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Where Tradition is a way of life

TRADITIONAL KNOWLEDGE IN THE U.T OF LAKSHADWEEP , INDIA

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Abstract :

An attempt is being made to compile and collate the traditional knowledge base existing within the community in the 10 inhabited islands of the coral archipelago in South west India- the Union Territory (UT) of Lakshadweep. The traditional knowledge base of the islands centre around the physical parameters that sustain marine ecosystem dependant livelihood and sustenance strategies of the islanders. The perceptions of various stakeholders on the value and relevance of traditional knowledge besides the insight into precursors to what might in later years become traditional knowledge is discussed. The need to integrate this in planning, management and conservation of vital resources is felt and necessary too.

Introduction

The coral archipelago of the Union Territory of Lakshadweep located off the south west coast of Kerala (India) has through years of insulation and isolation evolved subtle but substantial links with the marine ecosystems and habitats that the Arabian Sea offers. This gets manifested in the myriad ways in which the community living in the 10 inhabited islands interact and utilise the resources found in the lagoon, reef and open ocean. The extremely scarce land area (32sq.km) makes the seascape the larger dominating presence in the lives of the 69,000 strong population.

The paper attempts to document and place in context the observations, means and methods, the culture and life style that the islanders have created with the living world around them. It has also made an effort to compile and collate primary and secondary data from various islands and islanders. The most significant element in the paper is the broad and vast body of information that has been revealed over the years of interaction that the researcher has had with the island community. With due acknowledgment to R.E.Johannes and Barbara Neis (1) who defined “anecdotal gathering from fishers is one approach to broadening the information available to science; another is to treat fishers knowledge, fishers’ knowledge, fisheries natural science and fisheries social science as different knowledge systems that have interacted over time and space to influence the history of fish and fisheries”, the anecdotes and narratives of fishers and women engaged in fishing and gleaning in the reef and lagoon figure in this study too.

The need to “do everything possible to improve our marine environmental information base and share our expanded knowledge with those interacting with marine ecosystems to increase our collective capacity for stewardship and enhancement” (1) is also one of the justifications for this study. This process found meaning and relevance during the community meetings that were held prior to the preparation of a management plan for setting up of a community reserve in Agatti island (2).

“Fishers knowledge may often be the only source of information on the history of changes in local ecosystems and on their contemporary state that is of sufficient fine scale to help us design ways to protect stock remnants and critical habitats”. This is exactly the link that many socio-economic assessments that have remained as disparate reports. But amidst the din of data there is a “shadow” of valuable information that can go a long way to help in understanding marine resources and their valuation in terms of frequency, availability and conservation for the future.

The above said three distinct areas have been explored during the course of this study.

The Study

The study on Traditional knowledge of the Lakshadweep island community with respect to fishery resources undertaken by ICSF has the view to examine its role in strengthening fishery conservation and management measures, and climate change adaptation and mitigation measures.

ICSF has the objective of documenting traditional knowledge specific to men and women in relation to oceanographic, meteorological, biological, ecological and navigational aspects of fisheries of the Lakshadweep island community. In this context, the study will document the temporal and spatial dimensions of

- a. Traditional knowledge and perceptions in relation to rainfall, salinity, sea level, oceanic current and species distribution.
- b. Traditional knowledge in relation to pole and line fishing, bait fishing, and other fishing practises in the reef and lagoon.
- c. Traditional knowledge in relation to processing of fish and other marine species for human consumption
- d. Traditional knowledge in regard to conservation and management of tuna, bait and other fishery resources and the coastal, lagoon and marine ecosystem.
- e. Traditional institutions and measures that rely on traditional and ecological knowledge of island communities and management of fisheries resources including allocation.

Methodology

The study was based on a multi-pronged approach in the collection of necessary information and data relevant to the above objectives. In a sense, the study had a pioneering status with no precedence in the references available on the traditional knowledge of Lakshadweep archipelago. An exhaustive literature survey was done from which only a very few documents gave information on the topics to be focussed.

Apart from this, the primary source of information was the island community. There were informal one to one semi-structured interviews with a wide selection of fishers and community elders in many islands. Of this the most significant information was obtained from the islands of Kavaratti, Agatti, Kalpeni, Minicoy and Chetlat. The information from women reef gleaners were collected through formal focus group discussions or through direct informal trips to the reef and lagoon with them. In the case of nomenclature especially fish names, the information was collected through showing reference volumes on reef fishes and also charts and images. This was also found useful in getting the names of birds and plants.

Definition of Traditional Knowledge

The two senses in which the term “ traditional knowledge” is used by the World Intellectual Property Organisation Secretariat is relevant when attempting to understand the actual depth and scope of this entire school of thought.

The first would be to look at traditional knowledge as not limited to any specific technical field and may include agricultural, environmental and medicinal knowledge and that associated with genetic resources.

The second approach would follow a working concept in which the various categories of Traditional knowledge like agricultural, scientific, technical, ecological, medicinal, biodiversity, traditional cultural expressions, elements of language like names, geographical indications and symbols and movable cultural properties.

The Traditional knowledge systems in the archipelago of Lakshadweep gets best understood in the context of the socio-cultural, geographical and ecological milieu in which the island and its human community has been living. The following section gives an overview of this ambience briefly.

Study Area: Lakshadweep

Geographical profile

Lakshadweep is an archipelago consisting of 12 atolls, 3 reefs and five submerged banks. Located 220-440 kms from the coastal city of Kochi in Kerala, the Lakshadweep is a uni-district Union Territory with 10 inhabited islands and a land area of 32 sq.km. The inhabited islands are Kavaratti, Kalpeni, Kadamat, Kiltan, Agatti, Androth, Amini, Bitra, Chetlat and Minicoy. Androth with a land area of is the largest and Bitra (0.10 sq.km) is the smallest. Kavaratti is the capital island.

The islands are ring shaped atolls lying along a north- south axis except Androth. Each island has a lagoon on the western side and open sea on the east. The total area of the lagoon is 4200 sq.km and the reef area 816.1 sq.km. The territorial waters of the archipelago extends 20,000 sq.kms while the exclusive economic zone covers 4 lakh sq.kms.

Socio-economic profile

The indigenous population of Lakshadweep is Muslim belonging to the Shafi school of the Sunni sect. The entire population is classified as Scheduled Tribe (ST) and provided all the benefits of the same. There are certain social divisions in the islands which are based on livelihood and customs. Three classes exist in all the islands referred to by distinct names. The Koyas are the traditional feudal land owners, the Malmis are the navigators and fishers and the Melacheris are the coconut tree climbers and work force on land. In Minicoy, they are known as Manikfans, Takrus and Raveris respectively. The Amindivi islands maintain a special classification like Taravad, Tanakampranar, Kudiotis and Melacheris. There are many claims about the descent and history of the islanders. But it is generally following a pattern of one involving decorum, two economic relationships and three social behaviour.

The matrilineal set up in the islands implicate that family centers around the woman. The children grow up in the woman's house. The concept of property or Taravad is governed by the eldest male member or Karanavar and cannot be sold out. The joint family system has broken up with many educated members taking up employment and residence in other islands and on the mainland.

Demography and Education

The population of the islands is 64,429 (2011 census). There

has been a 6.23% increase in growth rate in population. The literacy rate is 92.28% . The education is imparted upto higher secondary level after which there is facility to study in colleges in the mainland. The specialised dialect called Jessri is spoken in all the islands which has now been converted to Malayalam due to the educational status. In Minicoy alone, the people speak Mahl which is written in the Maldivian Dwehi script.

Livelihood options in the islands



The mainstay of economy in Lakshadweep is from fishing that too Tuna fisheries. Other deep fishes like sharks, sail fish, marlins and seer fish also figure in the fishing catch. It has been estimated that 5000 people are directly involved in fishing and 3000 indirectly benefit from connected processes. There are 918 country crafts and 510 mechanised boats in the island that explore the oceans for fishes. The fisheries potential of the island waters has been estimated to be 1 lakh tons. The Fisheries department has been attempting to increase the landing – from 8072 tons in 1997, the tuna catch has increased to 12,200 tons in 2001.

Coconut cultivation and harvesting are land based livelihoods available on the islands. There are about 66,0150 trees in all the islands. The Lakshadweep micro variety of coconut is popular. The island harvests 280 lakh coconuts per year. (National Biodiversity Strategy and Action Plan report, 2002) The coconut yields copra, coir, meera (sweet toddy) and jaggery all of which provide employment to the people. There are 7 coir fibre factories, six coir production units and 3 fibre curling units employing more than 300 people in many islands. The

hosiery factory in Kalpeni island is an innovative venture. Tourism is another area where Lakshadweep is exploring its potential. The Society for Promotion of Recreational Tourism and Sports (SPORTS) has been making attempts to introduce innovative programs based on the concept of low volume high value packages.

Employment

The U.T of Lakshadweep which is the smallest Union Territory in India is a unidistrict one headed by the Administrator. The density of population is 1899 persons per square kilometre which is third highest in India. The rate of unemployment is high -19% with limited opportunities to register in the Employment Exchange and unwillingness to emigrate in search of jobs. It has been estimated that the number of people employed in Government sector come to 11000.

The ecology of the islands:

The ecological profile of the islands is related to the various ecosystems found here. The open sea, coral reef, lagoon, eastern and western shores provide habitats for a variety of fauna and flora. The coral reef is the major ecosystem in the archipelago with 12 atolls, 3 reefs, and 5 submerged banks. Found as a ring shaped structure on the western side of each island circumventing through to the eastern side as an arc, the reef area in the whole archipelago spreads over 816.1 sq.km. The earliest work on the coral reefs of Lakshadweep were done by Gardener (1903, 1906) and Alcock (1902). The coral diversity of Lakshadweep is second to Andaman and Nicobar islands. There are 78 species of reef building corals or Scleractinians belonging to 31 genera (Pillai et al. (1984) and Nair and Pillai (1972)). Out of these 27 genera with a total of 69 species are hermatypes and 4 genera with 9 species are ahermatypes.

The associations that coral species form among themselves along with assemblages are significant in determining the diversity of other life forms in reef. The Porites community, the Acropora community and Heliopora community are the major coral associations in Lakshadweep. The work done on Current Status and Impacts on Coral reefs in Lakshadweep (G.Srivastava and Dr.S.Ismail Koya, 1998) gives an account of islandwise status of coral reefs in Lakshadweep. According to this study, the islands Agatti, Bitra and Kadamat has satisfactory coral cover while Androth, Chetlat, Kalpeni has good reefs. In Suheli which is an uninhabited island the coral diversity is very good. Bangaram which has been leased out for tourism has an unsatisfactory coral status. In Amini and Kavaratti, the situation is bad while Kiltan shows critical status. There is a need to analyse this situation further.

The mortality caused by the El-Nino event in 1998 and subsequent bleaching has led to coral mortality upto 80% in various islands. Studies done by the Lakshadweep Coral Reef Monitoring Network (2001-2002) show that the present coral cover is between 10-20% with some islands like Kavaratti and Bitra showing a recovery of 35%.



Lagoon

The lagoon on the western side of all islands except Androth adjoins the shore with a total area of 4200 sq.km. The independent coral associations and growth in the lagoon are important as they are the habitats for fishes and other marine biodiversity. The calm waters of the lagoon protected from the vagaries of the open sea by the reef is a safe nursery for molluscs, echinoderms, turtles, fishes and dolphins. The maximum depth of the lagoon would be 300 feet. The part of the lagoon closest to the land is a scene of intense photosynthetic activity with extensive growth of sea grass. The sea grass beds prevent erosion and beach sediment movement. The beds are major feeding grounds for turtles, many fishes and other fauna. There are also records of growth of marine macrophytes or algae. The algae belong to green, brown and red varieties. The survey done by CMFRI (1977-79) recorded 82 species of sea-weeds in Lakshadweep waters. There are coralline algae which accumulate calcium in their bodies and contribute to coral growth. The lagoon is home to many marine fauna. Crustaceans, Molluscs, Sponges, Echinoderms and Turtles are the major faunal classes found in the lagoon. Besides these are the fishes and occasional mammals that visit the lagoon.

The Characteristic Bird, Plant and Animal of the U.T of Lakshadweep

The sooty tern (*Sterna fuscata*) is the bird of Lakshadweep. They abound in the small island of Pitti (1.21 sq.km) found north-west to Kavaratti. Besides sooty tern, the island is also home to Noddy terns (*Anous stolidus*) and Large crested terns (*Sterna bergii*).

The plant that has been designated as characteristic to the island is Bread fruit (*Artocarpus incisa*) which grows well in

the sandy coralline soil of the islands. The island community makes many delicacies with the fruit.

The animal is Butterfly fish(*Chaetodon* sp) which is also a common denizen of the coral reef and lagoon. Called the Fakki-khadiya in local language there are 16 species of butterfly fishes in the waters of Lakshadweep.

The Open Ocean

The Lakshadweep islands are enclosed in the Arabian Sea with Territorial waters extending to 20,000 sq.kms and an Exclusive Economic zone of 4,00,000 sq.kms. The main factors that determine the diversity and zonation of life in the open sea are temperature, currents, tides, chemical composition including salinity, nutrient upwellings and sinking. The photic zone that typically extends upto 150 meters abounds in plankton and many species of fishes like the flying fish. Whales, Dolphins, tuna schools and sharks also visit this area and can be seen. The middle zone from 150 meters- 1000 metres where light and oxygen availability decrease gradually is special for its nutrient upwellings and also sink from the upper layers.

The stormy weather associated with south-west and north east monsoon influence the life of Lakshadweep. There are currents along the waters of Lakshadweep whose intensity increase during the monsoon especially at 500 metres. The salinity of Lakshadweep sea is most at 100 metres.

Special habitats in Lakshadweep

The uninhabited islands of Tinnakara, Parali, Cheriya Paniyam, Baliya paniyam and Perumalpar are especially significant ecologically as they are refuge to a wide variety of fauna and flora. The characteristic floral growth of coastal species like *Pemphis*, *Tournefortia* and *Scaveola* are found along the eastern shores of many islands besides some of the uninhabited islands. The bird diversity of the archipelago is also specially located in these islands more. The extensive lagoon area of islands like Suheli par, Baliyapani par, Cheriya-pani par and Perumalpar are the best tuna fishing grounds. The Viringili island adjacent to Minicoy, the Kalpitti near Agatti, Kodithala and Cheriya near Kalpeni are also uninhabited islands that form an important area to explore biodiversity of the islands.

The mangrove vegetation in Minicoy

The southern most island of Minicoy in the archipelago has an isolated growth of mangrove vegetation. The mangroves



of Minicoy are in a formative stage and are classified as overwash and fringe type generally seen in small islands. Minicoy has two patches of mangroves of one hectare each. The eastern side of the island with its unique shingle beach has good mangrove growth belonging to the single species *Brugiera cylindrica*. The second mangrove area in Minicoy on the southwestern side of the island is of the fringe type with *Ceriops tagal* and some *Avicennia marina*.(Per.com.Kunhi Koya, CMFRI).

It is believed that a ghost lives in the mangroves and so the islanders keep away from it. The leaves and branches are cut for decoration. The branches of *Brugiera cylindrica* is used traditionally as poles for line fishing. The propagules have medicinal value.

Traditional knowledge in Lakshadweep

Lakshadweep inhabited since 7th century around the year 41 Hijra was and is completely dependant on the marine environment. The attempts that have been made to link traditional knowledge with life of the community has been rudimentary. The knowledge base of the islanders follow the all-encompassing and working concept put forth by WIPO in 1998-1999. It may belong to the “form of story-telling about a particular biological event which tends to distinguish it from scientific knowledge”.(1) The potential for systematic research involving fishers and their knowledge that gives special attention to the social, historic and historical context is very relevant. The information that the islanders give about various key elements relating to life in this sea-locked tiny area are often excellently juxtaposed over the results from scientific data to give the most reliable, relevant and insightful direction to concerns and strategies necessary for management and conservation of key resources.

Nomenclature and Traditional knowledge

The most elemental and essential part of the beginning of a knowledge base is the process of naming the familiarised elements. The best definition and justification for naming comes from the Marovo one (1a) that says “ those who cannot name the good things of sea and land cannot find them, and therefore cannot eat or otherwise benefit from them nor will they know how to look after them well”. The community in the Lakshadweep islands have followed this method in their naming expertise. The names have connection to the biodiversity too.

The nomenclature is of 2 types

a.Names of biodiversity

Flora

Fauna

b.Names of places

On land

In the reef

In the lagoon

Names of biodiversity

The names of flora has been systematically done in the land more than in the ocean. In the ocean, the algal and sea grass species are generally known by a single name. But differentiation occurs when the description about its links to the fauna is done. For example algae is accurately described as food for herbivorous fishes. In this case it would be worth noting Johannes description about the conveying information by fishers in the form of a story. When the El-Nino bleaching event occurred in 1998, the total breakdown of the coral colonies in the lagoon was accompanied by profuse algal growth. This resulted in herbivorous fishes taking over and monopolising the waters that fishers often describe as an amusing story. The sea grass is distinguished from the algae as it is the food of the sea turtles. Here too the fishers recount in exasperation the law that has prohibited killing of sea turtles that has resulted in increase in number who then graze on the seagrass beds that are ideal spawning and resting grounds for lagoon fishes. The subsequent drop in number of lagoon fishes thus gets connected to the Law protecting sea turtles.

The comprehensive list of more than 155 land plants and trees found in the island (unpublished list by V.A.Kuhnikoya, CMFRI, Minicoy, 1998, quoted in (2)) confirms the nomenclature specific to islands. But the various mangrove species found in the island of Minicoy is known by a single name.

The faunal list on the land in the islands is very sparse as there are almost no indigenous species here. However the islanders have very interesting names for the birds that visit the island. The strange presence of the tropical forest dweller, the White eye in some of the islands is seen as a good omen. The 53 species listed in recent times is an indication of the bird diversity on the islands. Many of the shore birds like waders and plovers have local names. The islanders have a penchant for keeping birds like egrets and grey herons as pets.

The most exhaustive nomenclature has been made by the island community on fishes. Of the 153 species of reef and lagoon fishes that were exhibited before the men, women and children of the islands with the help of illustrated books (3a and 3b), all had names both in Jessri and Mahl languages. The species differences gets reflected in the names too indicating the powerful sense of intuition and observation that goes behind the naming. This is in par with the most complex methodology that makes taxonomy perfect and infallible.

Ali Bebe of Minicoy and Fish nomenclature

Ali Bebe, a resident of Minicoy Island in the southern most part of the Lakshadweep archipelago shared his knowledge and observations about fishes, especially reef and lagoon fishes. Of this, the most important was the list of 110 species whose names in Mahl were known to him. He was also adept in describing the habits and habitats of the fishes. The species variations are expressed as changes in the first name with the suffix added. For example when asked about the name of the rock cod (*Cephalopholis* sp), Ali Bebe gave his characteristic smile and said " Fana" while explaining that there are Kaluphana, Kandurifana, Rayfana and Sikkifana. This is the same with the four species of groupers (*Epinephelus* sp) that



are commonly found in the lagoon. Called Laggan fana, Goudarufana, Fana and Sikkisikkifana, the fana represents Grouper.

Ali Bebe is also called the Lagoon doctor as he can assess the presence and absence of fishes in and around the coral boulders in the lagoon. The names of different areas in the lagoon that serve as fishing grounds are known to him. The Dheraddethere, the Raggan, Faroli, Fagun and the Tharathere are distinct areas marked by fishers since time immemorial and the knowledge and skills associated with fishing in each are passed on from generation to generation. The Raggan and Faroli are good for net fishing. Depending on the type of net, goat fishes(*Parupeneus* sp) snappers(*Thalassoma* sp) and squids are obtained.

Ali bebe remarked with remorse that the Dheraddethere area which connects the main island of Minicoy with the uninhabited island of Viringili was once filled with coral boulders but now the branching coral growth is gone. This along with the heavy dumping of plastic waste into the lagoon is fast destroying this valuable habitat.

The names given to places is also an important indication about the role of traditional knowledge systems in the life of the community. The names on land are connected to either ancient family names or names of trees or events. (4)

Names of places in the reef

The need to name and specify areas in the reef is connected to navigation and fishing. Of this the most relevant has been the naming of gaps in the reef known as entrances through which fishing vessels and boats carrying passengers to and fro to the ship operate. In Agatti there are three main natural entrances – the Aly(main entrance), the Balliya Alivu(centre of western reef) and Thodu (south west reef). In addition to this there are natural or man made channels in the reef. The eastern reef in Agatti has 6 small natural and man made 'shals'(Box 1) These shals are favoured fishing grounds for reef fishing as fishes enter and leave through this at low tide. The names of the shals coincide with an important event or the position of a mosque on land. In Minicoy there are 5 nat-

ural entrances known as Magus the knowledge of whose position and depth is vital for fishing and ferry usage.

The names of spots or coral boulders in the lagoon are also very necessary for fishing and location of areas through which boats can operate. This will coincide with spots for operation of certain gears and crafts, for certain kind of fishing, for specific fishes and other organisms like worms and turtles. The

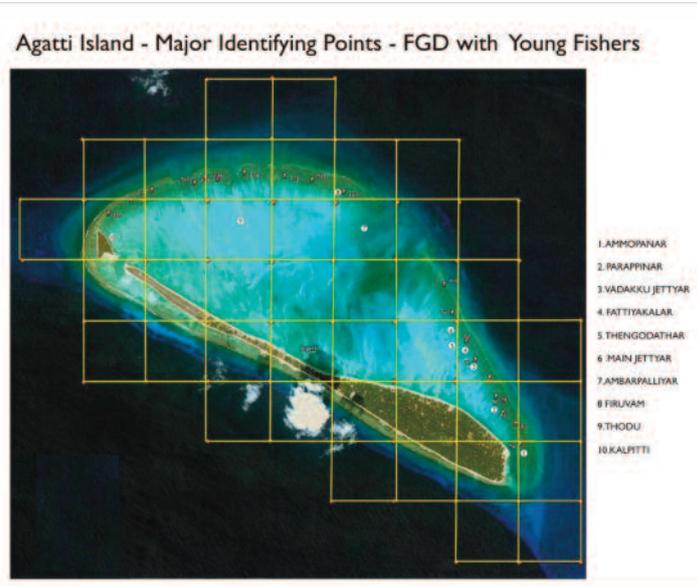
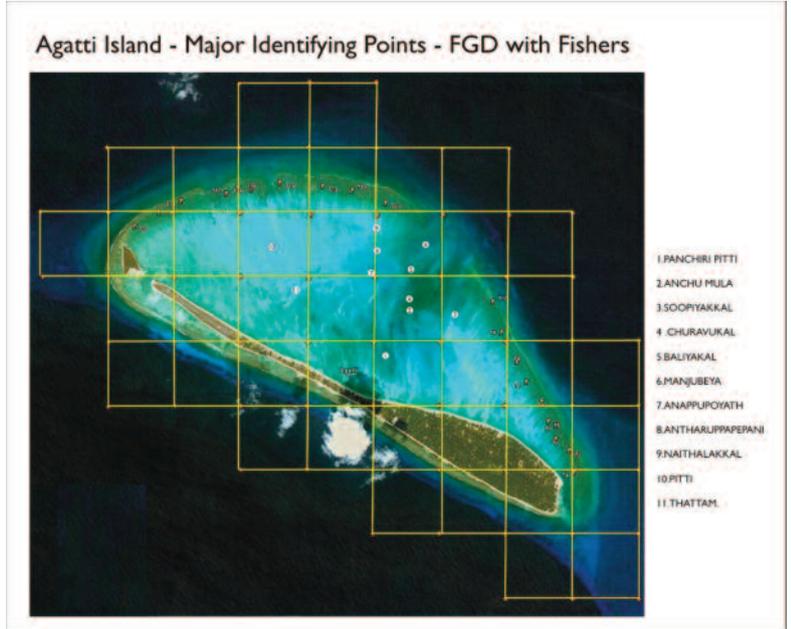
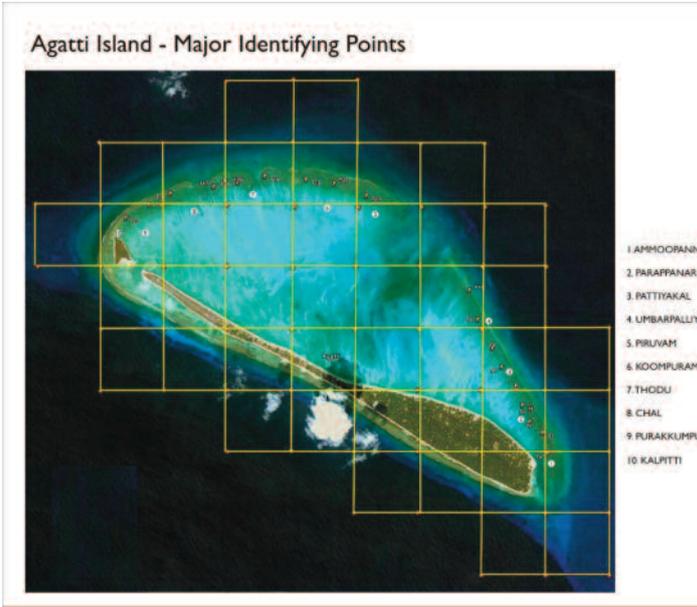
Names of places in the lagoon



fishers maintain a certain kind of mental cartography which can accurately be plotted onto maps (ref Caress Report 2 and 3). The Kunthalpara on the western lagoon near the jetty in Agatti is where cast nets operate for goat fishes whereas Carangids are found near Parape close to the seashore.

Mental cartography

The first one indicates the major 10 identifying points in the reef connected to access of fishing zones. The second map portrays the data collected from a group of young fishers and the third from more experienced fishermen. Each of the spots marked are based on the fishing zones. For example, Pattiyakal and Thodu for handline fishing, Koompuram and Pitti for sharks, Thodu and Baliyakal for bait fishing, Kalpitti



The two elderly men in Agatti island shared their knowledge about places in the lagoon and reef. The expertise with which the map was drawn on the ground with a piece of stick and the different areas marked for fishing, octopus hunting, cowrie collection and so on was amazing.

The Focus group discussions done with various stakeholders connected to fishing in Agatti island is shown in the 3 maps.

for octopus and cowrie. This exercise was done as a prelude to preparing the management strategy for the Giant Clam project.

Folklore and Traditional knowledge

There are many stories and myths connected to the biodiversity of the islands that are transmitted orally from generation to generation. Of this the oldest is related to the dolphin which is supposed to have escorted Saint Ubaidullah who while travelling from Jeddah was shipwrecked near the islands. The dolphin is therefore treated with awe and except in a few islands it is not caught or eaten. The fishers also record that dolphins, terns and tuna almost always travel together and they use dolphin schools and terns in the sky to locate tuna in the waters.

Most of the folklore of the people in Lakshadweep revolves around the sea and all tales and songs refer to the ocean and sailing vessels. The tales of Puganna Kevi, Omana poo and Bi kunhi along with the sea ghost Valuvan denotes a deep connection to the sea. The Kattuvili song that women render wishing the men luck as they go fishing has details of the wind and sails. It also requests the waves to be gentler and breeze to be right for the sails. The song on Parava meen or Flying fish sung in many islands reflect good knowledge about the species.



Songs and Knowledge

The mother and daughter in Kavaratti island who vied with each other to sing songs about biodiversity gave an indication about various means by which survival knowledge is passed on from generation to generation. The sing song nursery rhyme on names fishes is a good example:

Octopus and Tuna
The cod and the Wrasse
The lionfish and the Sailfish
Which among them is not a fish?

The song about the Spotted flying fish requesting it to bite the bait is a reflection on the behaviour of the fish.

Do not bite bite, dear Flying fish
Searched high and low for you
I threw the line for you in many places
It seems you will get hooked
Only when I am dead
Dear Flying fish

The women shared with us the various ways in which each fish should be cooked- some for frying, some for drying, some as a gravy. The loss in availability of certain fishes was also expressed.

Folk medicine and traditional healers

The community in Lakshadweep has a tradition of healing,

unique to the isolation with base in Ayurveda, herbal and al-chemic methods. The use of many marine species for healing denotes years of observation and skill. The Vella Kavidi (White Cowrie) shell ground well and put on sty in the eye. The shell of green turtle is ground and applied on throat to cure ulcers and infections. The “amber” which is occasionally obtained is a cure for specific ailments of the skin. The traditional bone-setting methods in the island use some marine organisms like shells along with medicinal plants from the land. There are still some people in islands like Minicoy and Amini who have retained this knowledge but not many people resort to such remedies any more.

Games and Biodiversity

Some of the traditional games that children in the island play are connected to the biodiversity. The games Bellachachulaka and Antheklíchomeenpayo that centre around the tanks and small ponds in the island introduces children to water sources and fishes in the fresh water habitats. The games Seelacheela and Kavidikali with cowries and shells makes the habits and habitats of these species common knowledge to the children. The game Chattal Chadal with the seeds of *Thespesia populnea*, *Pongamia glabra* and the occasionally obtained *Entada* seed was very popular with children.



Customary Laws pertaining to Resources

The Lakshadweep community has evolved a set of strongly maintained and deeply respected practises and customs that keep the social fabric intact. The unwritten code often implemented by the Amin was understood and passed on from one generation to the other. The Laws of Inheritance relating to the land is one of the most long-lasting. The Amin was authorised to punish any defaulter. The Amin could also oversee and delegate the community to participate in activities like ploughing, odam hauling and launching, rat hunting atop coconut trees (Eli Nayattu). The cleaning of houses and mosques where special events were held were also done under the direction of the Amin. The mosque tanks were cleaned regularly and Pistia plants grown to detoxify the waters.

Traditional Knowledge about Ecosystems,Species

and Fishing methods Lagoon

The allocation of fishing grounds in the lagoon is based on the presence of coral boulders in the lagoon. The mental map of the lagoon in each island is in the minds of the fishers. This is based on the presence and frequency of important fishes that are caught. For example the Acropora community in the lagoon is a good aggregating point for many live-bait fishes. The fishers frequent these spots before going out into the seas for tuna to fill their bait boxes. The Amin used to allocate the boulders to the fishing boats. This position has been taken over by Kelus or captains. The Amin used to get a share of the catch. The permits for the boats to operate were maintained through an unwritten code and there is an understanding between families and boats.

The coral communities, fishing methods and fish species: The coral associations and assemblages in a lagoon are important as habitats for many reef fishes. The association Acropora community is a good habitat for the live bait fishes. Likewise the Heliopora community is an ideal place to locate reef fishes. The fishing locations for specific gears and crafts that handle certain fish species is based on this intimate knowledge and observations of the lagoon.

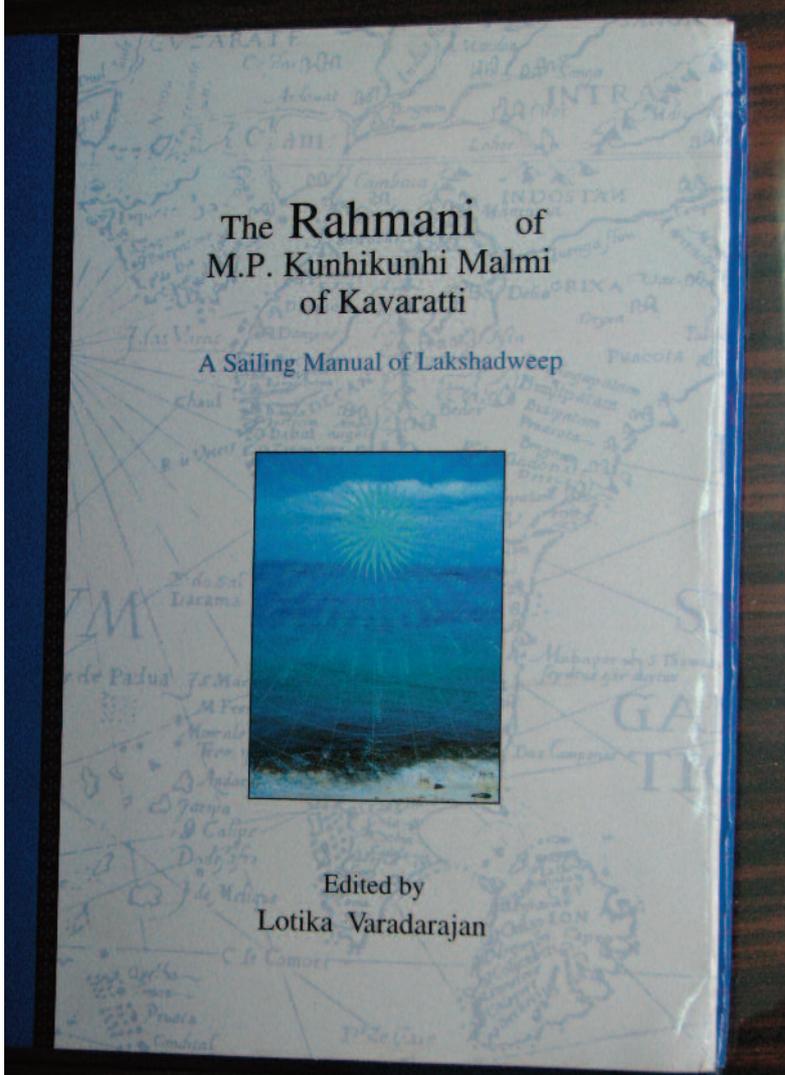


Navigation

Haji M.P.Kunhu Kunhu Malmi's indepth knowledge about the ocean, navigation through the ocean has been documented by the well-known social scientist Dr.Lotika Varadarajan in a book edited by her called " The Rahmani of M.P.Kunhukunhu Malmi of Kavaratti- A Sailing Manual of Lakshadweep". M.P.Kunhukunhu Malmi takes out all the necessary implements needed to make a sail effective and safe. The Samakha (compass), the Kaman (sextant), and the time and distance calculating planks are there. Along with this is the star chart (Koumala often sung as a song) along with the information on distance and direction of the main ports in India. The valuable document " Marjan- a study of traditional Navigation Science in Lakshadweep" compiled by Sri.T.A.Kunhi of Kiltan Island in 2001 describes in detail the intricate science of sailing the seas. He has been focussing on this since a decade and also serves to locate lost vessels and cargo ships that may be stranded in Lakshadweep sea. Years before the discovery of the sun, moon, stars and earth to locate and direct their own movements. The ancient navigation science of the Lakshadweep island is based on the movement and direction of the main star called the Kou.

Traditional Crafts for Fishing and the knowledge associated with it:

The wooden crafts used for fishing called odam or odi were carved in the island itself. The nomenclature of the odis were





in connection to the number of oars used. There are Ettuvalithoni with 8 oars, Aruvalithoni with 6 oars and Naluvalithoni with 4 oars. The oared vessels had the capacity to cross the reef and venture into the open ocean on the west or eastern parts of the island for fishing.

Lotika Varadarajan (Sewn boats of Lakshadweep, Sea faring traditions of Indian west coast) has referred to examples of

ferred to this system as Polygada while in the islands it is known as Kannal raapalagai. The fishers of Minicoy consult the Maldivian calendar to locate the direction of fishing grounds.

Sri.Muhsin of Chetlat island has been observing the boat building skills of his father and uncle for many years. Known as odam, the 10-15 metre boats that are made from the wood of teak or Artocarpus sp can carry upto 20 tons. The planks are held together by the coir made in the islands and also by wooden nails. The boats last for more than 4 decades with occasional maintenance.

According to Smt.Lotika Varadarajan, the origin of sewn boats has been traced to Lakshadweep islands. Examples of cartography and instrumentation are well illustrated from the island of Kavaratti.

The launching of new or renovated sailing craft is a traditional event in many islands. In Minicoy, the Jahadhoni or new snake boat like craft used in racing is launched with much celebration and customs. Similarly, a renovated fishing boat is set to the waters with prayers and offerings of beaten rice and lime juice. The priest who is the Chief Guest in the event prays for the long safe life of the boat besides blessing it with abundant fish harvest and so on.

Fishing Gears in Lakshadweep

The subsistence fishing in Lakshadweep are done by Cast net, Shore or beach seine, Drag net, Set net, Shal kakal, Covering

Fishing Gears of Lakshadweep
Season Area and Species

Type of Craft/Gear	Months of activity	Area	Species caught
1.Cast net	1. April-September	Western lagoon/Entrances on eastern reef	Goatfishes, Carangids, Whipfin mujara, half beaks, mullets
2.Beach siene	2. All year	Near shore on eastern side	Carangids, mujaras, goatfishes, half beaks
3.Dragnet	3. June- September	Southern side of lagoon	Snapper,parrot fishes, unicorn fish, surgeon fish, trigger fish
4.Set net a.Edenna bala b. Shal kakal	4 All year	Reef/eastern side entrances	Snapper, Mujara, Gar fish, red snapper/cod
5. Handline on odam Handline on shore	5. Jan –May, Aug-Dec Monsoon	Northern shore/ reef area	Goat fishes, reef fishes
6.Trapping over boulders	6. May-July	Shallow eastern lagoon	Snapper, Remora
7.Harpooning	7. All year	Bar area	Seer fish, Rays, Sharks
8.Light and knife	8. Monsoon/All year	Shallow water in lagoon	
9.Bait fish net	9. All year	Lagoon/ reef area	Yellow bait fish (Sprats-4 species)

Adapted from: :
Focus group discussions with fishers – Agatti island
Lakshadweep Biodiversity Strategy and Action Plan report- 2002
Caress Reports- 2 and 3

cartography and instrumentation which are well illustrated from the island of Kavaratti. Islamic in origin, it entailed a calendar system and there were schools of nautical instrumentation on the island. The system used the method of tracking the Pole star for direction. Stars like Great Bear and Southern Cross were studied over a 12 hour period. The Portuguese re-

boulders with cast nets, harpoon, light and sword, handline and so on. Each type of gear had associated with it accessories the usage of which has evolved over years of observation and timing.

In the case of cast net, it was made indigenously in the island

itself with cotton threads and it was mesh size that determined the making. Named according to the type of fish caught, there are nets for Goat fishes (Manakkathavala) and Kannanchena vala. There are also nets for the type and area where fishing is done like Kalmoodsalvala which is for covering over boulders to catch certain types of fishes. Some cast nets are operated from odams or rafts and would require 2-3 people but generally they can also be done alone.

The drag net operation that is called balafadal or chandelle uses the olabala that is a fish trapping device made of coconut fronds. The usage of coconut fronds and the chadalibala requires speed and timing according to the fishers in Agatti. The set net is an operation that involves patience and location of the right fishing grounds. It also calls for preparation of the area where the nets are set, maybe for a week. The leaf bags which accompany many gear operations for convenient collection of fishes are also made specially using coconut leaves.

The Harpoon method which is one of the most traditional requires an iron chisel, single or three pronged hook, a wooden harpoon rod and also a wooden model of a fish hanging from a rope. The harpoon experts use rowing boats to reach the right area at times. The light and sword method requires a torch which used to be coconut leaves tied together and lighted along with a knife.

In the case of handline, the wooden pole is made from Thespesia branches along with bait (worms) and nylon fibres and lead. The baitfish nets are also special with specific mesh size of the various baitfishes that the fishing operation may come across.

The above account is a brief overview of the various gears and their accessories. The real knowledge and understanding of the islanders is reflected most in the actual operation which demands unlimited patience and years of observation of the species and habitat. This cannot be documented in words but there is urgent need for retaining and passing on the skill to the next generation.

Allocation of spaces for operating the various gears

The allocation of spaces for using a particular gear was done by the Amin. But the fishers with deep and insightful observations had their own method of ascertaining the right place to start their fishing activities. In the case of cast net, the space sharing is based on an etiquette that is gracefully maintained. There are also instances when space sharing occurs on first come first served basis when the spaces for fishing are limited. In the case of beach seine, there is a behaviour code that is followed strictly by which the fishers leave 30-50 metres between 2 operators. In the case of set nets which need long duration of operation, there is a silent understanding that late comers in search of a space will leave without conflict. The number of choolabala –baitfishers have increased in number and there is pressure on space and also the resource itself.

Knowledge of Ocean currents and tides in relation to Fishing

The need to make an accurate and definite assessment of tides and ocean currents is highly essential in the context of fishing in the islands.

The tide charts give good assessment of the tides which when superimposed on the knowledge and observations that fishers have about fish behaviour becomes adequate for an efficient fishing operation. The best time for most fishing operations are when lowtide coincide with the new moon. When there is usage of odams the need for a sufficient high tide to set sail is felt. In the case of set nets, the setting of the net occurs when the tide begins to recede and the hauling happens after 2 hours or so. In the case of beach seine, the operation starts when tides change.

The changes in behaviour of fish species, especially their movement and aggregations has been observed over many



years and this knowledge base is behind the success of many a fishing operation. The goat fishes and Carrangids are most active during the beginning of high tide when they enter specific locations and move out during low tide. The keen observations about the movement of the tides and the fishes are based on this knowledge. In the case of harpooning, it has been found that fish like Olamin (Marlin or Sail fish) are best located at low tide during full moon days on specific days like 14th, 15th and 16th day.

The ocean currents in and around the sea in Lakshadweep are nutrient rich and support many tropical fishes and their movements. The direction and behaviour of oceanic species in relation to the currents is not known in depth by the fishers





except in a few cases. Some have observed the behaviour of sail fishes and seerfishes in relation to an unidentified star and a ocean current (Caress Report¹). The seer fish is found west of the star and the sail fish to the east that makes harpooning location easier. The analysis of currents in relation to currents is done more for tuna fishing which will be dealt with in detail below.

Tuna fishing

The pole and line fishing so characteristic to the islands had its origin in Minicoy island and the Republic of Maldives. The use of live bait fishes and a water spraying gear makes this method effective. The capture of live bait fishes and its storage are essential pre-requisites to tuna fishing. The islands Agatti and Minicoy are the best in this methodology. The fishing method involves step-wise and systematic planning along with team work. The tuna vessels will have 8-10 people who have to work in unison to make the operation effective. In Agatti island there is a very strong body of knowledge in individual fishers who decide the areas for fishing based on the seasonal variations in availability of tuna. The names of abundant fishing grounds are given locally and the mental map is referred to by the experts. There are atleast 10-12 fishing zones in Agatti for tuna alone. In Minicoy the knowledge about the 9 tuna fishing grounds coincide with ocean currents that are needed for movement of the fish shoals (ref Caress report 3) The fishermen use the Maldivian calendar to correlate the direction of the current. There are 3 main currents in Minicoy which decide the movement of tuna shoals and their availability. The observations about the meeting of 2 currents and the consequent increase in availability of tuna is an indicator of the depth of perceptions about the physical realm.

Sharing of catch

There is a very delicate but well maintained balance between the team members regarding sharing of catch. In most of the islands, 50% of the total catch goes to the boat owner and the rest gets shared with the 10-12 fishermen team. The team

sometimes involves together in the cleaning, cutting, filleting, cooking, salting and smoking of the tuna catch. In Minicoy, most of the boats follow a 1:2 sharing with a certain number being given to the mosque or a deprived family with no male members. Women are actively involved in the tuna processing in Minicoy.

The processing of tuna for preparation of mas is a laborious one with the first step of cleaning and cutting the tuna flesh. The fire for the cooking has to be made steady with dry coconut fronds and other wooden pieces. The big vessels are filled with water and salt is added. The correct amount of salt needed for a specific volume of fish is a knowledge that is called the "calculation of the eye". The tuna cooked over many days then gets ready for drying in the specially prepared shelves made of coconut wood and rafters. The smell of tuna drying is the characteristic smell of a good catch, efficient life and a good source of income for the islanders. The mas so made is packed in huge sacks and transported to mainland in the big cargo vessels known as Manjus.

The islanders have a specialised means of identifying and locating the live bait fishes. The 27 live bait fishes and their habitats and abundance ranking has been done for Minicoy (Caress 3). Except for 3 species the rest are still considered abundant. The species of tuna baits belong to Pomacentrids (Damsel fishes), Fusiliers, Sweepers, Cardinals and Sprats. The live bait fishes are usually found near boulders, branching corals, and at times the reef. The bait fishes are mostly collected beforehand and stored in bait boxes. Now made of iron or fibre glass there were expert weavers especially in Minicoy who made the baitboxes with the flexible and tensile branches of the coastal plant *Pemphis acidula*.

Reef gleaning and Knowledge of women



The reef and lagoon are areas where women and children visit both for recreation and in search of small much valued and useful marine life. The knowledge of women is passed on as collective memory, stories and interesting narratives. These gleaning trips with friends and family including children take place during low tide and women show enthusiasm and joy while benefits come their way as octopus, cowrie and the much coveted ambergris. But there are also trips organised with boats and gear in search of cowrie that is a source of income for the women.

Cowrie gleaning and Perceptions of women

The knowledge about Cowries that women have is passed on from one generation to the other in almost all the islands in the Lakshadweep archipelago. Now the biggest threat to the activity is the involvement of men in this with gears like snorkel and mask that makes locating the animals easier. The knowledge about this elusive molluscan species (*Cypraea* sp) centres around the type of Cowrie, its local name, the identification marks, habitat and behaviour along with its value in the market. In recent times with changes in availability, habitat loss and influx of men into the scene women perceive the threats that cowries as a species face on the islands. In all islands other than Minicoy, the Kattikavidi, Pullikavidi, Valiyakavidi, Vellakavidi, Chirimarinja kavidi and Chirimalanna kavidi are collected. In Minicoy, names like Kiru bodi, Adun boli, Hudu, Kanbayan boli, Kudi boli, Dhala boli, Mahtaboli are frequently taken by women and children.



The area from which the cowries are generally collected is the Reef flat which is accessible during low tide. In the case of big cowries the pricing is for single pieces whereas with small ones, the price is per kilogram. The cowries are collected and given to the boats or cargo vessels going to the mainland especially Mangalore. The money got by this returns in the form of goods that women order or as small cash. There is a trust and understanding between the women and the boat operators and not one instance of cheating was reported. When boats are hired to reach the cowrie grounds, the boatman gets Rs 5/head or 5 cowries if the collection is good. The knowledge about the best time to collect the species is where women show subtle observation skills and time tested memory links within the community. The areas within the reef flat where Kavidis are found have been marked in the mental map of the women involved from the time they visited these places holding the hands of their mother or aunts. The Kalpitti area near Agatti is a favourite spot for cowrie hunting and women are seen to organise boats to reach there in the seasons when the animals are more available. The tide table is used by direct observation on the waxing and waning of the moon. The fair months from September-April is preferred and fifteen to twenty days corresponding to full and new moon are the best times. The days with the lowest tide like 14th and 27th moon days are preferred for collection. Women carry sharp instruments to forcefully detach the cowries from the crevices or from the algal growth on stones in the reef where they hide. The collected cowries are buried in the sand so that the body of the mollusc decomposes, washed well, dried and packed for transport. Besides the cowries, other molluscs like Trichons, Conches and Clams are also collected as curios by women from the same area. There is a whole world of knowledge and observations on the habits and habitats of various species that the women see as they go reef gleaning. This has to be documented too. Yet there was concern about the unnecessary killing and disturbance of habitats like crevices and stones by the young who do reef gleaning on their own.

Octopus

The octopus is a species that is sought after during the reef gleaning trips by women. But there are also men skilled in the capture of octopus. The appal or octopus is a food item in the islands. There is no market attribute for this species but there is a silent export of dried and salted octopus from some islands. Minicoy does not prefer octopus meat as much as the other islands. It is believed that there are 3 species of octopuses in the island. Octopus is hunted both during the fair season and monsoon time. The reef is the best zone for locating octopus during low tide. Both men and women use long iron rods that make pulling of the animal easy. The octopus behaviour is best described in an interesting way by all who have been involved in this activity. The octopus is known as a clever animal with arms from its head. Their territorial nature makes them hide in crevices in the reef above which they place a piece of flat coral as a camouflage. The Appal Kaka, an expert octopus hunter from Kavaratti has his eyes trained to locate these hide-outs. He says that the mantle of the animal has to be turned and the ink sac emptied then and there. The appal or octopus is a special catch from the reef

gleaning operations of women. The women of Agatti and many other islands engage in octopus hunting (Appal Kuthal) during low tide. The women carry iron rods that make it easy to pierce and pull the octopus that lies hidden in the crevices and stones of the reef flat. The octopus is cleaned well and fried. One of the main delicacies that is made is Rice and octopus. The cooking takes a long time and is done in a low steady fire. The rice is cooked and mixed with turmeric and cooked octopus to be eaten hot.

Sea Cucumber

The sea cucumber or Kokka as it is popularly known is an animal that forcefully found a place in the collective memory of the island community. Though not used by the islanders, the Kokka was observed by all during the reef gleaning operations. But in the 1990 there was an attempt to collect these echinoderms and market them. An indiscriminate collection spree ensued and the population crashed to alarming levels. The product Beche-de-mer from this slow creature has a world market that Lakshadweep attempted to exploit. The community observed the crash and responded positively to the ban that Administration imposed. But this resulted in an investigation into the role and ecological status of the animal. There are certain islands where the population has still been not restored even after a decade of ban. The knowledge



about cucumbers that the islanders have now is based on this change in interaction with the species.

Sea turtles

The 4 species of turtles that are found in the waters of Lakshadweep including the lagoon were hunted in previous years. The knowledge that people have about these reptiles is connected to this interaction. The islanders have variously utilised the turtle population for various uses. The oil obtained from turtles is highly valued to repair and maintain the fishing vessels and boats. The shell of turtles especially



hawksbill had a good market as curio. The islanders are aware of the various nesting sites that Lakshadweep provides to 3 species- the green (*Chelonia mydas*) hawksbill (*Eretmochelys imbricata*) and olive ridley (*Lepidochelys olivacea*). All the turtles have been protected under Schedule 1 of Wild Life protection Act 1972 and included in Appendix 1 of CITES. But after the ban has been imposed there is a new body of information that states that the protection given to the animals has resulted in an increase in population and consequent grazing pressure on the seagrass beds that are valuable habitats for fishes. This has been established mainly for Green turtle which is a herbivore found aplenty in many lagoons of the islands. The fishers also expressed discontent about the frequency of trapping and destruction of nets by the turtles. This information has all the potential for being converted to the collective wisdom of a community in later years. The habitats in which turtles have been traditionally hunted has not been recorded properly. The islanders are well aware of the nesting sites of turtles. But there is no clear cut naming system as far as turtle species are concerned. They are generally called Aamai and Mirikam.

Sharks

The specialised hunting skills needed to locate and capture this magnificent denizen of the oceans exists in the islands. The hunting operation is not always an organised activity and often it is individuals with a drive who have ventured into this risky operation. The eastern side of the island with more easy access to the open ocean is the area for sharks and other large fishes. In some islands, the experts possess a large boat exclusively for their shark hunting trips. Though there will be 2-3 assistants, the skill to locate and follow the sharks along with the correct time and place to start the capture vests with the expert. The best time to hunt for sharks is during the early hours of sunrise and after sunset during the new moon in the months of September to May. The best bait that is used is tuna head or remains of goat meat. Each island has its own special areas where access to shark habitats is easier. In Agatti, areas like Mankunnu, Faraliya uda, Blangila moola, Pitti, Koompuram, Near Alathar are places that are traditional hunting grounds. (Caress 2).

The curing and preservation of marine species especially for the monsoon season when it would be off season for fishing is an activity for women. A whole host of fishes especially from the reef along with sharks, rays and tuna are salted and

dried in the sun. Many innovative methods to make the sun-drying faster and efficient is adopted. In many islands, octopuses are also dried and exported to other islands. The making of the delicious Riha- kuri in Minicoy from the remains of salted, cooked and dried mas adhering to the cooking vessels has the aroma of yester years.

Collection of coral boulders and stones for construction activities

This is also an activity around which a lot of information exists as regards the patterns of accretion and erosion, size and morphology of the corals, nomenclature and so on. Though there is sense about the value of the reef, the incapacity to identify the growth pattern makes the wisdom about coral reef a bit undefined.

The nomenclature of live corals is reflected in the dead remains that get collected. The shingles are broken pieces of branching corals and are of 3 types. The boulders are big and massive corals and it is known that it forms good substratum for coral larva to settle and grow. There are 2 types of boulders and the islanders do observe that collection and removal of this will make the lagoon bottom sandy which increases turbidity that retards new coral growth. The sand collected are also of 2 types. The collection of all the above material is an activity in which men, women and children are involved. As the transportation of building materials from the mainland is an expensive activity with high proportion of loss, the collection of traditional freely available materials is on the rise. The breakdown of the joint family system has also created the need for new houses by each member of the family.

Traditional Knowledge: Perceptions of the Community

A rapid assessment was made to understand what different stakeholders in the community feel about the value, relevance and role of traditional knowledge in this changing scenario. The environment of Lakshadweep islands is still at a level where there is not much distinct demarcation between the "old and new". But there are emerging concerns about certain issues that gets reflected as shift in attitudes to resources. The segment of the community that is educated and employed in steady jobs are confused mainly about traditions. With the breakdown of the joint family system and the need to move away from the parent islands both for higher education and jobs, many have realised the breaking away from traditions. But the value and role of knowledge for fishing and use of resources is still considered very relevant.

The youth including the girls feel anxious that with more and more of them taking up non-traditional occupations there could be erosion of the knowledge base as this is not written. A large segment of this group along with teachers feel that Traditional knowledge has to be included in the formal education system and the islands should have a curriculum that includes information and examples from the region. The tuna fishing classes for boys that is being done in schools was welcomed by many. The children were very keen to observe and record the traditional knowledge base of the islands as exemplified by the various projects that were done by

them.(Caress report 3) The women understood and spoke about the need for instilling care and concern about the marine world in children as many of the youngsters are found to destroy life forms unnecessarily. The general attitude of the various strata of the community has been to integrate the knowledge base into the life of the islanders rather than showcase it as a dull lifeless archaic rhetoric. The undeniable fact that this knowledge is still so essential for life and survival on the islands is accepted by all.

Precursors to Traditional Knowledge

The island of Lakshadweep is in a state of transition and change. The rapid exposure to the so called modern way of life and life style has in a sense taken away the deep rooted sense of belonging that islands alone can nurture. But the limited space and intimate human relationships and kinship brings about has created links to both society, livelihood and leisure. We can see the changes in attitudes and observations about change that gets expressed in all walks of life. The most apparent and frequently expressed one is about erosion of values like humaneness, religiousness and reverence that is rampant among the youth in the islands. The next major observation is the infiltration of habits and addictions that are resulting in life style diseases. The all pervading apathy and lack of motivation that a subsidy dependant state can create is evaluated as the main reason for this.

The next major body of observation that will develop into traditional knowledge in a few years time is about changes in the natural world. The El Nino and mass coral bleaching event of 1998 with its shocking impact on coral growth and fish diversity is imprinted in the minds of the people. Together with this is the effects of anthropogenic activities like blasting and deepening of reef channels. The drop in bait fish population along with increase in sea turtle numbers has been the subject of discussion in all the focus group discussions held with the community. The impact of plastics on the marine world, the problem of Solid waste management and eutrophication of lagoon were also debated upon. The overkill that often happens as part of reef gleaning is a matter of concern for many. The high rate of sea erosion that is hampering with the shore line, the increase in heat, the decrease in the number of rainy days and the changes in wind pattern are also topics where observation of people are keenly focussed. The above factors with its true scientific base and value have to be validated and a development plan and strategy with a pure island focus has to be evolved.

Recommendations and Suggestions

The study was expected to make recommendations on:

a. How traditional knowledge of the island community can complement scientific knowledge and contribute to strengthening formal management of fishery resources and the marine ecosystem as well as in sustainable use of marine biodiversity :

The major learnings from the study has a key role in making

this bridge between the large body of scientific information available on the biodiversity of the island with the traditional knowledge base of the community. This is especially true in the area of

1. Marine biodiversity and nomenclature
2. Habits and habitats of key species
3. Tuna fishing season, areas and curing
4. Micro-economy especially for women
5. Identifying the threats and vulnerable issues concerning key species.

The areas where traditional knowledge can contribute to scientific management of fishery resources would primarily be :

1. the identification of fishing grounds in the reef and lagoon that would give sharp focus to the activity
2. Observation about the status of the reef and lagoon with special reference to bait fishes and certain gears and operations
3. Lead indications about how the establishment of less and no take zones can be done in future.

b. How traditional knowledge can play a key role in adapting to/ mitigating the impact of climate change

This is to be defined and analysed in depth as the knowledge and observations about changes in the island is still in the formative stage. The body of information available on changes in patterns of rainfall, wind , season and frequency of availability of fishes and other marine resources has to be contextualised. The observations on El- Nino and coral bleaching along with its impact on coral reefs and fish abundance has to be studied more before this can be used in the mitigation and adaptations to climate change.

Afterword

The above section gives an overview of all the areas relating to the life and livelihood of the people of Lakshadweep who have lived in unison with the natural world around them overcoming the constraints of space and isolation by relating to mainland Kerala and Mangalore for trade and other relationships. The whole body of knowledge existing as vestiges on many islands about land biodiversity especially plants has not been touched up on except briefly in this paper.

It has to be noted here that most of the information gathered centres around the subsistence fishing methods that has sustained the life of the islanders since time immemorial. There are very few areas here for conflicts as of now there were comments and remarks about pressure from more boats, more gears and people in a restricted area. The increase in the tuna fishing activity which came into the islands other than Minicoy after the 1950s is seen by many as a monoculture fishing attitude. The decrease in the availability of the live bait fishes has been noted as due to pressure from many boats, disturbance and destruction of habitats with plastics and other pollutants, increase in turbidity that accompanies blasting and advent of speed vessels besides new laws that protect some species. The impact of the coral bleaching events has been expressed by many as having hampered the integrity of the habitats, community structure within the ecosystem. The integration of the much practised ways in which small and juvenile fishes that get trapped in the nets

are returned to the sea with an advise “ Go back and grow well” was conveyed by many when discussion on bans on fishing during the spawning season and the concept of no take zones were done. The need to recognise and address the fact that people in the islands are not managing the bio resources but living in harmony with them and utilising what is there is on par with the Moravian statement about naming. The ways in which sensible identification of conflict zones in resource use are done and the reasonable and refined way in which they are resolved before it emerges has to be analysed well. The change in accession methods and utilisation patterns of resources like octopus, cowrie and so on by men and the attitude of women to this should be treated seriously and the lessons integrated into the pattern of larger understanding of resource use.

The indepth and undeniable knowledge base on which the existing fishing related activities are carried on in the archipelago is the solid ground on which a concept and practise of enhancing utilisation of resources can be evolved. The apparently extractive fishing activities on the island still maintains a non-market oriented approach. So the surplus catch is shared and circulated leading to a no-poverty state as everyone gets a share. The slight catalytic interventions that can be made in the making and preservation of the coveted ‘ Mas’ and other marketable items associated with it will go a long way to improve the life of the islanders. There is more need to evolve a sustainable management strategy for utilisation of land based resources. The precious lens of fresh water is being extracted indiscriminately, more land is coming under concrete which arrests replenishment of ground water, the contamination from septic tanks and diesel power plants is on the rise. The failure of traditional methods to conserve the valuable sources of fresh waters in the islands like ponds and wells is a matter of concern. The increase in waste especially plastics has started affecting the marine world too. The greatest lesson to be noted while documenting the Lakshadweep Traditional knowledge is that it permeates all aspects of life from cooking, fishing, navigation and architecture. The link to a modern educated life has only reinforced this base as we see Directors of departments commenting that he just returned from a traditional fishing trip. Many women who are teachers or employed in government sector will be making mas appams or assisting the men in the family in tuna cleaning and drying. For the islanders, traditional knowledge especially about the ecosystems and livelihood related activities is still a dynamic, evolving phenomenon. The link to tradition and the confidence it imparts to be able to live in this stark and highly challenging milieu is still a way of life here. This is what makes life for them not a mere coping with a conflict resolution strategy. This is what brings smiles to the faces of the islanders and may create a high value for Happiness Index.

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