups exploited at Minicoy are clupeids, caesionids and apogonids. The clupeid, *Spratelloides delicatulus* is the only species caught as bait in the northern islands. The major fishing areas for live-baits are Minicoy, Agatti, Suheli, Perumal Par, Bitra, Valiapani and Cheriyapani. Both meteorological and hydrographical factors influence the recruitment of migratory groups to the lagoon, while resident forms depend on the recruitment success.

In the present paper, the *status quo*, problems and prospects of live-bait fishery in Lakshadweep are briefly described and options for expansion and management of live-bait fishery sector in the island and lagoon areas suggested.

INTRODUCTION

Oceanic species of tuna such as skipjack *(Katsuwonus pelamis)* and yellowfin *(Thunnus albacares)* are exploited in Lakshadweep by pole-and-line fishing method using live-bait. Baitfish are composed of small fishes collected from the lagoon or reef areas and thrown live into the sea to attract tuna schools within range of the boat. A study of the status of bait fishery is important because (i) fishermen rely on regular and adequate supply of bait for fishing activities and (ii) fluctuations in tuna catch depends on the availability of baitfish.

The major fishing areas for live-baits are Minicoy, Agatti, Suheli, Perumal Par, Bitra, Valiapani and Cheriyapani. The important groups exploited at Minicoy are clupeids, caesionids and apogonids while the clupeid, *Spratelloides delicatulus* is the only species caught as bait in the other islands. *S. delicatulus* is caught from the sandy areas of the lagoon by an encircling net while the other groups are taken from deeper coral bottom areas and reefs using a lift net.

There is no separate baitfishery at Lakshadweep. Each boat collects its own baitfishes from the lagoon before proceeding to the tuna fishing grounds. The tuna pole-and-line fishery of Minicoy in its early form is described by Jones (1958). The advent of mechanised fishing boats and its advantages over the traditional crafts is described by Varghese (1971). Baitfishes and their fishing techniques in the Indian Ocean have been discussed by Silas and Pillai (1982) and an account of live-bait fishery at Minicoy is given by Pillai et al, (1986). The importance of adequate and suitable data for stock assessment of bait fishes was emphasised by Gopakumar et al, (1991).

Although data on the tuna landings are available from almost all areas of pole-and-line fishery, there is no information on the quantity of bait utilised. At Minicoy, CMFRI has been collecting information on the bait fishery and has also recently started a monitoring programme at Agatti. This paper analyses the baitfishery at Minicoy from 1985 to 1994 and also presents the fishery in detail during the 1994-95 fishing season at Minicoy and Agatti.

DATABASE

Data on the baitfishery at Minicoy and Agatti during the pole-and-line fishing season (September to May) were collected by enquiry from the fishermen and by joining fishing trips. Information was collected regarding the quantitiy of bait used, species caught and the area of the baitfishery. The above information was obtained from the captain and divers of 40% to 60% of the boats operating on the observation day. The data were collected in

such a way so as to cover a minimum of 60% of the total fishing days in a month. The total catches of the observed days were raised to the number of fishing days in a month. Effort represented in numbers is the total number of baitfishing trips made by the boats in a month while catch (in kg.) is the total amount of bait caught for the respective effort. Catch divided by the effort gives the catch per unit effort (CPUE) and total tuna caught divided by total bait caught is reported as catch per unit bait (CPUB).

RESULTS

Inspite of catches being low during 1989 - 1992, the exploitation of baitfishes at Minicoy shows an increasing trend (Fig. 1, Table 1). The CPUE has also increased but the CPUB decreased during 1994-95 season when compared to the previous years (Table 2). The amount of bait used by the boats at Agatti is higher than that used at Minicoy with an avearage CPUE of 14 kg (Table 3). Apogonids formed the principal group at Minicoy and contributed to the fishery from early November to the end of fishing season (Table 4). Among apogonids, the important species was Archamia fucata while Gymnocaesio argenteus was the chief caesionid caught in the fishery (Fig. 2). At Agatti, the favoured fishing site for baitfishes was Perumal Par (Table 5).

DISCUSSION

The relationship between catch and effort data at Minicoy and Agatti is linear. A similar relationship has been reported for baitfishes from other ar-

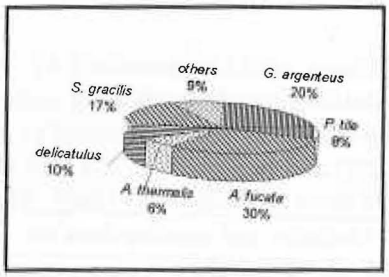

Fig. 1 Trend in tuna baitfishery at Minicoy

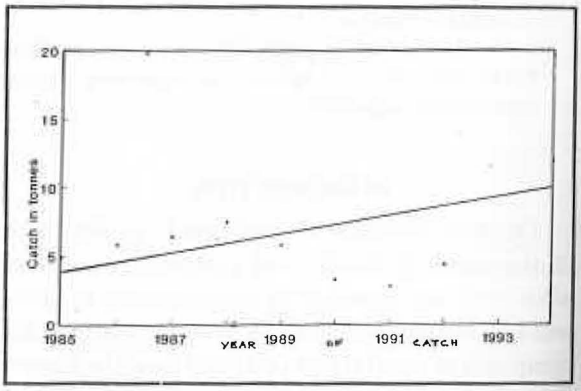

Fig. 2 Species composition of baitfishes at Minicoy

TABLE 1

EFFORT, CATCH, CPUE AND CPUB OF TUNA BAITFISHERY AT MINICOY.

Year	Effort (Trips)	Baitfish Catch (kg)	CPUE (kg)	Tuna Catch (t)	CPUB (kg)
1985	2544	4826	1.9	578	120
1986	2730	5789	2.1	701	121
1987	3207	6366	2.0	959	151
1988	3340	7449	2.2	994	20
1989	3896	5760	1.5	1018	177
1990	2908	3263	1.1	907	278
1991	2393	2791	1.2	364	130
1992	2449	4343	1.8	494	114
1993	3419	16763	4.9	895	53
1994	3726	11876	3.2	1193	101
Average	**3061**	**6923**	**2.2**	**810**	**127**

TABLE 2

CATCH STATISTICS OF LIVE-BAITS USED IN THE TUNA POLE-AND-LINE FISHERY AT MINICOY DURING 1994-95

Month	Effort (Trips)	Baitfish Catch (kg)	CPUE (kg)	Tuna Catch (t)	CPUB (kg)
Aug.	10	15	1.5	1	67
Sep.	300	296	1.0	23	78
Oct.	740	4146	5.6	548	132
Nov.	438	727	1.7	67	92
Dec.	250	386	1.5	43	111
Jan.	392	1771	4.5	82	46
Feb.	395	1802	4.6	112	62
Mar.	239	2507	10.5	17	7
Apr.	384	1657	4.3	123	74
May.	79	290	3.7	18	62
Total	**3227**	**13597**	**38.9**	**1034**	**731**
Average	**323**	**1360**	**4.0**	**103**	**73**

TABLE 3

CATCH AND EFFORT OF TUNA BAITFISHES AT AGATTI DURING 1994-95 FISHING SEASON

Month	Effort (Trips)	Baitfish Catch (kg)	CPUE (kg)	Tuna Catch (t)	CPUB (kg)
Oct.	200	2000	10	61	31
Nov.	520	7223	14	57	8
Dec.	166	2205	13	10	5
Jan.	783	11745	15	194	17
Feb.	15	225	15	5	22
Mar.	1012	12954	13	793	61
Apr.	650	9750	15	102	11
May.	368	5778	16	155	27
Total	**3714**	**51880**	**111**	**1377**	**182**
Average	**464**	**6485**	**14**	**172**	**23**

TABLE 4

GROUP-WISE COMPOSITION OF LIVE-BAITS (IN kg) AT MINICOY DURING 1994-95

Month	Clupeids	Caesionids	Apogonids	Pomacentrids	Total
Aug.	-	-	-	15	15
Sep.	291	-	-	5	296
Oct.	632	3514	-	-	4146
Nov.	159	133	383	52	727

Continuation.

Dec.	61	-	325	-	386
Jan.	1033	483	255	-	1771
Feb.	348	236	1218	-	1802
Mar.	572	-	1935	-	2507
Apr.	638	-	1019	-	1657
May.	-	-	290	-	290
Total	**3734**	**4336**	**5425**	**72**	**13597**
%	**27**	**32**	**40**	**1**	**100**

TABLE 5

BAITFISHING AREAS AND THEIR CONTRIBUTION TO THE CATCH AT AGATTI

Month	Agatti	Bangaram	Perumal Par	Total
Oct.	100	400	1500	2000
Nov.	144	795	6284	7223
Dec.	157	630	1418	2205
Jan.	336	4530	6879	11745
Feb.	-	38	187	225
Mar.	1036	864	11054	12954
Apr.	1554	141	8055	9750
May.	1675	168	3935	5778
Total	**5002**	**7566**	**39312**	**51880**
%	**10**	**15**	**75**	**100**

eas (Rawlinson and Nichols, 1990; Dalzell and Lewis, 1988). Dalzell and Lewis (1988) suggest that the lack of a curvature in the catch-effort relationship may be due to the dynamics of pole-and-line fishery. As baitfish are essential to the capture of tuna, fishermen will quickly leave a baitground when catches decline and will try other locations for bait supply. This may be the case at Agatti because of the accessiblity to different baitfishing grounds. For this reason the baitfishery at Agatti is self-regulatory. When catch rates in a particular baitground decrease the fishermen move to new baiting locations. This movement gives the baitfish at the first site to undergo a recovery period due to the reduced fishing effort. Therefore at present levels of fishing effort, the catches of baitfish at Agatti will sustain the pole-and-line fishery. At Minicoy, the bait catches indicate an increasing trend. The lack of alternative baiting sites is compensated by a judicious exploitation of a variety of bait species. Thus, the fishery which may commence by the catching of *S. delicatilus,* may quickly shift to *S. gracilis* and then on to caesionids which may enter the lagoon by that time and finally, on to the resident apogonids. This shuffling of species, reduces pressure on any particular group. The fishermen at Minicoy, at times, complain about lack of adequate bait in the lagoon. This is particularly so when there is no recruitment of caesionids. Juvenile caesionids form an important component of the baitfishery at Minicoy. They are caught mainly in the deeper areas of the lagoon and outer reef areas on the western and eastern sides of the island. There is very little information on the biology of this group. Variations in hydrographical and meteorological conditions may influence the recruitment of young ones of baitfishes into the lagoon (Anderson and Saleem 1995).

Tuna catch per unit bait (CPUB) which is the weight of tuna caught per 1 kg of bait is higher at

Minicoy when compared to other pole-and-line fishing areas of the world. At neighbouring Maldives, CPUB is only 7-13 kg (Maniku *et al.*, 1990) while the average CPUB at Minicoy for the last 10 years was 127 kg. This is mainly due to the low amount of bait used by the Minicoy fishermen, the average CPUE being only 2.2 kg when compared to 14 kg at Agatti and about 45-60 kg at Maldives (Anderson, 1994).

The total catch of baitfishes from pole-and-line fishing areas of Lakshadweep is estimated to be 125 tonnes. This is a broad estimate based on the bait catches of Minicoy and Agatti and the number of boats operating at Suheli and Valiapeni and Cheriyapani areas. Data from all areas of baitfishing need to be collected for understanding the exploitation rate and suggest appropriate management measures. There is also an urgent need to accurately quantify the amount of bait caught per boat. The estimates are based on figures given by fishermen which may vary widely from person to person. At present, the baitfish are directly transferred from the net to baitwells by using a piece of cloth and as such estimating the catch is difficult. If a slightly different approach is used, wherein the transfer of a bit to the boat is effected by a bucket, whose volume and weight of bait it can hold is already known, then this will give better estimates of the catch (Hida and Wetherall, 1977).

Except for a few reports (Madan Mohan and Kunhikoya, 1985; Madan Mohan et al., 1986; Gopakumar et al., 1991) there is very little information on the population dynamics and biology of baitfishes of Lakshadweep. Stock assessment studies and estimating the growth and mortality parameters of bait-fishes will have to be attempted.

Earlier reports on the culture and use of fishes such as topminnow as a live-bait fish for tuna are encouraging (Baldwin, 1977; Herrick, 1977). Apart from the hardy, freshwater forms, experiments may be undertaken to rear marine forms such as the apogonid, *Archamia fucata*. A related aspect would be to apply the technology of mass production of prawn juveniles and use them as chum in the pole-and-line tuna fishery. Appropriate research projects on these lines have been formulated and work initiated at the Minicoy centre of CMFRI.

Protection of corals and coral reefs which form the habitat of baitfishes need to be stressed. Blasting and dredging are still carried out in certain islands of Lakshadweep. Anthropogenic damage to corals by using the lagoon as a dumping place for garbage, tuna wastes and other organic matter will also have to be checked (Nasser, 1995). Clearing of vegetation for human settlement and development of tourism will lead to increased run off which will in turn increase the sedimentation rate in the lagoon.

Management options for the live-bait fishery would, therefore, include : collection of fishery data from more areas of fishing, studying the biology and understanding the stock of exploited species, culture of suitable species for use as bait and maintaining the reef health of islands.

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