

Lakshadweep Livebait Fisheries Management Plan

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Foreword



Lakshadweep islands being atolls situated in the midst of oceanic waters is unique with respect to the marine biodiversity and fish wealth. The waters are replete with high value oceanic resources like the tuna and tuna like fishes. Historically, the islanders have been tapping these resources using traditional fishing methods. The island group boasts of being the only territory in the country where pole and line, a one-by-one fishing method is practiced. Low impacts on the stock and high selectivity make the pole and line method a

highly sustainable one. Local ownership and shorter duration of fishing are few other uniqueness of the fishery in Lakshadweep. Though, over the years, there has been progresses in fishing sector with respect to mechanisation; craft size and amenities on-board, marketing strategies etc., the fishery is still rooted to the sustainability principles. Hence, the islands possess immense potential for developing the fisheries sector on the strengths of its sustainability quotient to provide enhanced income to the fishers and quality job to its youth.

Livebait is an essential part of pole and line fishing for tunas. Since, the livebaits are collected from the reef system; the harvest of these species should also be guided by the sustainability principles; ensuring low impact on the stock and continuity of other ecosystem services by these fishes. Hence, close monitoring of the livebait fisheries is essential and the fishery need to be managed based on scientific acumen. The CMFRI have been providing guidelines and policy briefs to the maritime states for development of fishery management plans. These briefs are made based on scientific data generated by the Institute over the years through close observation of the fisheries in each state.

The Institute have accumulated information on the fisheries of Lakshadweep through the Minicoy Research Centre and other projects over the years. A fisheries management plan project for Lakshadweep has been in place since 2017 for continued monitoring of the fishery, data generation and preparation of management guidance in due course. The Lakshadweep Livebait Fisheries Management Plan (LLFMP) is one of the outputs of the project and intends to rationalise the bait fisheries of the islands based on the scientific information available.

The Plan lists actionable points with the responsible entity and time frame to achieve the set goals under each overarching objective. It also provides administrative, legal and institutional requirements for the successful rolling out of the Plan. The Plan has been reviewed through focus meetings at the institute and consultations with the Administration and the public. The Plan, when formalised and enforced by the Administration will increase the sustainability quotient of the Lakshadweep tuna fisheries, benefiting the ecosystem and the fishery in a large way.

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Executive Summary

Lakshadweep islands boast of having one of the most sustainable fishing techniques for tuna fisheries - the pole and line. Fisheries, especially the skipjack tuna pole & line fishery is the mainstay of the economy of the islands. On the strength of its very low ecological impacts, the fishery is in course to attain the Marine Stewardship Council (MSC) certificate. However, the livebait fisheries, the ancillary fishery of the pole and line fishing, has interaction with the ecosystem as the fishing is done inside the lagoon or near reef areas where the corals and associated resources are at bounty. The changing fishing intensity by way of enhanced craft size and increased duration exerts added pressure on the livebait resources. The integrated island management plan (IIMP) mandates use of this zone in line with a well worked out management plan. All these call for exploitation of the livebait resources in line with a science based fisheries management plan. Thus, the ICAR-Central Marine Fisheries Research Institute under its in-house research project "Resource assessment and management framework for sustainable marine fisheries of Lakshadweep" developed this document.

Reviewing the existing information on livebait fisheries at national and international levels, scale of fisheries, extant traditional management practices etc., the document sets goals and management actions under 5 different objectives spanning from improving the data, protection of livebait species, judicious usage, raising awareness on conservation and management, reduction of negative impacts to the ecosystem and physical environment; and enhancement of stock and habitat. In the course of preparation of the document, consultations were conducted with the stakeholders and peers at various levels with the final consultation held on 23rd January, 2019 at Kavaratti island coordinated by the World Wildlife Fund (WWF)-India which is steering the Fishery Improvement Project (FIP) for the skipjack tuna pole and line fishery of Lakshadweep. The important recommendations of the Plan are provided below.

- Fishery data quality and coverage, in general, need to be improved with use of scientific methodology. Modern techniques may be resorted for better accuracy in collection and reporting and for ensuring compliance. Specific data on the use of livebait species need to be incorporated in the data collection schedules/log books.

- The bait fish use efficiency need to improve further and wastage due to mortality while fishing and storage need to be reduced through awareness and training. Information on area and time of livebait spawning aggregations need to be collected for every atoll and necessary legal provisions made for protection of the spawning aggregations.
- The fishers and the managers need to be imparted with regular training on fisheries management and good livebait fishing practices. Awareness programmes need to be conducted for the fishers and general public on the importance of lagoons, and the fishery resources therein and the need for their conservation.
- Information on the interactions of Endangered Threatened and Protected species (ETP) with livebait fishing need to be collected by incorporating relevant fields in the data collection schedule/log book. Interaction of livebait fishing with the corals need to be reduced to bare minimum with regulation or prohibition of the gears and methods that pose threat of severe interaction with the corals. Sensitise the fishers on the need for avoiding interactions with other ETP species such as turtles and cetaceans.
- Long-term monitoring of the ecology of the livebait habitats such as the lagoon and near reef area needs to be done. Critically damaged habitats (corals and sea grass) may be rebuilt for enhancing the livebait population in the lagoons. Enhancement of the natural stock of important livebait species through breeding and sea ranching has to be taken up on priority. Alternative livebait species including the farmed species such as milkfish (*Chano chanos*) need to be experimented for viability.
- A two-tier fisheries management council (FMC) *i.e.* atoll level 'AFMC's and a federated U. T. level 'LFMC' with representation of the stakeholders is essential to be constituted to oversee the implementation of the Plan. Constitution of FMCs hence is a precursor to rolling out of the Plan.
- The Lakshadweep marine fishing regulation Act (LMFRA 2000) may be reviewed to incorporate legal provisions needed for implementation of the Plan.
- The Director of Fisheries, Lakshadweep with advisory support of FMC will be responsible for rolling out, enforcement and review of the Plan.

Background information on the livebait fisheries in Lakshadweep





Introduction

Lakshadweep, a group of atolls situated off the south-west coast of India has skipjack-targeted Pole and Line (P&L) fisheries in existence from time immemorial. P&L, a one-by-one fisheries is regarded as one of the most environmentally friendly and socially desirable way of fishing. It involves release of small pelagic fishes (baitfish) stored live on board into the sea. Together with splashing of water, the livebaits attract the tuna shoals to the boat, excite feeding frenzies and retain the shoal in the vicinity for fast and sustained hooking. Steady supply of baitfishes is therefore crucial for successful pole and line fisheries. Hence, P&L fisheries comprises of two fisheries; one for livebaits and the other for tunas. Livebaits are caught from the sand banks or reef flats in the lagoons or outer reef areas of the atolls. Success of the tuna fishery essentially depends on the availability of livebaits in right time and quantity. Livebait fishery is the most important reef fishery in Lakshadweep, having interaction with the lagoons and the marine biota therein. However, a widely-held view is that there is significant prospect to improve the P&L fisheries through modifications in livebait

fishing and its management. Baitfish fisheries of Lakshadweep is quite well documented, mainly by the Central Marine Fisheries Research Institute (CMFRI).

Livebait resources

Livebait resources in Lakshadweep waters belong to 45 species, 30 genera and 19 families (Jones, 1964); Nearly 14 species of fishes belonging to families Dussumieriidae, Apogonidae, Caesionidae, Pomacentridae, Emmelichthyidae and Atherinidae constitute the baitfish fishery (Pillai *et al.*, 2002) with island to island and seasonal variations. *Spratelloides* spp., *Apogon* spp., *Archamia* spp., *Caesio* spp., *Pterocaecio* spp., *C. caeruleus* and *L. tapeinosoma* are the most dominant livebait species. Species of baitfishes occurring in different atolls (adapted from Kumaran *et al.*, 1989) are listed in Annexure -I. Livebait fisheries in Minicoy and the remaining islands vary greatly for species composition, species use pattern and harvest methods.

Baitfish fisheries

Fisheries for the baitfishes in Lakshadweep are discrete and practiced individually by respective fishing boats with almost 100% of the catch used for pole and line fishing. There are essentially two types of fishing for baitfishes, namely, encircling seine nets and dip nets. Encircling net is mainly used for fishing sprats and dip net for all other species which occupy deeper areas, often in close vicinity of the corals. The baitfish species are selected based on the availability. Shoals are identified based on several cues varying between species. Pelagic shoaling species like the sprats and to some extent the juvenile fusiliers can be located by ripples on the surface of the sea. Fishermen's knowledge of the availability of particular coral species and the associated baitfish helps them fix the location for most of the remaining baitfish species. As the water is very clear, they will be able to judge the species and the quantum available before setting the net. Encircling nets are operated by surrounding the identified baitfish shoal to heave them onboard. Split coconut leaves tied on the ropes were used as scare line for enhancing the efficiency of encircling nets in northern islands earlier. However, the use of scare line has reduced drastically mainly because of the availability of better snorkel aids that help fishermen to swim along

with the nets while watching closely the movement of the shoals to ensure efficient fishing (Fig. 1 to 4).

In case of dip nets, long poles are used to keep the net immersed in stretched condition and the baitfishes are attracted to the surface above the net using fish paste as chum. The net is lifted when the baits aggregate in sufficient quantity. Dip nets are also used with the help of stones as dead weight and long bridles to pull the net with the help of swimming fishermen. This method is used for fishing the reef associated baitfishes from depths in the outer reef areas. Baitfishes collected are quickly transferred to the livebait tanks onboard. It is a rectangular shaped tank with two compartments separated using a perforated board and connected to the sea with



Fig. 1: Paying off the net to encircle the shoal of livebait



Fig. 2 Heaving of the net onboard. Swimming fishermen prevent the escapement of the fishes from the net.



Figure 3. Transfer the bait into the livebait tank

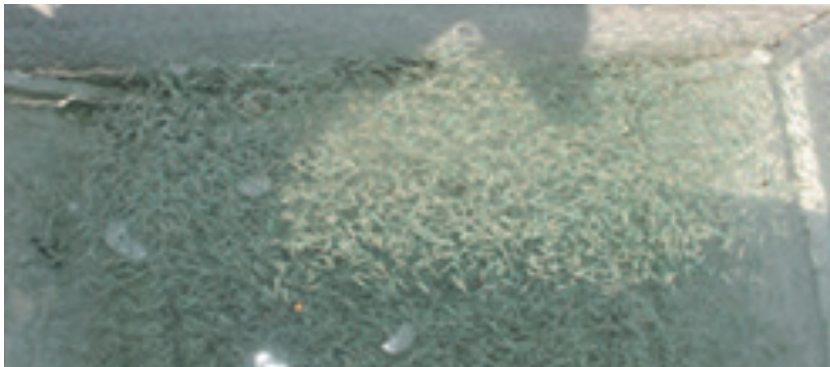


Figure 4. Livebaits stored in the bait tank onboard.

a pipe through the hull of the boat. Water flows into the tank when the boat is in motion and the overflow pipe helps to maintain the water at desired level, ensuring total flow through of seawater.

Brief on the biology and life history of important livebaits

Detailed information on the biology of tuna livebaits of Lakshadweep is limited to the works of CMFRI till 2004. The Research Center of CMFRI in Minicoy had been collecting information on the fisheries of Lakshadweep including livebaits until it was closed in 2004. However, due to the geographic isolation of Minicoy from other islands, information from these islands is scanty. Nasser (1993) gave a brief on the feeding and reproductive biology of important livebaits from Lakshadweep (Table 1). Wider presence of mature *S. delicatulus* in the fishery from August onwards indicated that major spawning

Table 1. Feeding and reproductive biology of important livebait of Lakshadweep

Species	Length range (mm)	Length at maturity (mm)	Sex ratio (M:F)	Spawning season	Fecundity	Chief food items
<i>S delicatulus</i>	20-61	33	1:1.4	November & December	170-704	Copepod, decapods & fish eggs
<i>S gracilis</i>	29-61	37	1:0.98	November; March & April	400-1120	Copepod, mysids & cumaceans
<i>Gymnocaesio argenteus</i>	45-99	—	1:1.01	January & March	—	Copepod, decapods, Mysid & amphipod
<i>Caesio striatus</i>	44-118	—	1:1.2	November & March	—	Copepod, decapods & isopod
<i>Pterocaesio pisang</i>	30-45	—	—	—	—	Decapod & amphipod
<i>P chrysozona</i>	46-92	—	1:0.97	—	—	Isopod, amphipod & mysid
<i>Chromis caeruleus</i>	22-69	38	1:1.5	November & December	2516-4800	Copepod, decapods & mysids
<i>Lepidozygus tapelinosoma</i>	38-86	—	1:1.13	February	—	Amphipod, decapods, copepod & ostracod
<i>Archamia fucata</i>	41-62	—	1:1.5	March	1100-2200	Decapod, mysids, amphipod & zoea
<i>Apogon thermalis</i>	27-58	—	1:1.03	January	—	Decapod, mysids, amphipod & zoea
<i>Rhabdamia gracilis</i>	21-50	—	1:0.5	—	—	Copepod

takes place during post monsoon. However occurrence of juveniles in the fishery for a longer period suggested that this species has more than one spawning season (Mohan and Kunhikoya, 1985). Wider presence of young ones in the fishery during October to April indicated that the recruitment occurs during this period (Jones, 1964). Similarly, the presence of matured *S. gracilis* found in the fishery suggested that this species spawns from March onwards and the nature of ovary showed that it spawns more than once in a year (Mohan and Kunhikoya, 1985). The bluepuller, *Chromis caeruleus* is another important livebait harvested from the lagoon of Minicoy. The species attains 64 mm total length (TL) by the end of first year of life and a TL of 95 mm by the end of second year. The individual fish may spawn more than once in a year. The main breeding season is about 9 months, from August to April, with a peak period from May to July (Mohan *et al.*, 1986).

The food of *S. delicatulus* and *S. gracilis* mainly consisted of post larvae of decapods, harpacticoid, copepods, mysids and gammarids (Mohan and Kunhikoya, 1985; Nasser, 1993) and *C. caeruleus* chiefly fed on copepods (Mohan *et al.*, 1986).

Descriptive account of baitfish stock status

Information on the distribution, abundance, fisheries, biology, life history traits etc. of livebaits of Lakshadweep is limited to the works done by CMFRI. There has not been any concerted study on livebaits since 2004. Paucity of quantitative catch and effort data separately for livebaits from remaining islands hindered their stock assessment in the respective atolls. Sivadas and Naser, (2000) reported the stock status of *S. delicatulus* and *Archamia fucata* in Minicoy lagoon being overfished. Both species showed higher level of yield and fishing mortality and main reasons for higher mortality rate might be the limited habitat, the type of net and the short life span of the species. Though signs of catch decline were noted on a few occasions (Kumaran *et al.*, 1989, Gopakumar *et al.*, 1991), the fishery is thriving with fluctuations despite intensification in fishing. Widely-held view is that for fast growing, fast reproducing fishes with high rates of natural mortality like many of the livebait, the catches can be high relative to biomass with little fear of over exploiting the resource.

The sprats are fast growing and short-lived (Nasser *et al.*, 2002) and hence are resilient to fishing pressure. Life expectancy of *Spratelloides* spp. is 4-6 months (Dalzell *et al.*, 1987, Milton *et al.*, 1991). Though there are no clear signs of overfishing, it is prudent that the stocks and fishing pressure is evaluated at regular intervals considering the enormous importance of the livebait fishery to the tuna fisheries of Lakshadweep.

The livebait species collected during the exploratory survey from the lagoons of different islands of Lakshadweep by Kumaran *et al.* (1989) is presented as percentage of total catch in Table 2. A recent lagoon survey done by Dakshin Foundation (2016) showed a steady decline in availability of commonly used baits in all the atolls since 2012 except in Minicoy, where a customary management of the livebaits is in practice.

Table 2. Percentage of different groups of livebaits in total catch in Lakshadweep (Kumaran *et al.*, 1989)

Island	Sprats	Apogonids	Pomacentrids	Caesionids	Atherinids
Kavaratti	12.36	63.22	22.98	1.44	—
Agatti	12.24	38.33	34.05	15.38	—
Bangaram	22.63	1.02	76.35	—	—
Perumal Par	45.00	6.50	41.00	7.50	—
Suheli	34.60	9.81	45.47	3.63	6.50
Kadamat	11.93	38.53	29.05	10.09	10.4
Chetlat	51.00	—	40.23	—	8.77
Kalpeni	30.65	22.21	35.21	9.89	2.04
Minicoy	33.43	40.19	9.40	14.98	2.00
Average	28.2	24.4	37.1	7.0	3.3

Mas-odi, a larger (12.5m LOA) country craft propelled using wind and rows was the craft of yesteryears used for pole and line fishing in Minicoy. The Department of Fisheries established in 1959 spearheaded the fisheries development in the islands with motorisation of the fishing crafts, introduction and popularisation of pole and line fishing in other islands with the help of expert fishermen of Minicoy, provision of motorised fishing boats to beneficiaries on subsidised cost etc. in the early 1960s (Varghese, 1987).

Changes in tuna fishing pattern

Pole and Line fishing using *Mas-odi* for tunas has been in vogue in Minicoy Island from time immemorial. Fishing in other islands was limited to the lagoon and near shore resources using country canoes. The pole and line tuna fishery in other Islands was established after introduction of motorised fishing crafts in 1959. The fishing sector further developed over the years with improvements in crafts, fishing techniques, processing and trade. Size and type of the boat gradually evolved from 7.5m LOA open decked ones in 1960s through 10-12m during '90s to nearly 15m Maldivian type boats with wheelhouse in the mid-2000s (Figure 5 and 6). Fishing technique also developed with the advent of synthetic materials. Mechanical water sprayer replaced the manual splashing of water in the late eighties (Fig. 7).



Figure 5. Pole and Line boat modified to Maldivian type boat (initial phase of transformation)



Figure 6. Maldivian type pole and line vessel-recent version

There has been deployment of anchored fish aggregation devices (aFAD) by the Government to aid tuna fishing since 2006. There were 9 aFADs deployed near different islands as on 31 January, 2019 (see Annexure II for details). Another important development in the sector was the introduction of double pole and line fishing for yellowfin tunas in the late 2000s.



Figure 7. Pole and line boat fitted with mechanical water splasher at stern

Handline with live chumming is the latest development in the islands, helping the fishermen capture medium sized yellowfin tunas. This fishing method has emerged to be predominant in most of the islands, especially, the islands where the skipjack pole and line fishing is less significant like Amini, Kadmath, Chetlath, Kalpeni and Kiltan etc. The recent initiative of the Department of Fisheries to provide license to the local fishers and traders to deploy larger fishing vessels from mainland as collector vessels, which collect tunas and other fishes from the local fishing boats and transport to mainland for marketing; has fuelled the widespread use of yellowfin handlining with live chumming, as yellowfin is the preferred fish by these traders.

Fishermen in the islands practice daily fishing, mainly from the respective islands because of the limitations in the capacity of crafts and nearness of the fishing ground to the island. However, with the improvements in craft and engine, they have begun to move to different islands according to the availability of tuna shoals and camp there for fishing. *Massmeen*, brine cooked, smoked and sun dried tuna loins identical to the *Maldivefish*, a similar product from the Maldives is the major commodity made from the skipjack tuna which has a traditional market in the mainland India, Sri Lanka and some South East Asian countries.

Existing bait-fisheries management practices, issues and prospects

Fishermen of Minicoy use many livebait species as per the availability in different seasons while the remaining islands grossly depend on *S. delicatulus*. Only recently the fishermen of other islands have started using baits other than *S. delicatulus* owing to the expansion in pole and line fishing fleet and the upward creeping size of the crafts exerting high demand for the baitfish.

The bait fishery in Lakshadweep to some extent is self-regulatory mainly because of the scale and pattern of pole and line fisheries and lack of additional fishing pressure on livebaits for other uses. Non-existence of separate fishery for baits and poorer survival of the baits in confinement necessitates collection of livebaits individually by the fishermen immediately prior to proceeding to fishing. Fishermen are

Livebait fishery data such as the geo-location of livebait fishing, time spent on livebait fishing, species caught, quantity of bait caught and used, relative abundance and Tuna CPUB are important for effective management of livebait fisheries

thus forced to spend less time for collection of bait as they need to be in the tuna fishing grounds early in the morning when the tuna responds better to fishing. Development of handline fishing for yellowfin tuna in majority of the islands in the recent days has reduced the fishing pressure on baitfishes due to diversion of few existing units to yellowfin fishing.

Customary management of livebait fishery exists in Minicoy, where the fishery has been in existence for several centuries (Box-1). Though Minicoy has been the model on which pole and line fishing in the remaining islands have been developed, the customary bait management practices of Minicoy has not been adopted by these islands. Since the bait is crucial for P&L fishing, the baitfishery need to be monitored regularly and managed stringently to sustain the fishery. It calls for a need to develop a management paradigm for livebait fisheries prepared with the participation of the stakeholders set on the principles of precautionary approach and ecosystem approach to fisheries management.

Data collection on baitfishes, issues and prospects

Fish landing data is collected by the Department of Fisheries through enumerators following census method of enumeration at present. Livebait caught are utilised while fishing and the unused baits are released back to sea (often inside the lagoon); and hence the catches of livebait are not reflected in the data collection by the Department. Targeted livebait studies whenever carried out relied on enquiry coupled with personal observation by the scientists (Nasser *et al.*, 2002 and Pillai *et al.*, 2002). Increasing number of units and size of the fishing crafts warrant developing a better data collection framework encompassing more attributes including livebait catches and use. Disciplined self-reporting may be instilled with rightful use of technological advancements for convenience and instantaneous access in integration with trained observers.

Baitfish use efficiency, awareness and conservation

Baitfish use pattern is erratic in most of the islands except in Minicoy, where the bait is used very conservatively. Catch per unit bait (CPUB) for Minicoy was reported as 53.1-95.6kg during 1981-85 (Pillai *et al.*, 1986) and 53-278kg during 1985-94 (Nasser *et al.*, 2002) and that for Agatti as 19-27kg during 1994-97 (Nasser *et al.*, 2002). The catch rate of Minicoy is much higher compared to 7.5 to 30.4kg reported from Maldives (Maniku *et al.*, 1990). IPNLF (2012) comparing the livebait use efficiency in pole and line fishing regions globally reported higher efficiency of pole and line fisheries of Lakshadweep which in turn enhanced the livebait use efficiency of Western Indian Ocean region considerably compared to other regions (Table 3). Higher efficiency of pole and line fishing in Minicoy is due to their conservative use of baits as they depend only on Minicoy atoll for bait unlike Agatti which has alternate atolls in the vicinity for livebait collection like Perumal Par, Bangaram, Pitti etc. Excess livebaits are often held in small floating cages (Fig. 8 & 9; Box-2) for subsequent day's use. However, loss occurs due to mortality while fishing and handling. An initial mortality of 30-80% is reported by Gopakumar and Mathew (1986) based on the method of fishing.

There is ample scope for improving the livebait efficiency, especially in Agatti and other northern islands. Large scale campaigning for conservative use of livebait fishes with practical demonstration of efficient methods is needed. Use of better materials for livebait

Table 3. Skipjack tuna catches per unit bait from various pole and line fisheries (IPNLF, 2012)

Country	Catch Per Unit Bait in Kg	Source
	(range in bracket)	
Maldives	8.6 (7.4-10.0)	Anderson (2009); Adam (2006)
Solomons	12.1 (9.9-15.0)	Nichols & Rawlinson (1990)
Hawaii	23.1	Sakagawa <i>et al.</i> (1987)
Kiribati	14.8 (7.1-21.3)	Rawlinson <i>et al.</i> (1992)
Japan	15.9	Sakagawa <i>et al.</i> (1987)
Papua New Guinea	22.4	Argue & Kearney (1982)



Figure 8. Structure of livebait holding cage in the present days



Figure 9. View of bait cage in the lagoon

Box-1

Customary baitfishery management in minicoy

Minicoy being a far flung atoll traditionally practiced conservative use of baitfishes by alternating different species in seasons of availability while the remaining islands were bestowed with smaller atolls, reef areas or sand banks in the neighborhood to depend on. Fishermen of Minicoy traditionally used different baits available in the lagoons as well as at outer reef areas. Ownership of individual boulders by boats, seasonal fishing closure, prevention of holding of excess bait, restriction on use of certain species, restriction on use of certain fishing gears etc (Sivadas and Wesley, 2006 & Hoon, 2003) are a few measures adapted for self-management of bait.

Area allocation: Tuna fishing boats are allowed to select a livebait fishing ground exclusively for their own baitfish collection. The area allocation is made every year by group discussion with all the boat owners and to give an equal access to all the livebait fishing grounds to all boat owners. Each boat marks the chosen area with wooden poles and other floating material to identify their spot.

Seasonal fishing closure: Since the Bodhi (Apogonids) baitfish is associated with coral boulders inside the lagoon, the fishermen realise that the spawning grounds for this fish is within the lagoon and do not capture throughout the tuna season. Hence there is closed period for Bodhi collection from May 15 - November 15, even if tuna fishing season begins during bodhi ban period.

Restriction on boulder Collection: Earlier people used to collect the branching coral locally called Muraka from lagoon for local construction. Later they realised that removal of boulders is adversely affecting the baitfish collection for resident baitfishes. Hence the head of village called a meeting and took decision to stop collection of boulder coral.

Restriction on use of certain fishing gears: The people from Minicoy and other islands are prohibited to use any type of fishing net in open sea near to reef. This is due to the belief that using net in such area drive away small fishes, and consequently make tuna flee from coastal waters, resulting in failure of tuna fishery.

fishing net and scoop nets, improvements in livebait fishing and handling, better methods of holding the excess catch etc., will improve the survival of the baits. Protection of habitat is very vital for the existence of the livebaits as their abundance is influenced

Box-2

Floating cage for baitfish holding

Rectangle cage of 1.5*0.75*0.5 m (length*width*height) dimension made up of PVC pipe. The cage is covered with net of 5 to 6 mm mesh size (baitfish net); buoys are provided along the upper side and anchor is either shared with boat or cage is tied to rope from the boat (Fig. 8). The cage is normally used whenever there is a scarcity of bait in the atoll. Unused baits in the livebait tank after the day's fishing are then stored in the bait cage for subsequent use. A single cage can hold 4-5 kg of baitfishes.

by oceanographic changes, modifications of the reef ecosystem, habitat damages due to natural and anthropogenic interventions etc.

Status of the livebait habitat, protection and restoration

Livebait fishes reside the lagoons and near reef areas of atolls including the reef slopes. The common livebait of Lakshadweep *S. delicatulus* inhabit shallow sandy areas and reef flats inside the lagoon while closely related species *S. gracilis* occupies deeper part of the lagoon or outer reef areas. Most of the other species live very close to the corals at relatively deeper areas. Though reduced these days, dredging inside the lagoons for navigation purpose is one of the main causes of habitat destruction besides piling for construction of jetties inside the lagoons. Such developments alter the circulation and sediment transport inside the lagoon beside physical damage to the reefs. Fishing inside the lagoons is another major concern as few of them like the seine netting, bottom set gillnetting, spear fishing for octopus etc., interact with corals. Fishing for baits that live in close association with the corals like the cardinal fishes, fusiliers, damsels etc at times cause damage to the corals. However, destruction of corals is prohibited under the Wildlife (protection) Act, 1972 and CRZ notification, 2011.



Livebait Fisheries Management Plan

The livebait fisheries management plan- Lakshadweep (hereinafter referred to as the Plan) strives to bring in an order in the fisheries for sustaining the tuna fisheries, the mainstay of Lakshadweep's economy. As the fishing method and the baits used in the recently emerged live chumming based handline for yellowfin tuna is more or less identical to that of the skipjack pole and line tuna fishing, the plan holds good to address the issues in this fishery too. The Plan

will form the basis to deal with the changes in the fisheries including the negative changes expected with the urge for development as well as those rooted to natural causes including climate change and other contingencies. Nascent state of fisheries provides opportunity for intended development of the sector guided with tested management plans. Nevertheless, like many other tradition bound subsistence fisheries, the fishery has been in existence for years with little regulations due to which drastic changes to their practices or controls of any kind will not be desired by the fishermen.

There are only a few models to guide preparation of a fisheries management plan for livebait fisheries of Lakshadweep. The fishery though has similarity with that of Maldives in respect of species composition, harvest and handling methods, it is characteristically distinct in scale. The document on livebait sustainability by IPNLF (2012), the global study on the management of tuna livebait fisheries (Gillet R., 2012) and the Maldives livebait fisheries management plan by the Marine Research Center (MRC) Maldives (Gillet *et al.*, 2013) form the major guiding documents for the preparation of this Plan. The Plan focuses mainly on long-term monitoring of the livebait fisheries and documentation of missing information. Responsible fishing and handling practices together with species diversification and habitat protection would yield the desired results. Awareness of the fishermen as well as the public on the need for responsible livebait fisheries and habitat protection through targeted campaigns are focused. The Plan outlines interventions broadly comprising of monitoring, development and awareness and legal interventions.

Vision

A sustainable livebait fishery that supports pole and line tuna fisheries ensuring ecosystem health.

Background

Pole and Line fisheries of Lakshadweep have potential for being scaled up staying rooted to its traditional values of conservation and gain economic benefits thereon. Livebait fisheries, an inevitable subsidiary fishery of pole and line-skipjack tuna fishing is known to

have interactions with the sensitive atoll ecosystem. Management Plans help to mitigate the interactions and ensure continued productivity of the fisheries. Management plans are needed to meet several national and international conventions and protocols. The National Policy for Marine Fisheries-2017 of Govt. of India desires that all the fisheries in the country are managed for long-term sustenance following a science based species or area management Plans. The Sustainable Fisheries Development Plan (SFDP, 2025), part of the Integrated Island Management Plan (IIMP) necessitated that the livebait fisheries of Lakshadweep be managed enshrining the principles of co-management and ecosystem approach to fisheries management not just for the sustenance of pole and line fisheries but also considering other ecosystem services it is rendering. Livebait fisheries management Plan is one of the important objective and deliverables of the in-house Project of CMFRI –Resource assessment and management framework for sustainable marine fisheries of Lakshadweep.

Purpose of the plan

The purpose of the Plan is to rationalise the livebait fisheries of Lakshadweep based on the best available scientific information together with the community by identifying the fishery, assessing the present state of exploitation and specifying the management, conservation and technical measures. The Plan gives clear statement on the objectives and direction for managing the expanding livebait fisheries of Lakshadweep; setting achievable and measurable goals that will direct strategic interventions towards the overall objectives. The Plan intends to provide transparent rules for monitoring and regulating the livebait fishing, livebait handling and usage. It prescribes administrative framework for ensuring implementation of the Plan together with mechanisms that allows it to be updated as conditions change. The Plan is designed to be nested in the larger Fisheries Management Plan for tuna fisheries that may come up in future.

Scope of the plan

Scope of the plan covers a wider area of livebait fisheries of Lakshadweep as below.

Fishes	All the fishes presently used or liable to be used in future for skipjack tuna pole and line fisheries and yellowfin handline fisheries in Lakshadweep
Fishing Activity	All kinds of fishing activities, smaller or larger scale, inside or outside the lagoons that target the livebaits for pole and line and handline fishing or any kind of fishing targeting at any scale.
Fishing Method	All methods used for catching the livebait fishes from the lagoons or open sea with or without the fishing crafts or fishing gears.
Area	All islands of Lakshadweep including the inhabited and uninhabited islands, submerged sand banks, sea mounts and reef areas in the territorial waters of Lakshadweep.

Objectives and the overarching principles

Objectives #1 Ensure sound data on livebait fisheries

- Quality data is an important pre-requisite for developing sound fisheries management plan; a model data reporting sheet given in Annexure III
- Information on livebait fisheries is not incorporated in the present data collection scheme
- The collection of basic/simple information that is relatively easy to analyse should be favoured over more comprehensive schemes.
- Self-reporting habit need to be inculcated in the fishers and automated data reporting system would encourage better compliance.

Objective #2: Protection of livebait resources and minimising wastage

- The extant livebait fishing methods are appropriate for the scale of operation and new interventions in the plan shouldn't greatly disrupt these fishing practices
- The new management scheme should not contribute to the downfall of the tuna fisheries of the islands
- Appropriate monitoring mechanism need to be put in place.
- It is better to have few pragmatic control measures that are better understood by the stakeholders and that can be enforced with the available infrastructure and institutional arrangements.
- Management interventions when designed and enforced carefully will enhance the sustainability of the resources.
- If livebait wastage can be reduced, then the livebait requirements of the pole-and-line fleet are decreased, which will tend to mitigate to some degree livebait over-exploitation.
- Gentle livebait handling, efficient use of livebait during chumming operation and improved design of livebait tanks onboard etc. will improve the livebait use efficiency.
- The livebait fishes are also caught occasionally for domestic consumption though at very smaller scale, especially during monsoon months when the offshore fishing is affected due to squally weather or monsoon.
- Targeted fishing of spawning aggregations are observed for Sprats which needs to be regulated

Objective #3: Raising the awareness of livebait fishers of management

- Fishers need to be regarded as partners in protection of the fishery resources in order to enhance acceptance of the control measures.

- There is need for awareness of public on the necessity for protection of livebait habitat and reduction of wastage. Schools are better places to disseminate such messages and hence there is need for making awareness materials targeting students.
- Awareness generation on management and conservation should be integrated in to the regular work programme of the Department of Fisheries.

Objective #4 Reduction of negative impacts on the ecosystem and physical environment

- The ecological significance of livebait fishes in the atoll system is much beyond sustaining the pole and line fishing method.
- Some of the livebait fishing practices hamper corals while driving the fishes out of the coral crevices.
- Coral destruction and other physical disturbance of the reef should be discouraged.
- Livebait fishing should have very minimum impact on the ecosystem and the environment. Fishing activities that have impact need to be regulated.
- Efforts should be made to reduce bycatch in the livebait fishery including juveniles of reef fishes.
- Though livebait fishing in Lakshadweep is not reported to be interacting with the endangered, threatened and protected species, objective information may be gathered for addressing the issue.

Objective #5 Enhancement of stock and habitat

- Lagoon is the major habitat for the livebait fishes and the lagoons are reported to be threatened with many changes.
- There is gradual habitat degradation in the lagoons due to natural causes as well as anthropogenic interactions.
- Awareness on habitat protection and enforcement of existing

regulatory mechanisms can mitigate the problems greatly.

- Restoration of habitat like the coral reefs and sea grass beds by artificial propagation may be required for critically damaged habitats.
- Stocks of threatened species of livebait fishes in the ecosystem may be enhanced through artificial propagation.
- Alternatively, livebaits from farmed sources could be attempted to relieve pressure on the natural livebaits.

Goals and action points/interventions

The management actions/interventions are listed below under different goals. They can be categorised as Legal interventions (L), monitoring (M), developmental (D) and awareness (A) related interventions. Time frames for each of the interventions are suggested. Measures programmed for action on adoption of the plan will be prioritised and scheduled according to operational needs and resource availability.

Objective#1. Ensure sound data on livebait fisheries

Goals	No	Action Points	Responsible Entity	Category	Time frame
Put in place appropriate data collection and reporting system	1	Develop suitable data collection system and piloting	CMFRI/DoF	M	On adoption of Plan
	2	Designing log sheet for reporting	CMFRI/DoF	M	On adoption of Plan
	3	Efforts towards electronic and online reporting	DoF/CMFRI	M	Following AP#2
	4	Training of the data collectors and the management	CMFRI/DoF	D	Initially after AP#2. Thereafter once annually
Monitor the data collection and management of the data	5 a	Regular Collection of catch and effort Data	DoF/CMFRI	M	As per Schedule following AP#3
	5 b	Regular Collection of biological Data	CMFRI/DoF	M	On adoption of the Plan
Periodic Evaluation of the stock	6	Put in place observes for reporting livebait use pattern	DoF	D	On adoption of the Plan
	7	Review and compile data	DoF/CMFRI	M	Monthly/Annually
Periodic Evaluation of the stock	8	Analyse and disseminate the catch, effort, utilisation, discard data at atoll level	DoF/CMFRI	M	Annually
	9	Review of catches, fishing pressure and associated risks	CMFRI/DoF	M	Every three years

Objective#2. Protection of livebait resources

Goals	No.	Action Points	Responsible Entity	Category	Time frame
Improve the livebait use efficiency	10	Collect information to estimate the CPUB and monitor the pattern annually	CMFRI	M	Data collection as per schedule
	11	Incorporate information on efficient use of livebait fishes in the awareness/training modules under Objective#3	CMFRI/DoF	A	See AP#23, 25, 27, 28, 29&30
Reduction of livebait wastage	12	Reward programmes for motivating efficient livebait use as well as reporting	DoF	D	Annually
	13	Estimate the wastage in the livebait fisheries	CMFRI	M	Quick Survey on adoption of the Plan
	14	Incorporate contents explaining the need for reducing wastage and ways that it can be achieved in the Handbook/other awareness materials under Objective #3	CMFRI/DoF	A	See AP#23, 25, 27, 28, 29&30
	15	Investigate the measures to reduce other pressures on the livebait resources	DoF/CMFRI	M	On adoption of the Plan

Minimise livebait mortality while fishing and handling	16	Collect information on efficient livebait handling techniques	CMFRI	M	Immediately
	17	Incorporate contents on better livebait handling techniques in the training manual/awareness materials under Objective #3	CMFRI/DoF	A	See AP#23, 25, 27, 28, 29&30
	18	Identify the critical points for livebait mortality and advice suitable measures for mitigation	CMFRI	M	Detailed study immediately on adoption of the Plan
Conserve spawning populations	19	Incorporate information on better materials for fishing net and handling equipment's in the handbook/training manuals/awareness materials under Objective #3	CMFRI/DoF	A	Following AP# 18
	20	Identify the location and time of spawning for important livebait species	CMFRI	D	Through a study following adoption of the Plan
	21	Demarcate spawning grounds for protection	CMFRI	D	Following AP#20
	22	Prohibit fishing for the spawners and use of spawners for livebait by appropriate spatial and temporal closures	DoF	L	Following AP#21

Objective#3. Raising the awareness of livebait fishers of management

Goals	No.	Action Points	Responsible Entity	Category	Time frame
Capacity Building of Fisheries managers and the fishers for fisheries management	23	Develop a Training Module on fisheries management targeting managers	CMFRI/DoF	A	Immediately
	24	Delivery of course to the management at various levels	CMFRI/DoF	A	Following AP#23
	25	Develop a Training Module for fishermen on Good livebait fishing /handling practices	CMFRI/DoF	A	On adoption of the Plan
Preparation of Training / awareness materials	26	Periodic Programmes for Training the Fishers	CMFRI/DoF	A	Following AP#25
	27	Refinement of the Training Modules	CMFRI/DoF	A	Following APN26
	28	Prepare a Handbook in vernacular languages on aspects of livebait fisheries for use by fishers, public and management	DoF/CMFRI	A	On adoption of the Plan/ Completion of the survey at AP#13&18
Preparation of Training / awareness materials	29	Prepare brochures/Handouts/Palmlets/posters on various aspects of livebait fisheries for awareness	DoF/CMFRI	A	On adoption of the Plan/ Completion of the survey at AP#13&18
	30	Develop a Handout on best practices in tuna livebait fisheries	CMFRI/DoF	A	On adoption of the Plan/ Completion of the survey at AP#13&18

Awareness of public on the Need for conservation of livebait fishes	31	Regular interactions with the public on importance of livebait fisheries and livebait conservation	DoF/CMFRI	A	As per Schedule to be made after AP#28, 29 &30
conservation of livebait fishes	32	Awareness on conservation of livebait fisheries programmes in the Schools for the children	DoF/CMFRI	A	As per Schedule to be made after AP#28, 29 &30

Objective#4. Reduction of negative impacts on the ecosystem and physical environment

Goals	No.	Action Points	Responsible Entity	Category	Time frame
Minimise interaction with corals	33	Estimate the type and level of interaction of livebait fisheries with corals	CMFRI	M	Commence detailed study Immediately
	34	Ban any livebait fishing-related activities that are shown to disrupt coral reefs.	DoF	L	Following AP#33

Minimise interaction with other fishes including ETP species	35	Collection of information on bycatch in the livebait fishery by onboard observers.	CMFRI	M	Commence detailed study Immediately
	36	Estimate the type and level of interaction with other species of fishes and other organisms including ETP species	CMFRI	M	Commence detailed study Immediately
	37	Incorporate information on why livebait fishers should not disturb coral and avoid bycatch of ETP or take significant amounts of bycatch into the awareness booklet under Objective #3	CMFRI/DoF	A	Following AP#35&36
Diversification of livebait use	38	Document the species diversity in livebait fishery in different islands	CMFRI	M	Commence detailed study Immediately
	39	Collect information on the species diversity in livebait fishery of other nations	CMFRI	M	Immediately
	40	Incorporate information on use of multiple livebaits in the manuals/training modules under Objective#3 for motivating the fishermen of northern islands to diversify the livebait use.	DoF/CMFRI	A	See AP#23, 25, 27, 28, 29&30

Objective#5. Enhancement of stock and habitat

Goals	No.	Action Points	Responsible Entity	Category	Time frame
Monitor the livebait habitat	41	Continuous monitoring of the livebait habitat for physical, chemical and biological changes	DoF/CMFRI	M	On adoption of the Plan-Periodically
Rebuilding the critically damaged habitats	42	Rebuild the critically damaged coral ecosystem	DoF/CMFRI	D	On adoption of the Plan
Enhance the stock of critical species	43	Rebuild the critically damaged seagrass ecosystem	DoF/CMFRI	D	On adoption of the Plan
	44	Breeding of important livebait species for stock enhancement	DoF/CMFRI	D	On adoption of the Plan
	45	Undertake stock enhancement programmes for important livebait resource	DoF/CMFRI	D	Following AP#44
	46	Assess the impact of stock enhancement programmes	CMFRI/DoF	D	Following AP#45
Trials of alternative livebaits (farmed)	47	Experiment alternative livebaits from farmed sources (Eg. Milkfish)	DoF/CMFRI	D	On adoption of the Plan

Administrative framework for livebait fisheries management

The livebait fisheries management Plan is expected to be nested in the larger Tuna Fisheries Management Plan that would come up in near future. The Department of Fisheries is the responsible entity for the management of the fisheries in general. Hence, the administrative Department for formulation and enforcement of Fisheries Management Plan is the department of Fisheries at U.T. level and the Field Units of the Department at Atoll level. The Director of Fisheries being the Adjudicating Officer of the Lakshadweep Marine Fisheries Regulation Act, 2000 (LMFRA) is bestowed with legal authority to maintain and enforce the provisions of the Act. There are nine authorised officers one each in every inhabited island (except Bitra) for atoll level enforcement (Bitra comes under the purview of the Authorised Officer, Chetlat Island). Being a Union Territory without legislation, the Administrator of U.T of Lakshadweep is bestowed with powers to make or amend Rules under the Act.

Fisheries management council (FMC)

Though a three tier FMC (Village, District and State) is suggested in general for all the states, two-tier advisory council *i.e.* atoll level FMC (AFMC) in all the inhabited islands (Ten) and a UT level FMC is suggested for Lakshadweep as the UT is a single-district territory. Annexure-IV & V suggests composition of the FMC. The U.T. level FMC will have representation from all the ten atoll level FMCs. The FMC will be responsible for implementing all aspects of the marine fisheries development and management. Functions of the FMC may comprise of recommendations on management and development matters for all fisheries and mariculture including setting and allocations of management limits and management of licensed fishing vessels. The terms of reference for the FMC may be made encompassing these aspects. The Director of Fisheries with advisory support of FMC will be responsible for implementing the Plan once approved by the Administrator. The Council will meet as often as necessary or expedient for the transaction of its business and dealing of specific issues. Constitution of FMC is a precursor for the Plan.

Managing the plan

Adoption

The Plan on submission may be reviewed by the FMC based on which the same may be recommended by the Director of Fisheries for adoption by the Administrator in file prior to notifying it in the official gazette.

Evaluation and review of the plan

The FMC is responsible for reviewing the Plan on annual basis. The annual evaluation process may result in the decision to amend the schedules to the Plan itself. There can also be a mid-term review of the Plan.

As part of the Annual review meeting, FMC will ensure that the Plan is effective in moving towards the stated objectives and the goals; and consistent with the principles. A report comprising of review of the Plan's performance will be prepared annually by the Director of Fisheries under the supervision of the FMC and submitted to the Administrator.

Amendment

The provisions of the Plan can be amended as deemed necessary following the steps as below

1. Recommendation of the Director of Fisheries and approval by the FMC
2. Signature by the Administrator
3. Notification of the amendment in gazette

Major amendments to the Plan may be made after thorough review by competent person/committee.

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Annexure 1

Atoll wise commonly available species of livebait fishes (Blue colour in the table indicates availability) (Adopted from Kumaran et al., 1989)

Species

Species	Agatti	Amini	Androth	Perumal Par	Bangaram	Bitra	Chetlat	Kadmat	Kalpeni	Kavaratti	Kiltan	Minicoy	Suheli Par
<i>Spratelloides delicatulus</i>	Blue												
<i>S. japonicus</i>	Blue												
<i>Stenatherina lemmincki</i>		Blue				Blue							
<i>Allanetta barnesi</i>		Blue				Blue					Blue		
<i>Pranesus pinguis</i>		Blue					Blue	Blue		Blue			
<i>Rhabdamia cypsefurus</i>	Blue								Blue				

Annexure II

Anchored Fish Aggregating Devices (aFAD) in position in the Lakshadweep waters as on 31st January, 2019

Sl.No.	Name of the Island	Date of deployment	Position	Distance from the island	Depth of Deployment	Remarks
1.	Kadmath	16.01.2018	Lat:-11°22'000"N Log:-072°45'100"E	8 Nm	1860 mtr	Active
2.	Androth I	07.03.2018	Lat:-10°45'745"N Log:-073°46'695"E	6 Nm	2022 mtr	Active
3.	Androth II	06.03.2018	Lat:-10°57'560"N Log:-073°40'496"E	8.5 Nm	1800 mtr	Active
4.	Kalpeni	07.05.2018	Lat:-10°07'480"N Log:-073°45'000"E	6.5 Nm	2100 mtr	Active

Sl.No.	Name of the Island	Date of deployment	Position	Distance from the island	Depth of Deployment	Remarks
5.	Chethlath	14.11.2018	Lat:-11°43'622"N Log:-072°39'80"E	5.5 Nm	1880 mtr	Active
6.	Kavaratti	10.01.2019	Lat:-10°36'370"N Log:-072°30'300"E	8 Nm	1850 mtr	Active
7.	Agatti I	20.01.2019	Lat:-10°53'200"N Log:-072°04'570"E	7.5 Nm	1850 mtr	Active
8.	Agatti II	29.01.2019	Lat:-11°02'860"N Log:-072°10'350"E	10 Nm	1900 mtr	Active
9.	Kalpeni	29.01.2019	Lat:-10°03'240"N Log:-073°28'440"E	10.30 Nm	2200 mtr	Active

Annexure III

Data sheet for reporting baitfish and tuna catch information

Name of the Boat												
Base of Operation												
BAIT COLLECTION				Date		Start Time			Finish Time			
FEN	Latitude	Longitude	Location	Land Mark	Hondeli	Rehi	Mukuran/ Baichala	Nilamahi/ Pacha chala	Bodhi	Karatti	OTHERS	Non-Bait sp
1												
2												
3												
Total quantity of the bait collected												
Quantity of Bait remaining at the end of the day												
Fate of the balance bait (released back (R)/ Consumed (C)/sold (S))												

Interaction with ETP species Sighted (S), Caught in gear (released live (L), released dead (D), kept for sales/consumption (C)				Turtle		Dolphin	Birds	Whale shark					
				Date		Start Time	End Time						
FEN	Latitude	Longitude	Location	Land Mark	FAD/ Flotsam FS	PL/ HL	SKJ	YFT	KWA	FRI/ BLT	DOL	RRU	OTH
1													
2													
3													
Total Quantity caught													
Quantity of bycatch caught													

FEN: Fishing Event Number, FAD: Fish Aggregating Device, FS: Free school, PL: Pole and Line, HL: Handline, SKJ:Skijack, YFT:Yellowfin tuna, KWA: Kawakawa, FRI: Frigate tuna, BLT: Big eye tuna, DOL: Mahimahi, RRU: Rainbow Runner, OTH: Others (BET: Big Eye Tuna, SFA: Sail fish, BLM:Black Marlin, BUM: Blue Marlin, SWO: Sword Fish)

Annexure IV

Lakshadweep Fisheries Management Council

The function of the Council is to provide recommendations to the Administrator through the Secretary (Fisheries) on policy matters relating to fisheries management

The Council will consist of the following members

1. Two persons nominated by the fishermen associations
2. 10 members representing the public (one each from the members of the Village (Dweep) Panchayat of every inhabited island)
3. Director of Fisheries, U.T. of Lakshadweep
4. Deputy Director of Fisheries, U.T. of Lakshadweep
5. District Fisheries Officer, U.T. of Lakshadweep
6. Chief Conservator of Forests, U.T. of Lakshadweep
7. A representative of the Director, ICAR-CMFRI, Kochi

Secretary (Fisheries), U.T. of Lakshadweep will be a special invitee in the Council meetings. The Director of Fisheries will be the chairperson of the Council. In the absence of the Director, the person acting as the Director shall chair the Council. Experts on the subject can be invited to attend the Council meeting whenever required.

The Council may establish sub-committees for specific purposes

The Council will meet as often as may be necessary or expedient for the transactions of its business.

Annexure V

Atoll Fisheries Management Council

One Atoll Fisheries Management Council (AFMC) will be established in every inhabited island and will have jurisdiction of the atoll and the satellite islands/islets in its lagoon. The function of the Atoll Fisheries Management Council is to provide recommendations to the Director of Fisheries on policy matters pertaining to fisheries in the atoll relating to fisheries management.

The Council may consist of the following members

1. One person each representing the fishermen associations (country crafts, motorised country crafts and motorised boats)
2. Nominee of the Fishermen Cooperative societies in the island
3. President of the Village (Dweep) Panchayat
4. Vice-President, Village (Dweep) Panchayat
5. Fisheries Unit in Charge

The President of the Village (Dweep) Panchayat will be the chairperson of the Council. In the absence of the President, Vice-president, Village Panchayat shall chair the Council. The Unit-in-Charge of the Fisheries Unit, functioning under the concerned village (Dweep) Panchayat will act as the Member-Secretary.

The AFMC in respect of Suheli and Bengaram atolls may be considered in consultation with the major users of this fishing base i.e. Kavaratti and Agatti fishermen. Similarly, the jurisdiction of the important reef areas/sand banks viz. the Cheriyaniam, Baliyaniam, Pakshippitty and Perumul Par etc may be considered in consultation with stakeholders.

Lakshadweep Livebait Fisheries Management Plan

Lakshadweep islands are one among few places in the world where Pole & Line, an ecologically sound tuna fishing technique is in vogue. Livebait fishing, an inevitable subsidiary fisheries for pole & line fishing however has minor interactions with the ecosystem as the livebait species occupy lagoon and near reef areas, a habitat shared by corals and associated fauna. The Management Plan for the livebait fisheries will help to reduce the adverse impacts of livebait fisheries to the ecosystem through management actions directed at creating awareness to the fishers and public, regulation of use of certain gears, spatial and temporal fishing regulations etc. The Plan lists actionable points with the responsible entity and time frame to achieve the set goals under each overarching objective. It also provides administrative, legal and institutional requirements for the successful rolling out of the Plan. The Plan has been reviewed through focus meetings at the institute and consultations with the fishers, public and the Administration.



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