

Socio-Economic Assesment & Monitoring of Coral Reefs of Agatti Island - UT of Lakshadweep

Project Completion report

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Cover Photo: Reef Gleaning in the Eastern lagoon and reef at Agatti
Photo credit : Vineeta Hoon (Jan 2002)

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Chapter 1. Introduction

The Lakshadweep islands lie scattered in the Arabian Sea about 225 to 450 km from the Kerala Coast. They comprise 12 atolls, 3 reefs, 5 submerged banks with a total land area of 32 km², and useable land area of 26 km². Lakshadweep is considered the smallest Union Territory of India with a population of 60,595 persons in 2001. However considering its lagoon area of 4200 km², 20,000 km² of territorial waters and about 4,00,000 km² out of the 8,59, 992 km² of Exclusive Economic Zone of the west coast of India, Lakshadweep is a large territory¹.

Geographically the islands lie between 8° - 12 °3' N latitude and 71°E - 74°E longitude. The islands are flat and scarcely rise more than two meters. They are vulnerable to storms and sea erosion. The islands consist of coral formations built up on the laccadive-chagos submarine ridge rising steeply from a depth of about 1500 m to 4000m off the west coast of India. Eleven out of the thirty-six islands are inhabited. These are Agatti, Andrott, Amini, Bangaram, Bitra, Chetlat, Kadmat Kavaratti, Kalpeni, Kiltan and Minicoy. Kavaratti is the Administrative headquarters and Agatti is the only Island with an airport. The islands are linked to Kochi by ship, helicopter and Indian Airlines services.

Settlement History

The history of these islands is obscure. The general belief is that the first settlements on these islands took place in the period of Cherman Perumal, the last king of Kerala. According to tradition, the first islands to be settled were Amini, Kavaratti, Androth, and Kalpeni. People then moved on to the other islands, like Agatti, Kiltan, Chetlat and Kadmat. An old dialect of Malayalam is spoken on all the islands except Minicoy, where the inhabitants speak Mahal and use the *Divehi* script of the Maldives.

Records show that various rulers and dynasties have administered the islands of Lakshadweep since the 11th century. The Cheras ruled the islands followed by the Kolathris, Ali Rajas of Cannanore, Tipu Sultan and the Bibi of Arakal. The main interest in controlling these Islands was to control the coir trade. The Portuguese and British also showed interest in these islands for the same reason. The British managed to wrest control of the Islands from the Rulers of Malabar in 1905. Coconut cultivation in these islands became the main activity of interest for all the rulers and significantly, owning coconut trees became the wealth marker and status differentiation among the islanders. The *Amin Cutcherry* was an important administrative unit where people deposited their coir in return for rice. The *Amin* was normally the administrative head or *Karanwar* from the most important family or *Tharawad* on the Island.

The early rulers from Kerala, as well as the British colonial government never paid any attention to fisheries or reef related activities of the islanders. Their whole attention was on maximizing coir production. The Lakshadweep islands were famous for producing the best golden fibre (coir) in the country. The people were encouraged to plant coconut trees. Land was leased out to them in order to do so even on the uninhabited islands.

There therefore developed a two tier caste system of landlords called *Koyas* who owned the coconut trees and their servants known as *Melacheries* who tended the coconut trees and harvested the coconuts. Another caste called malmis, were known to be the early sailors from Agatti. They had the knowledge of stars, their position, and about navigation.

¹ *Lakshadweep and its people: 1994-1995*, Planning and Statistic department, Secretariat, Kavaratti.

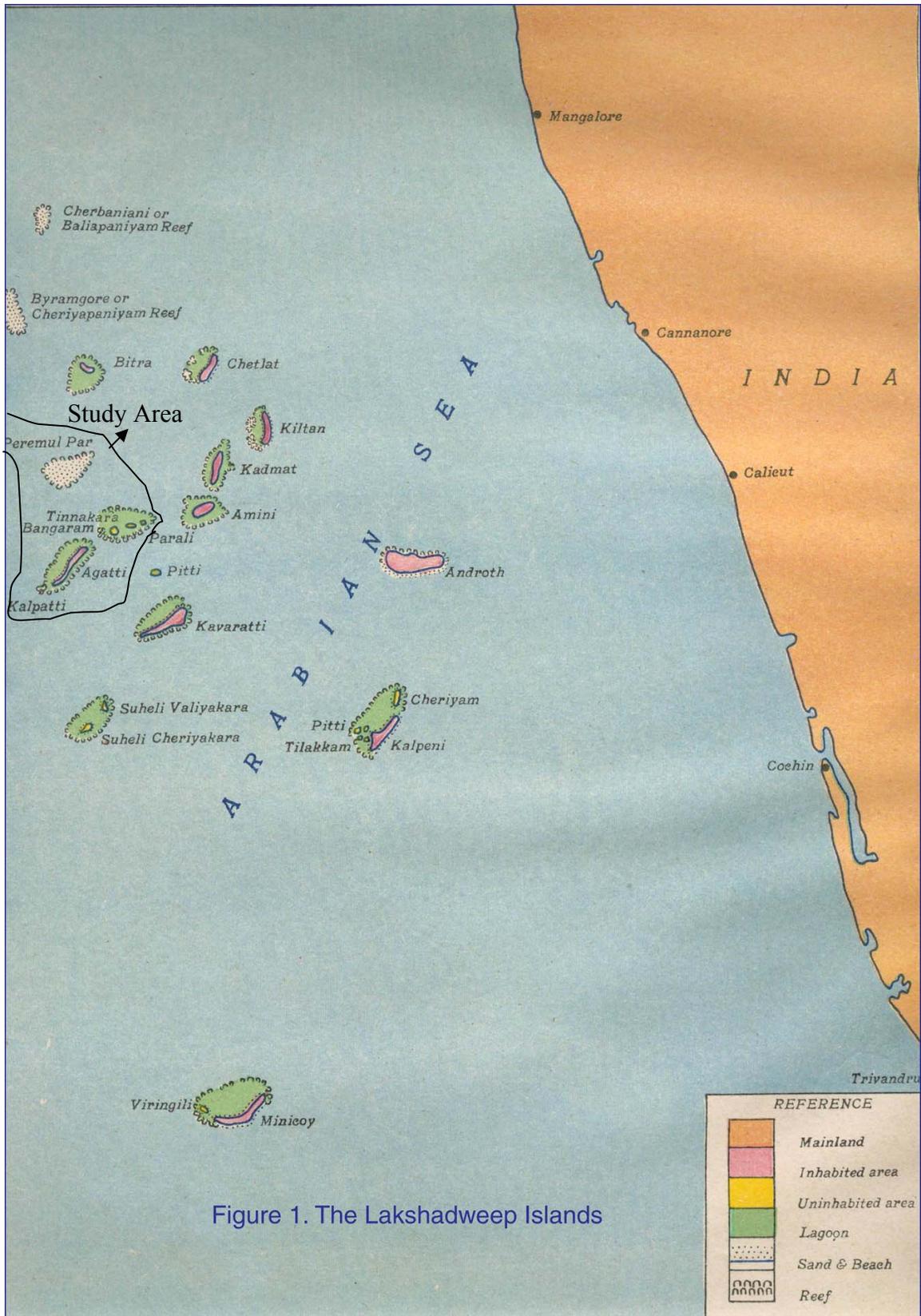


Figure 1. The Lakshadweep Islands

Fishing was identified as an “industry” only in the late 1950s, after India gained independence. Once fishing became lucrative, the Koyas employed the malmis to navigate the fishing boats. Over time the people of Lakshadweep became experienced and skilled in navigating and fishing in the seas around them. They now have intimate understanding and knowledge about the currents, tides, stars, fish habits and characteristics. Today most of the Koyas are involved in Tuna fishing both as boat owners and boat team members.

The Lakshadweep Administration, department of information and statistics publishes an annual report on the population, housing and developmental activities in Lakshadweep. The islanders are declared as Scheduled tribes by the Government of India. They have a homogeneous population and the main religion is Islam. They have a matrilineal society and property is passed down the female line.

The 1990's have shown a rapid change in the attitudes of the islanders towards their customs and traditions and their economic development. Old customary practices are giving way to the new laws imposed by the Government. The most significant change is that the matrilineal system is breaking down with the growing popularity of the *Shariat* – Islamic Law that enables sons to claim property rights. This in turn has led to a construction boom with added stress on the land and fresh water resources.

Tourism/scuba diving that have been taboo in these islands and limited to day trips from the ship is picking up. The first island resort at Bangaram opened in 1988. The second one in Kadmat opened up in 1995 with a dive school and in 1999 the Agatti Island resort was started. Thanks to the Dive School run by Laccadives at Kadmat, many of the departmental staff such as environment wardens have learnt how to scuba dive. All this is bound to have an impact on the socio-cultural and economic activities in the islands.

Establishing a socio-economic monitoring is very relevant in this region. Rapid developments are taking place in the Islands of Lakshadweep. A delicate ecological base now sustains these islands. Any imbalance is likely to do harm to the islands. Many of the new economic activities such as tourism are recent in origin. Already one can sense resentment between local resorts managers and the islanders. It will soon be necessary to devise management options and make conflict resolutions between stakeholders.

Aims and Objectives as stated in the proposal:

The goal of this project is to carry out a demonstration project for socio-economic monitoring in the Islands of Lakshadweep where biophysical monitoring is taking place and to establish a base line for assessing socio-economic changes over time in communities linked to the Reef at the demonstration site.

Objectives

1. Identify Socio-economic indicators for routine monitoring of the selected parameter and to produce a monitoring plan for demonstration sites.
2. To identify and predict problem areas in reef resource use of different stake holders in the U T of Lakshadweep.
3. To establish a process that will involve local participation (civil society) in monitoring and managing their reef resources.
4. To increase local awareness of stakeholder related issues and threats with regard to reef/lagoon usage.

5. Collect stakeholder views on coral reef resource management options, such as the establishment of protection zones within reef/lagoon in tune with local needs and utilisation patterns.
6. Identify alternative livelihoods where applicable.
7. Recommendations to GCRMN biophysical monitoring.

This report is the culmination of a year long project. Four major visits and several visits of shorter duration, consultations with GCRMN, the Lakshadweep Administration, NGOs, Panchayat bodies, village elders, agencies of state and central levels and the Agatti monitoring team have gone into compiling this report.

This report is divided into 10 chapters.

Chapter 1, introduces the reader to the Lakshadweep Islands and the aims and objectives of this project

Chapter 2 explains how the project was carried out and the methods used for data collection.

Chapter 3 contains a profile of Agatti Island, Bangaram Island and Perumal Par reef that provides the resource base for the Agatti Islanders. It also lists the services available to them such as: medical, educational, religious facilities, public utilities (sewage, electricity and water supply), communication facilities, marketing outlets, transportation and other facilities such as hotels, restaurants, banks, post office and government subsidy.

Chapter 4: explains how the Agatti Islanders interact with the reef resources, fishing methods, gear used etc.

Chapter 5: describes the seasonality of resource use in a seasonal calendar and resource-activity maps developed by the stakeholders themselves, place names for fishing grounds and ranking them in order of fish availability. It also explains the perceptions of the local people on the state of the reef.

Chapter 6: describes the market attributes of extractive and non extractive reef resources and presents the findings from a survey to assess the non-market, non-use values of reef resources as perceived by the Islanders.

Chapter 7: presents a profile of the main stake-holders - Agatti Islanders, their population, demography, Income, occupation and living standard.

Chapter 8: describes resource governance, the customary practices and laws with regard to property, marriage, freshwater, sanitation, sharing and lagoon use. It lists the applicable protection acts and current legal status with regard to coral reef resources. Islanders compliance with governance, approach towards tourism, local efforts and role of Non Governmental Organizations.

Chapter 9: presents the results of the socio-economic monitoring of reef related activities carried out between July and December 2001 by the Agatti monitoring group.

Chapter 10: presents the key learnings, conclusions and insights gleaned from the data analysis. It assesses the strengths and weakness of the exercise and provides recommendations for the future.

Chapter 2: Methodology of Project Execution

A socio-economic assessment was carried out at Agatti Island, UT of Lakshadweep to gain an understanding of the way of life and to provide baseline data for parameters to be monitored in the future.

The Centre for Action Research on Environment Science and Society (CARESS) provided the training and supervision and the team of volunteers in Agatti carried out the work. Supervisors from CARESS and the Agatti team met 4 times over the project period to discuss the assessment and monitoring activities and chalk out a work plan.

To achieve the objectives of the project, the research design was structured as follows:

1. Conducting a socio-economic assessment and monitoring training workshop. April 2000.
2. Conducting the socio-economic assessment at Agatti Island April-July 2001
3. Monitoring reef related activities July-December 2001
4. Validation of the data collected and future management plans January 2002

The Socio-economic Assessment and Monitoring Workshop

A Socio-economic Monitoring workshop was conducted at Agatti from 7-13th of April, 2001. The workshop objectives were:

To introduce the trainees to the principles of socio-economic assessment and monitoring of coral reef users;

To familiarize the trainees with the GCRMN Socio-Economic Manual for Coral Reef Management;

To select a Pilot demonstration site for a socio-economic monitoring.

There were 14 participants at the workshop. Dr. Syed Ismail Koya, Chairperson of the Lakshadweep Coral Reef Monitoring Network (LCRMN), selected the participants. Participants represented DST, DoE, LCRMN, Dept of Fisheries, IXORA club, Agriculture Census and Planning. These participants were residents of Kavaratti Island and Agatti island. Since three participants from LCRMN were unable to attend the workshop. Three unemployed women college graduates and a representative from the Pykala Society from Agatti island were included as participants in the workshop.

The participants were provided with guidelines on how to conduct socio-economic assessments of coral reef uses in Lakshadweep. Agatti was chosen as the Pilot demonstration site for Socio-economic monitoring since bio-physical monitoring has been conducted here in 1999 by the bio-physical monitoring team of LCRMN.

Dr Vineeta Hoon and Hemal Kanvinde, (CARESS) trained the participants and the subsequent monitoring team in using the GCRMN sponsored manual -- Socio-Economic Manual for Coral Reef Management authored by L.Bunce, P Townsley, R. Pomeroy and R. Pollnac.

The classroom sessions at the workshop concentrated on preparing the participants for planning and carrying out fieldwork and data collection in Agatti and Bangaram Islanders. The rest of the workshop followed the *learning by doing* approach in which the participants were given assignments with time limits to complete. They were free to approach the trainers to have their doubts clarified.

The data collection, visualization, validation and tracking were explained through feed back both before and after the participants had time to practice and get thorough with using participatory approaches for data collection.

The following tasks were completed during the workshop

1. Participants defined goals, Identified Parameters and Sub-parameters for data collection. (Appendix 2.1)
2. Prepared a list of Stakeholders and Key informants to be consulted (Appendix 2.1)
3. They spent time assessing the secondary data available
4. Conducted a Reconnaissance survey
5. Prepared a tracking sheet on the work completed & by whom for Agatti Island (Appendix 2.2)

Forming the Agatti Monitoring team

On completion of the work it was felt that the momentum gained in gathering data relevant to Socio-economic Monitoring Parameters for Agatti Island should not be lost and the work should continue. Two teams were formed: 1. The participants from Kavaratti agreed to carryout the work in their Island provided the work was given to a Youth Club IXORA², which claimed to do environmental work.

2. The Participants from Agatti formed a team to carryout the job of data validation and completing the socio-economic assessment. The team consisted of a steering group who received training in the workshop. The steering group in turn selected and trained field workers to do the data collection. Care was taken to select educated field workers who lived in different parts of the island. A gender balance was maintained by having 3 male and three female field volunteers.

The Steering Group

A.E Ayoob (Fisheries Officer, Agatti)
Mohammad Ali. M (Tech Asst. S&T, Agatti)
Abdul Shukoor. B (Res Off Agri Census)
O.G Moosa (Asst Curator, GJM, Agatti)
M.I Cheriya Koya (Indian Airlines Rep)

Field workers

P Shahanaz Begum, Pre degree
N.M Thajunnisa, SSLC
A. Hajara, BA, B.Ed
P. Moosakoya, SSLC, TechI Course
Abbobacker P, SSLC, Elec Diploma
Mohammed P, B.Tech Drop out

The Steering group consisted of a representative from the Department of Fisheries, Department of Science and Technology, Agriculture Census and Welfare department. Their role was top provide guidance, orientation to the field workers and prepare a work plan for data collection. The group met once a week to share experiences and analyze the data collected and arrive at key learning's from the field.

To ensure that data was collected from all over the island, the team divided themselves into three groups to collect data from the three blocks in the island. The field workers were given a short brief of activities to be carried out during the stipulated period.

² The IXORA club defaulted on the work and providing accounts. This was very disappointing to say the least

Group A South Block	Hajara Mohammad P Ayoob A E Thajunnissa Aboobacker
Group B Centre Block	
	O.G Moosa Shanaz Begum Moosakoya B
Group C North Block	Mohammad Ali Abdul Shukoor b

The dead line to complete data collection on the Parameters selected was set to the 1st week of June, 2001. The project supervisor consulted with the team in June and assigned the next six months work for practice monitoring.

Socio-Economic Assessment at Agatti Island April-July 2000

Data Collection

The Agatti Monitoring team spent 10 weeks in carrying out the socio-economic assessments in their respective islands. They consulted with Island elders, Reef stakeholders, tourist resorts and the various government departments. Data was collected from both Secondary and Primary sources.

Secondary Sources

Secondary source of data include government records from the various departments.

Demographic data was collected from the Basic Statistics Handbook published by the dept of Planning and Statistics, Census operations for 2001, and the Health department from the Administrative headquarters at Kavaratti.

Fisheries landings and related information was collected from publications of the Department of fisheries, Agatti.

Relevant legislations and Notifications for conserving coral reefs was collected from the Dept of Science and Technology and Environment.

The Land Survey and Records department was consulted to find out about the land ownership status in Agatti, Bangaram, Thinnakara and Pareli 1,2 & 3.

Information on Blasting dredging and deepening of Navigation Channels was collected from the Harbor works department.

Tourism Statistics and development plans from the department of tourism and SPORTS that is in charge of developing tourism in the Islands and the basic Statistical handbook.

Information on Marketing produce, pricing and quantity marketed was collected from records of the Co-op Society

Primary Data Collection

The Project Team made a list of all the reef related activities at the workshop. The parameters were reef use pattern, resource governance, island demography, community services, market attributes,(extractive and non extractive), non-market non-use value. The sub-parameters within reef use pattern were activities related to the lagoon, such as

cowry collection, Tuna fishing, and net fishing in the lagoon; species of fish, their ranking in terms of abundance, tourism, and so on.

Within resource governance were included government laws and acts, traditional/customary law. To this one added the local self-governance, panchayat which has contemporary significance as a grass-roots institution with administrative powers in developmental activities.

Community services included markets, transport. We included the Co-operative society since it provides subsidized consumer essentials, and now includes building material, in return for the coconut and copra produce of the islands. Thereby the Co-operative society also has a role in the services sector.

Once the parameters were selected, the team held focused group discussions and interviewed practitioners of various reef related activities. By doing this they were able to collect information on various related sub-parameters and parameters simultaneously (Folk taxonomy, reef governance, traditional knowledge).

The field data collection methods included:

Semi Structured interviews with approximately thirty key informants for the reef related activities.

Oral histories were collected from elderly traditional fishermen and reef gleaners.

Focused Group discussions were carried out with the following focus two FGD were conducted one preliminary discussion to learn about the activity and the second one to Validate the findings:

Women's Activities, Reef gleaning and Cowry Collection (April & June)

Traditional Fishermen (April & June)

Socio-economic status (June)

Customary Practices (April and June)

The team used a variety of Visualization Techniques during these interviews. For example, the traditional fishers were asked to identify the local fish taxonomy, locate key places and fishing spots, particular features on the map. The key informant fishers were also asked to Rank fishing grounds and fish to establish their relative importance. Catch data were also used to list species according to % catch composition.

Resource Maps: Individual resource maps were made for each reef related activity. These maps were consolidated into a single resource map showing all the activities and their overlapping spheres. The resource maps for all the activities were prepared for the monsoon season and Fair season. The various locations for each activity have also been ranked in order of preference. These maps provide a wealth of information on the seasonality of activities. These maps are very useful since we can easily see if more than one stakeholder is utilizing the same location and anticipate conflicts that can arise due the competition for the same resource.

A seasonal calendar was prepared to show the seasonality of the various activities.

Historical Transect was used to show the changes taking place on the island.

Ranking to show the most important and favored species and fishing grounds.

A questionnaire survey was used to collect information on income, sources of income and personal values regarding the reef since we were not able to assess the income

structure and reef dependency on the islands through participatory methods. 203 households were surveyed on a random basis to collect this data.

Since the team members are Agatti islanders themselves, they are very familiar with the different reef related activities as they have participated in all of them at some time or the other of their lives. In some aspects they are also Key informants.

However by carrying out the Socio-economic assessment themselves they developed a pride in learning more about the islands and started questioning every activity with a monitoring perspective.

Monitoring Reef related Activities 1 July- 31 December 2001

Six months from July to December 2001 were spent in monitoring the number of people who perform the different activities on the reef. These six months included 3 months of the monsoon season and 3 months of the fair season. This monitoring was conducted to assess which activity has the greatest impact on the reef.

The island was divided into 8 zones. A data sheet was prepared listing the different types of reef related activities that takes place during the day. The field workers daily collected data on the number of people performing each activity and entered it into the data sheet.

They monitored the shoreline at four different times of day to coincide with the tides:

Beginning of High Tide

High tide

Beginning of Low tide

Low tide

The logic behind choosing these times for observation lies in the relationship of tides and fish movements. The Fish shoals enter the lagoon with the beginning of high tide and leave with the beginning of low tide. Therefore maximum fishing activities coincide with the change of tides. Movement of big loaded vessels such as Manju, barges from the Jetty to reef entrance, takes place during high tide. Reef gleaning activities, shoreline protection activities and boat underside repairing activities take place during low tides.

By taking observation during these four times we are sure of getting data on every type of reef related activity for that day.

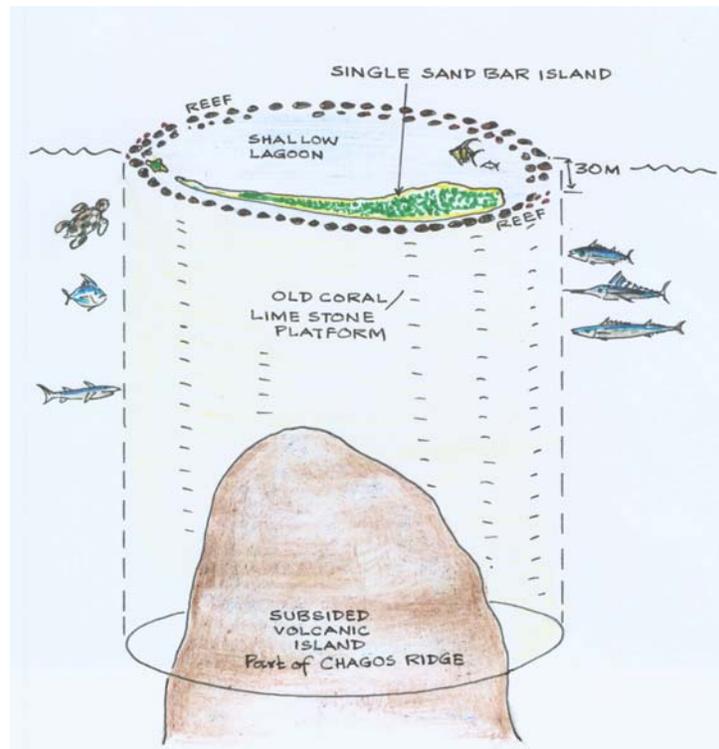
Validation of the Data collected and future management plans January 2002

The team and project supervisor met together in January to finalize the report. They summarized information on each parameter and sub parameter and made some basic calculation to develop a key learning on various issues and management problems related to reef conservation and future participatory monitoring.

Chapter 3 - A Profile of the Agatti Island

Agatti the Island chosen for the demonstration site is an atoll like most of the islands in UT of Lakshadweep. It consist of coral formations built up on the Laccadive-Chagos, submarine ridge rising steeply from a depth of about 1500 to 4000m of the west coast of India (fig 3.1). The traditional fishing and land rights of the people of Agatti extend as far as Perumal Par reef and includes the small islet of kalpitti in the south of Agatti Island. The Bangaram lagoon that encompasses the islands of Bangaram, Tinnakara, Parelli I, Parelli and II, Paralli III was washed away during a storm in 1976. Therefore for socio-economic monitoring purposes we shall study the intensity of reef related activities in all these areas.

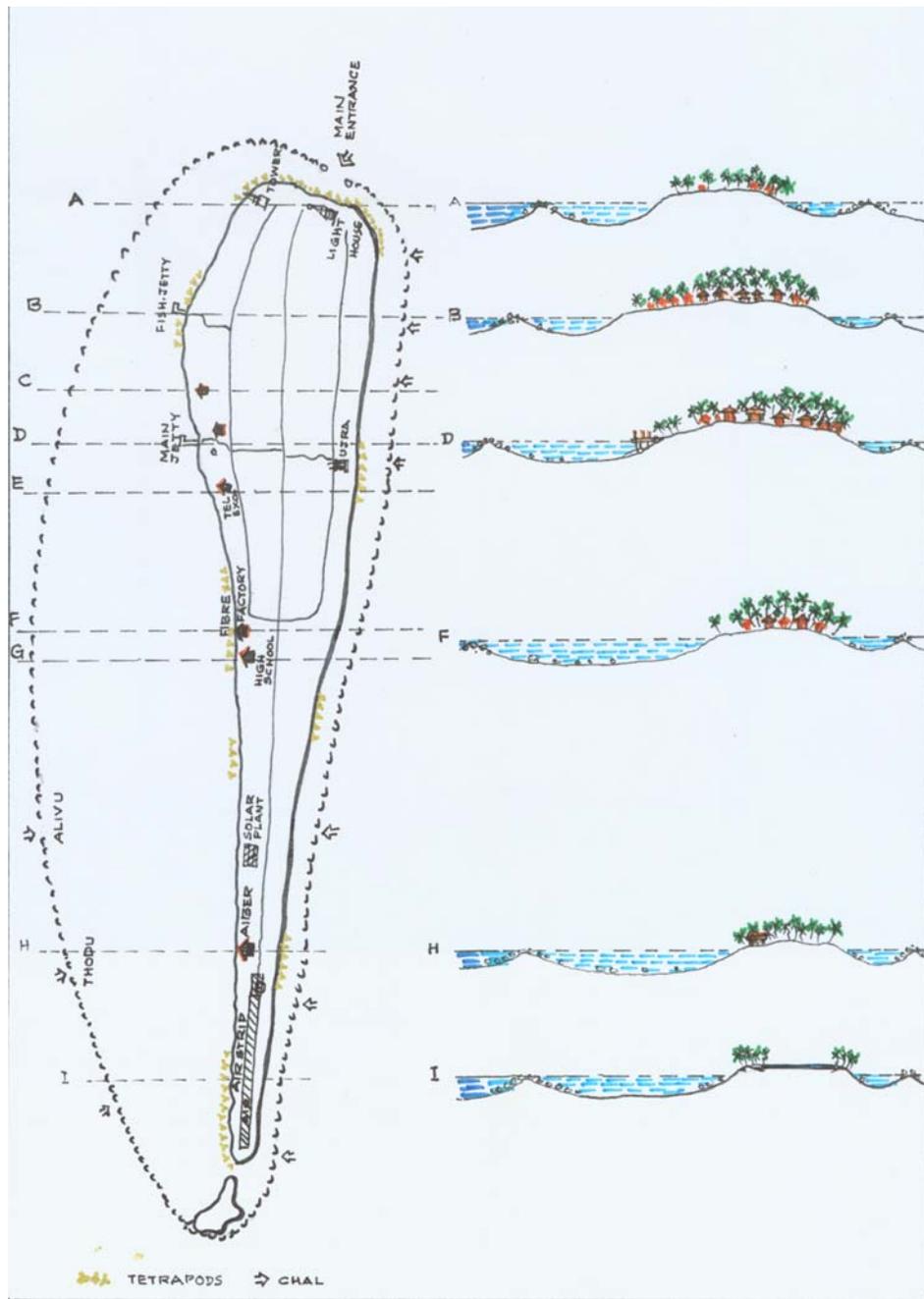
Figure 3.1 Formation of Agatti



How the islands got their names

A story goes that once while king Perumal (the last King of Kerala) and his courtiers were exploring the islands, they were pursued by a sailing craft that ran aground a reef. They named this reef Perumal Par after the King. Tired, hungry and exhausted they continued to row till they reached a small island where they stopped and had lunch and they called it Tinnakara,- which mean a land to eat. From Tinnakara they spied three more small sand banks, that they named Paralli I, II and III. They camped the night in a beautiful teardrop shaped island that they named Bangaram. There were a great number of coconuts lying on the ground and they felt frustrated since they had no knife to break them open. Looking around they noticed a fairly big island further south of Bangaram and one of the courtiers looked and thought surely they must be people residing their and must have a knife and he said in Malayalam Aah Kathi... And ever since then the island has been called Agatti. (B.Moosa Koya: 2001).

Figure 3.2 Agatti Island and Transect sites



1. Ecology and Economy

The Agatti Islanders draw resources from three natural ecosystems. These are the Land Reef and Lagoon and deep sea. Traditional economy of the people of Lakshadweep revolves around coconut grown on the land and fishing in the lagoon and ocean. The reef provides protection to the island and its economy and the corals that built the island also provide building material for house construction for the islanders.

Land

Agatti is located at 10°51' North latitude and 72°11' East longitude. It is the western most Island in the UT of Lakshadweep. It has a total area of 2.7 sq kms. The island is elongated and is 7.5 kms long. The width varies as we move North to south. It is 1000 meters at its widest point in the north part of the island and tapers of to almost as little as 100 m width in the south. We can get an idea about the land its topography and resources from the transects (Figure 3.2 and Appendix 3.1).

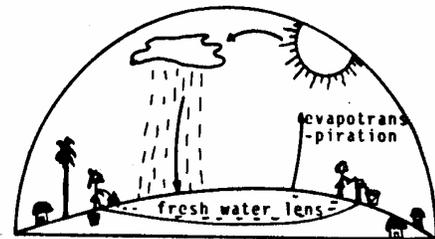
The island is flat and rises around 2 meters above the sea level. The southern portion consists of a long narrow stretch almost two km long and an average breadth of 100 mts. An airstrip has been built in this stretch in 1987. Kalpitti lies further south and it is separated from the airstrip by a shallow strait of about 200 meters. It is possible to walk to Kalpitti on very low tide dates.

The area of human settlement in Agatti is most concentrated in the northern portion. Transect sites A-E. The whole of the island is planted with coconut trees and the southern portion has some Casuarina trees. There are a few neem, papaya and breadfruit trees as well. A rich coconut grove locally referred to as a 'kaadu' (forest) lies on a depression, towards the northeastern side of the island lies. This depression is man made and earlier was used for cultivation of cereal crops. There is a big banyan tree in the centre of the island. This is located next to the Golden Jubilee Museum. Storage place is limited and piles of construction materials, sand, bricks from the mainland, coral shingle, boulders and sand can be seen in piles all over the island. Tetra-pods are used to prevent sea erosion around the airstrip and the northern part of the island.

Ground water

Figure 3.3 - The Hydrological Cycle

Freshwater resources are limited. The hydrological system is extremely fragile. The water is contained in a freshwater lens 1.5 m. below the surface. The water is periodically renewed by rainfall. Conserving and protecting it from pollutants is very important. It will be very expensive to replace this resource, if depleted.



The islanders allow a water plant to grow in the tanks and wells to ensure that the water remains clean.

Lagoon

A beautiful lagoon where various types of corals and multicolored fishes are found in abundance encloses the Western-side of the island. The reef forms an ellipse eight km in length and 5 km in breadth. Along its eastern arc and lying slightly north east and southwest is the island itself.

The surrounding reef has three natural main entrances, namely:

1. Aly (Main entrance) in the northern end. This serves as the main passage for boats plying between the passenger ships and Jetty.
2. Balliya Alivu (Centre of Western reef). This serves as a passage for cargo vessels (Manjus and Barges).
3. Thodu (South West reef): used by small crafts and boats to enter.

A narrow and shallow lagoon lies on the eastern shore of the Island it extends further south to surround Kalpitti and joins the Western reef. The eastern reef can easily be

reached by walking from the shore. This is therefore the most trampled area by reef walkers and gleaners.

The eastern reef has 6 small natural and man made channels called shals or chals. The chals are important since these are points where the fish shoals enter and leave the lagoon with the tidal change. These chals are therefore favored reef fishing spots for net operators and are used by the fishermen during the monsoon season. Each chal is named after a mosque or an important event that occurred at that spot for e.g. a boat capsized at the SE reef carrying people from the Balliya illam house. This chal is named Balliyaillatha Makkala chal (SE).

Agatti is remarkable in that it has no storm beach. The eastern shore is composed of sand rising from the level reef flat, which is well exposed at low tide. To the south separated from the main island by a narrow channel is the small uninhabited islet of kalpitti. The storm beach can be seen in the south and western part of Kalpitti that is strewn with coral shingles on the exposed bedrock. According to Syed Asraf (Asst Head master) the coral growth on the southwest is strong so as to protect the islands from the southwest monsoon.

Bangaram, Tinnakara a Parelli

Bangaram is located at 10°56' North latitude and 72°17' East longitude. Bangaram island with its idyllic palmgrove back drop lies 8 km North East of Agatti. The island has a very large and beautiful lagoon. There is a semi-circular bay in the eastern point of the island which serves as a ideal place for swimming. The surrounding reef has three natural entrances:

1. Muli Aliv – the main entrance lies to the South.
2. Kuliylia Bander – the main entrance in the West
3. Mand Aliv – lies in the west

Figure 3.4 Bangaram Island and Transect Sites

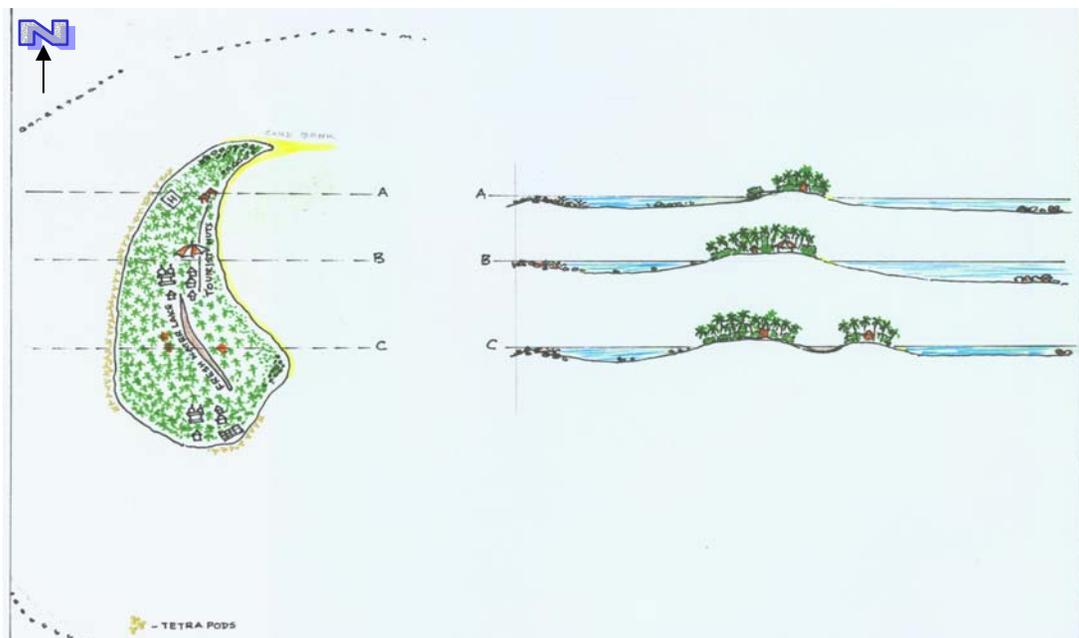


Figure 3.4 shows the island of Bangaram and the main transect sites. The Helipad lies to the north of the island and the Bangaram Island beach resort is situated close to it. The beach resort has 30 twin cottages situated along the eastern shore. Transect A: The Jetty, Reception, Dive center, Bar and dining facility lie in the middle of the resort area.

There is a small brackish water lake called Fuller in the center of Bangaram. This lake serves as a refuge for several types of water Birds such as herons and storks. Rows of tetra pods and cement blocks can be seen around the Helipad, near the solar panel site and along the western shore. These anti erosion measures make it very difficult to walk around the island and detract from the serenity and beauty of Bangaram.

Bangaram was the first uninhabited island to be developed as an international tourist destination. The resort supports a dive center. To the south of Bangaram and within the lagoon lies a small Pitti-sand bank. To its east about 2.5 km away is Tinnakara and further east is Parali 1 and 2. A sand bank connects these islands during the dry season. Parali III was washed away in 1976 during a big cyclonic storm. The coral reefs close on Parali the eastern shores of which is the only portion that is open to the rigors of the high seas.

The lagoon surrounding these islets is the favorite turtle hunting ground of the Agatti men. Two kinds of turtle are found – the green turtle and the Hawksbill. The green turtle used to be killed for its fat but is now a protected species.

Perumal Par

26 km North West of Agatti Island lies Perumal Par. This is a reef enclosing a lagoon. It is a very important Tuna bait fishing ground. The fishermen from Agatti go to this lagoon and reef only during the fair season from October to April. The reef is dangerous as it is barely visible during high tide and calm seas. Tradition has it that the reef got its name when the sailing craft pursuing the Perumal King of the west coast wrecked on it (Ramunny, M:1965)³

Tuna Fishing boats travel between Agatti and Perumal Par on a regular basis during the fair season. It takes roughly 2.5 hours to traverse the 26 km distance. The reef is very big and it takes around 2 hours by a Tuna fishing boat to circle Perumal par. There are two small natural entrances through which one can enter into the lagoon.

There are four Pitti s or sand banks within the lagoon.

1. Thekkila Pitti (Main sand bank)
2. Vadakila Pitti
3. Kadmathala Pitti
4. Amin odam meena pitt

Each of these Pittis or sand banks lie about 10-15 minutes by motor boat from each other. A Government of India Emblem is located on the North Western side of the Perumal Par reef.

Bar area

The Bar area is the reef area that slopes towards the deep sea. It is about 20 meters wide. There is a great variety of species of fish and corals found in this area and it is favored by the reef fishermen and harpooning experts. (Figure 3.5)

On the leeward side the reef slopes into the sea. The first plateau is found around a depth of 5-6 m. The second plateau with the sandy patches is found around 25m – 30 m

³ Ramunny Murkot:1965, Atlas of The Laccadive, Minicoy and Aminidivi Islands, Lakshadweep Administration, GOI

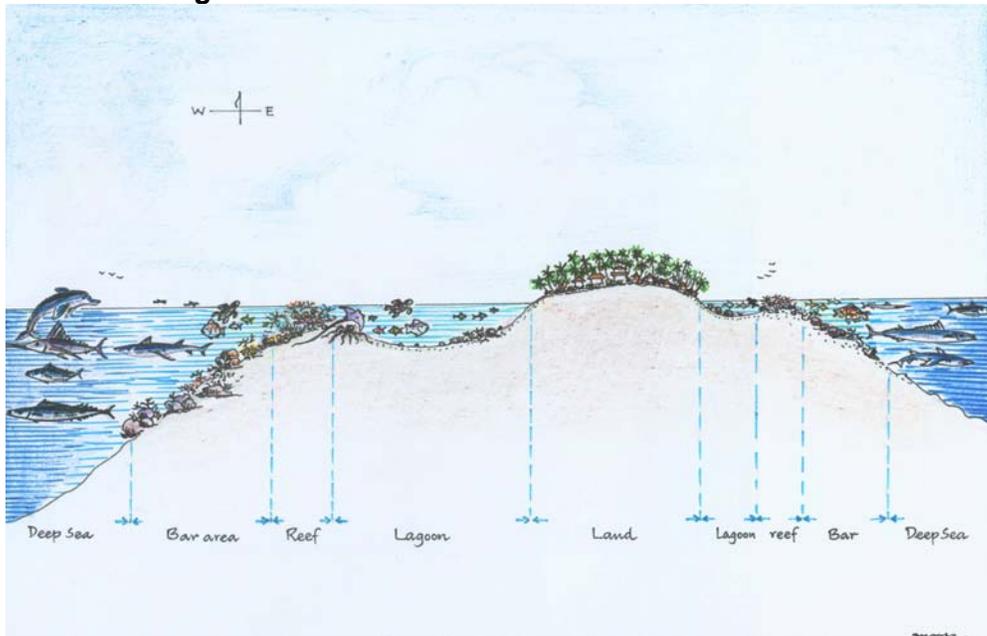
(Andreas: 1997⁴). This area is locally called the bar area, where one can witness the variety of the coral formation in all their glory and species variety. The fishermen favor this bar area, for harpooning and spearing specific kinds of Rays and big fish. This bar area is around 200 m around the reef.

During high tide water exchange takes place between the lagoon and the open sea over the reef. The lagoons have sand bottoms with scattered coral boulders and pinnacles followed by extensive sea grass beds at the landward side.

The lagoon opens to the sea through one or more natural entrance points. These are natural breaks in the reef that allow boats to ply between the ocean and the lagoon.

There are other small shallow entrances, locally known as chals. The chals are important since these are the points where the fish shoals enter and leave the lagoon with the tidal change. They are therefore favored reef fishing spots for net operators and are used during the monsoon season.

Figure 3.5 A Cross-section of The Reef resources



Coral reef Biodiversity

The Lakshadweep archipelago consists entirely of coral reefs the most diverse of all marine ecosystems. Coral reefs are known to host many levels of biodiversity ranging from planktonic organisms to sharks. The dominant species on reefs are corals and fishes. During the past nine decades, The Central Marine Fisheries Research Institute (CMFRI), the National Institute of Oceanography and The Zoological Survey of India (ZSI) have undertaken several studies in this region. The ZSI carried out extensive surveys in 1982-87 and in 1991, published a volume on the fauna of Lakshadweep. Similarly the CMFRI carried out a survey from January to March 1987 to study the fishery potential which culminated in the publication of a special issue on Lakshadweep (CMFRI bulletin 43, 1989).

⁴ Personal communication with Andreas Heidman in September 1997

The coral fauna of Lakshadweep is known to harbor a total of 105 species divided among 37 genera (Pillai: 1996). Rodrigues (1996) has recorded 29 new records for species in Lakshadweep (annexure: 3.1). His study conducted in 1993 was mainly concentrated along the reef flats within the Agatti lagoon. He reports that the corals on the Agatti reef flats are dominated by *Acropora* spp, *Pocillopora* spp., *Porities* spp., and massive and encrusting favids. *Psammocora* spp is common in the northern islands. There is a profusion of blue coral (*Helipora coerulea*. *Millepora* spp) which forms the dominant element in the lagoon. (Pillai 1996). Eighty six species of macrophytes, ten species of Anomuran crabs, eighty one species of Brachyran crabs, 155 species of Gastropods, 24 species of Bivalves, 13 species of sea stars, six species of brittle stars, 23 species of sea cucumbers, 15 species of sea urchins and 120 species of fish are found in the Lakshadweep (Rodrigues 1996). A list of fish found in Lakshadweep is attached in annexure: 3.2

The green turtle and the hawksbill turtle are also found in all the Islands. They graze on the sea grass beds and frequent the bar area and lagoon area.

There are many symbiotic relationships between reef animals. Even though there are many kinds of organisms on the reef, there are not large populations of any one kind. Hence species of fish, mollusks and crustaceans, which are favored by islanders, are vulnerable to over fishing.

There are several types of primary producers in the coral ecosystem. The zooxanthellae live symbiotically with the coral polyps, take up their nutritional requirements from the coral excreta and translocate nitrogen back to the corals in a quick re-cycling process of about four hours. Borrowing filamentous algae and calcareous algae are also associated with the corals. The latter are secondary frame builders in the reef. Benthic macroalgae like the sea grass are the most prolific primary producers.

The ocean

The ocean contains substantial living and non-living marine resources. Sharks, rays as well as a large number of food fishes such as tuna, seer and halfbeaks move about in shoals and frequent these waters.

Agatti, Bangaram and Parali and their enclosing reefs lie within the Arabian sea. Agatti has an access to a large extent of territorial waters of the Arabian sea. The fishermen of Agatti conduct their deep sea fishing activities in these waters. They normally circle the deep sea area around each of these small islands and Perumal Par and rarely travel more than 25 km radius from the islands.

Climate:

These islands have a tropical humid, warm and generally pleasant climate. The climate is equable and no distinct and well-marked seasons are experienced. The south west monsoon period is the chief rainy period which lasts from late May to early October. The temperature starts rising in February and reaches its peak in April-May. The average temperature of Lakshadweep ranges between 24°C to 31° C. The air is humid throughout the year and the relative humidity is approximately 70-75%.

The islanders divide the climate of Lakshadweep into two seasons: The fair season and the monsoon season.

Fair season

The fair season lasts from October to April. The seas are calm and the tuna shoals move towards these islands. Skies are clear and temperatures warm (30°C). There is very little rainfall. These six months are the most important period of the islanders life and the island economy. Everything happens in the fair season. It is as if everyone wakes up from

the long monsoon slumber and the islands are a hive of activity. Children can be seen playing and swimming in the lagoon. Fishermen rise early in the morning before dawn and go out to fish. Fishing trips can last as long as 14 hours. Copra and fish are seen drying in all the available spaces throughout the island.

The main activities in the fair season are: Deep sea tuna fishing; Fish processing, drying fish and copra, and Construction work

Monsoon Season

The monsoon season lasts from May-September. Very little productive activity can be observed in the islands in this season. It rains most of the time and the islanders remain indoors. They gossip, rest, pray, watch TV and go about the daily round of activities of domestic work and child care. The monsoon season is a very difficult time for the islanders and it is the time they feel their isolation the most. Bad weather can result in the cancellation of scheduled flights and ships. Very little fresh food is available in the islands. Fishing is restricted to the lagoon and the catch is limited.

Community Services

a. Drinking Water

Since fresh water is limited in all these islands the government is encouraging rain water harvesting. The Lakshadweep Public Works Department provides plastic (Syntex) tanks to all the interested residents. So far 80 households, have availed this scheme.

Organised Piped water supply is not available and hence the people have to fend for themselves. The people tend to use well water and boil and drink this water. Every household has a well. Until 1990 the people used to hand draw the water from the well. Now nearly every house has a 1.5 hp pump to draw water from the well which supplies piped water to the kitchen and toilet.

b. Ration cards

Presently 1,430 ration cards are in circulation, with 109 special cards for the casual labor brought in from the Tuticorin and Virudhunagar districts of Tamilnadu, for construction work. The special cards are given for a maximum period of 6 months and the responsibility of procuring these cards, and the housing of these laborers, lies with the contractors from Agatti.

c. Religious services

There are 49 Mosques scattered all over the island that provide a place of worship to the entire population of Agatti. The Juma (Friday) prayers are performed in two mosques called Juma masjid. On Fridays the fishermen can go fishing only after the afternoon prayers have been completed.

d. Educational services:

There are altogether six educational institutions which include one High School, one Senior Basic school, three Junior Basic School and one Nursery school. All schools are co-educational.

The High School at Agatti has an old history. It began as a Primary school in 1878 during the days of the British rule. This primary school was upgraded to, Senior Basic School in 1958-59, when the standard VI was introduced. In 1972-73 it was upgraded to a High School.

A unique feature of the school syllabus is that Fishing Technology and Tuna Fishing methods is included as part of the curriculum

Religious education is provided by five Oathapalli (Madrassas) and one Markez (tuition Centre). The Madrassas focus on providing religious education and teaching the children Arabic so that the children can read and understand the Koran in its original text. The Markez serves as a tuition center for weak students from both the Madrassas and regular schools

An orphanage is also functioning in the island and provides a home to around 30 orphans. These orphans come from all the islands of Lakshadweep.

e. Health Services

A community health center has been functioning since 1998 with the minimum required medical facilities. This is currently being upgraded into a full-fledged 30-bedded community Health Center. The community health center provides health care facilities for persons suffering from ordinary diseases like diarrhea, fever and colds.

The serious cases that cannot be helped at the CHC are evacuated to either Kavaratti or mainland by helicopter. The medical health center runs awareness programmes for preventable diseases and focuses on cleanliness of surroundings and sanitation.

f. Care for Elderly and Children

There are no formalized Care institutions in the Island. The Joint Family system provides, the safety net for elderly, children and unemployed members. Traditionally women have always provided the care for their family members and it is not uncommon for them to take care of their elderly and children themselves.

g. Sewage

Every house has a toilet in Agatti. These toilets are connected to a double compartment septic tank. One compartment stores the fecal matter and the water passes into the other compartment and percolates into the soil. There is no direct sewage pipe to the lagoon or sea. The dry and decomposed fecal matter from the sewage pit is finally buried in the beach by the side of the lagoon.

h. Electricity

Agatti was electrified in 1968-69 with a 29.6 KV diesel generator. Now all the houses are electrified. Electricity is provided from diesel generation. At the peak level of demand, 475 KW of electricity is consumed. The Generator capacity is 1140KW and there are 222 street lights, 35 solar lights. The High Tension lines are underground and cover 7.5 km, while Low Tension line covers 17km underground, and 5km overhead line. The diesel is stored in barrels on the ground. This sometimes spills on the ground and enters the fresh water lens. Since diesel storage is causing some water pollution the electricity department has now set up a Solar Power plant at the south side of the island. This will help minimize the heavy load being carried by diesel generators.

i. Marketing

Private

There are around 38 privately owned stores in Agatti, these are multi purpose shops and carry good such as provisions, milk powder, soft drinks, candy, snacks and stationary. There are two photo studios and one shop with photo-copying facilities. There is no medical shop and medicines are supplied at the health Centre or purchased from the mainland.

Co-operative Societies

The Co-Agatti island Co-Operative Supply and Marketing Society Ltd was first set up in 1962, to facilitate the islanders to buy provisions and rations and other essential

commodities at a fair price. All the members of the island are members of this society. It has been linked to the Lakshadweep Co-operative Marketing Federation (LCMF) which is its wholesale outlet unit. It is also the mediator between the islands and the NAFED, the later fixing the rates of copra. Presently the rates of copra, fixed by NAFED are Rs. 3,250 per quintal. People can exchange copra for provisions (general as well as consumer electric appliances) on subsidized rates. Most people prefer this exchange while a few sell for direct cash.

The society has more than 5,000 members but not all sell their copra through the co-operative. Those with good mainland marketing contacts prefer to sell it directly to the mainland. However 99% copra is sold through the society.

The issue of building materials on subsidy was started in 1999. The table below shows the amount of purchase.

Table 3.1 Construction Materials imported from the Mainland			
Item	Price/unit	Sale Mar 1999-2000	Sale Mar 2000-2001
River Sand — 30-45 kg bag	Rs. 10	11,879 bags	30,811 bags
Jelly (granite) 30-45 Kg bag.	Rs 20	15,354 bags	40,090
Cement- 50kg bag not subsidized	rs. 195	5,449 bags	8,002
Iron rods – not subsidized	Rs. 22-27/ kg	----	8mm- 990 kg 12mm- 1,010kg 10 mm –1010 kg 6mm – 1,016kilos

The sources in the society, on an average 100 people have built the new kinds of houses in Agatti.

j. Workshops

There are four motorcycle repair shops and one bicycle repair shop. There is one sawmill, six furniture-making units, one barbershop and one pickle production center.

k. Hospitality

There are around 11 teashops, where one can sit and have tea and snacks through out the day. They close from 1-3 Pm. Two of them also serve lunch and dinner on demand basis. There is one 4 bedroom lodge that charges Rs75 per day per person. This lodge is in the center of the island. It is basically four rooms on top of a shop and is located close to the Government Dak Bungalow. All these teashops and lodge are run on personal initiative and are privately owned by islanders.

l. Bank and Post Office

The Syndicate bank is the lead bank in Agatti. It is functioning since 1976 and as yet has 2500 savings accounts.

A post office is located close to the bank, people can also use the post office for sending and receiving money orders.

m. Communications

Telephone

This Island is well connected with Telephone services and Direct-dialing facilities both International and National can be made. The Government offices mainly have Inter Island dialing facilities and only the Additional Sub Division officer has national direct dialing service connection. There are 743 domestic and 64 Government office telephone subscribers. 85.4 % of the households in Agatti have private phone connections. Most of the domestic connections have removed the national and International direct dialing service facility, since these calls are expensive. There are 5 telephone booths in Agatti from where people can make long distance calls.

Internet and Fax

There is as yet no direct Internet access in Agatti. The only Internet access is through the government departments and is mainly used for official purposes for connecting all the government offices with Kavaratti. Fax is also used for this purpose.

Ship to shore Radio Communication

A police radio set and wireless communication is used for communication between Agatti and Bangaram. The Port office is in charge of the Mother-set and receive all communication and further pass it to the responsible person or department for further action.

The Port office has a multi channel facility and the Agatti Island beach resort and Bangaram resort have single channel base sets so that they can communicate directly with their own boats and personnel.

The new fishing boats that are being issued by the Fisheries Department are now fitted with these wireless handsets and so far two fishermen have this facility on board.

n. Transportation

Marine transportation

in road that is approximately 5 km long and connects the Island from the Northern end to the Airport. The west side road is 4 km in length . It starts at the communication tower in the north and meets with the middle road near the high school. There are 5 passenger cum cargo ships that serve Agatti island and connect it with mainland and the other islands. The ships MV Bharat Seema and MV Tipu Sultan connect all the islands with the Kochi once a week throughout the year.

MV Dweep Setu, MV Amindivi and MV Minicoy connect the islands with mainland only in the fair season- September to April. The introduction of Aminidivis and Minicoy in 2001 has improved the frequency of travel between the islands and mainland.

In 1992 two Inter-Island ferry vessels MV Kadeeja Beevi and MV Hameedath Be, were introduced. They connect all the islands with Kavaratti once a week.

Some private entrepreneurs ply their boats between the islands as taxies during the fair season. They charge the passengers around Rs.200/ each way.

The Shipping Corporation of India also manages one oil barge and three cargo barges to bring cargo to the islands.

There are two motor sailing vessels called 'manjus' owned by private operators, which carry cargo for the islanders. Manjus have replaced traditional sailing vessel called 'odam'. The manjus transport island produce such as mass-min, coir and copra. In return they bring back essential food commodities and consumer goods, which are sold in Agatti shops. These manjus help in keeping up trade between islands and mainland.

There are 4 cargo barges for transportation of Government Cargo which includes, provisions, stationeries, furniture, construction materials such as bricks, sand and jally and fuel (diesel, kerosene and petrol).

Air Service

An Airport started functioning at Agatti in 1988. Air passengers from Kavaratti can avail helicopter service to fly to Agatti in time to catch their flights. These helicopters also serve as the inter-island and island-mainland ambulance service.

Road Transport

There are three concrete roads in Agatti. The east road is 4 km long and traverses the island from the lighthouse in the North to the high school junction where it meets the middle road. The middle road is the main

There are four link roads that run west to east and connect with the N-S roads. Besides this there are several walking and cycling tracks criss-crossing the island.

At present in Agatti bicycling is a common method of road transport. Both girls and boys bicycle to schools.

As the society became more affluent there came a demand for motorcycles. At present there are 396 two wheelers.

33 three wheelers or auto rickshaws provide a taxi service and 7 tractors can be hired for transporting heavy loads.

Government offices own 9 jeeps, 2-ambulance 54 power tillers 1 Tractor 9 tempos and 2 fire engines.

o. Government Subsidy

Owing to the remoteness of Lakshadweep and the high cost of transportation most things are provided to the islanders at a subsidized cost. The Lakshadweep Islanders are regarded as a scheduled Tribe population, which also entitles them to subsidies and free education and health care services. This can be regarded as a service to the island community.

The Lakshadweep Administration provides rations (cereals, sugar, palm oil and Kerosene) at subsidized costs to all the islanders.

To encourage more youth to take up Tuna fishing as a profession, the department of fisheries provides a 20% subsidy towards the cost of a Tuna fishing boat and a 33 1/3 % towards the cost of a boat engine.

Ship transport from mainland to island and inter-island is subsidized.

Schools are government run and are free of cost. The Health care is subsidized and electricity charges are subsidized.

Chapter 4: How the Islanders interact with the Reef

The islanders draw resources from the land, the lagoon, reefs and the deep sea. The reefs and lagoons provide the islanders with their basic energy needs. These include construction materials, food and cash income. Fishing and coconut cultivation is the mainstay of the economy and is an important source of protein. Scuba diving tourism is an emerging industry. Fisheries comprise commercial fishing in the deep sea and subsistence fishing in the lagoon using a variety of traditional methods. The island households use all the ecosystems within their vicinity but they put nothing back in terms of management of these free natural resources.

History of fisheries development

The planned development of fisheries in Lakshadweep started with the inception of the department of fisheries in 1959. In those days the main sources of income was from coconut plantation even though a vast sea around these islands with promising income was available. In order to enhance the fishing potential of the islands, the department systematically trains fishermen towards commercial deep sea fishing. The idea is to enhance the catch with modern technology. Fishermen from Minicoy, who were masters of the traditional Pole and Line fishing of Tuna were brought in to train fishermen in other islands. The department provides training and a 30% subsidy for purchasing diesel and mechanized fishing craft. They have also tried to popularize hand held radio sets and GPS on the fishing boats. Fishermen of the islands are said to have resisted the ideas of fishing with motorized boats, etc. in the initial stages, saying that these would scare away the fish. Today the fishermen attach outboard motors to their country craft. After an organized effort of two decades the total fish landings has increased from 500 tonnes (for the entire Lakshadweep) in the 1960's to 2276 tonnes in 1998 in Agatti Island alone.

The Traditional fishing areas of Agatti Islanders include, the submerged bank Perumal Par, the lagoon and waters around Bangaram, Tinnakara and Paralli. The usufruct land rights of the people correspond to the areas of fishing.

The folk tales and songs reveal that the islanders did fish in the lagoon and outside the reef. The earlier fishing activities were subsistence-based and commerce was limited to selling tortoise shells, cowries etc. The traditional craft and gears used, took long hours, required teamwork and skill for an operation. Every able-bodied male was involved in fishing. The fish caught was shared equally amongst all the team members who rowed the boats and hauled the nets. An extra share was given to the owners of the boats and nets and other gear. “ Earlier when fish were plentiful and inhabitants were few, the fishermen would share and distribute fish to any one who required fish. These days they sell the extra catch.”

The traditional crafts for fishing were mainly constructed out of wood and were carvel-built. The wooden planks were fastened together and fixed to ribs with coir yarn. The rudder (made of wood) is detachable and removed when the craft is hauled up on to the shore. The commonly used craft are named according to the number of oars used. Thus there are –

Ettuvali thoni/ ettuvalikinathu – with 8 oars

Aruvali thoni/ aruvalikinathu – 6 oars

Naluvali thoni/naluvalikinathu – 4 oars.

All these crafts were used in the open sea. They also used a raft made up of 4-5 logs tied together called the *Tharappam* for Octopus fishing and handline fishing within the lagoon. These crafts are still used, though very minimally.

Reef related Activities

Reef related activities comprise of fishing, reef gleaning, and water sports. We can distinguish two types of fishing activity - fishing for subsistence consumption during the monsoons, and fishing for commercial purposes during the fair season.

Each activity is described below in terms of gear used, gender, local perceptions of resource availability, traditional knowledge and customary practices in resource sharing.

A. Subsistence Fishing

The various types of fishing in Lakshadweep are listed by terms of gear used :

1. Beesh Bala- Cast Net

Name of Net	Diameter (meters)	Mesh size mm
Manakatha bala	3.5	55 45 30
Kananchena bala	3.75	70 60
Kalmoodsal bala	1.5	45 30 15
Chariya Bala	3 π	40

This is an age-old practice. The net is operated by a single man. The left hand holding few portions the right hand thrown in such a way that it totally spreads and fall on the shoal. When it is hauled up sinkers bunch around and form a pouch at the bottom. When operated inside the lagoon near the reef area operation is done from the boat "odams" or a raft. 1-2 persons are needed to row the boat. In this case the catch will be divided among the persons, boat and net.

The *Beesh bala* is a conical shaped net with a rope on the top and sinkers attached around the perimeter. The mesh size decreases from the

center to outer circumference. The net is operated around the year both day and night. Since the species to be caught vary with the seasons and timings different sizes of cast net are used. There are several types of cast net classified according to the mesh size. These nets are also named according to the type of fish caught. e.g. *Mannakatha bala* (Goat fish net) and *Furachi bala* (whip fin Majjara net). The gear was indigenously made with cotton twine till the mid 70's. Cotton twine has been replaced by nylon since nylon is more durable and does not need to be dried in the sun after each operation. Around half a kilo of nylon twine costing rupees one hundred and fifty is used for making this net. Cast nets are not expensive and each of the 870 households in Agatti owns a *Bala Beesal*, however on a daily basis only 5-6 people operate these nets. The approximate catch size per operation is 1 kg. The most commonly caught fish are carangids and goat fish.

Share: When a single person is involved he keeps the total catch. When more than one person is involved the catch is divided equally between the people and the gear owners.

The fishers practice a space sharing etiquette while using the cast net at any given fishing site. The cast-net fishermen explained that *Mankkam* generally

The mesh size decreases from the center to outer circumference. The net is operated around the year both day and night. Since the species to be caught vary with the seasons and timings different sizes of cast net are used. There are several types of cast net classified according to the mesh size. These nets are also named according to the type of fish caught. e.g. *Mannakatha bala* (Goat fish net) and *Furachi bala* (whip fin Majjara net). The gear was indigenously made with cotton twine till the mid 70's. Cotton twine has been replaced by nylon since nylon is more durable and does not need to be dried in the sun after each operation. Around half a kilo of nylon twine costing rupees one hundred and fifty is used for making this net. Cast nets are not expensive and each of the 870 households in Agatti owns a *Bala Beesal*, however on a daily basis only 5-6 people operate these nets. The approximate catch size per operation is 1 kg. The most commonly caught fish are carangids and goat fish.

Common name	Local name	
Carangids	Bangada, Kuluval	36%
Goat fish	Manakkam	18%
Whip fin Mujjara	Furachi	13%
	Bacchala	13%
Half Beaks	Mural	10%
Mulletts	Thidhira	5%
	Walmeen	5%

abound in the western lagoon near the tower, the jetty, on *Kunthalpara*, *Parape*, and such places. *Kannachenna* (Carrangids) shoals enter the lagoon through *Chals* or shallow entrances of the eastern reefs in the beginning of high tide and move out during low tide. They move northwards, southeast and south west of Kalpitti. *Thithira* (Mullet) occurs at the entrance of the *Sheikhinna palliya chal* and move northwards. *Furachi* can be caught on the eastern side of the reef and western side of the jetty. *Kuluval* occurs in Parape, near the sea-shore

The fish shoals can be caught while they move together as they enter with the high tide or when they leave with the low tide. The fishermen consult the tide. If the expected time is 7 a.m, the cast net fishermen will come to his standing place at the *chal* an hour earlier. He will then stand and wait for the shoals to appear and cast his net and catch the fish at the appropriate time.

Since there are limited number of *Chal* or entrance points on the reef, there can be a problem if more than one fisher wants to operate at the same *Chal* at the same time. The customary practice is first come first served. The latecomer is required to find another place to cast his net and if all are occupied he must return without fishing.

40 groups are in this activity. Permit used to be obtained from the *Amin* in the past, who now plays only a ceremonial role

2. *Adi Bala - Shore seine/ Bala Adiyal/beach seine*

The operation is termed bala adiyal. This is a rectangular shaped net. It is operated by 2-4 people and is operated throughout the year near the shore. The nets dimensions are length 15-20 m; width 2-3 m and mesh size 15-25 mm. The operation is carried out during the tidal changes, as it is known that small fish come to shallow water when the tide changes. The fishermen stand on the shore and shoot the net in the form of an arc and haul it back to the shore. Towards the final stages of hauling the footrope is manipulated in such a way that it reaches the shore prior to the head rope in a dragging action and never rises from the bottom.

The catch size is around 8kg/operation. Carangids form 23% of the catch. The total catch is divided into equal parts between the persons involved in the operation plus the net: e.g. if 4 persons are involved total catch is divided 5 equal parts as the net owner gets one extra part. There are 80 such units/net operators in Agatti. However only 5-10 fishermen operate in the lagoon on any particular day.

Carangids	Bangada, Kuluval	23%
Whip fin Mujjara	Furachi	16%
Goat fish	Manakkam	15%
Half Beaks	Mural	13%
	bacchala	10%
Remona	Reesam	7%
Rabbit fish	Onam	7%
Gar fish	Oola	5%
Mullet	Thithira	2%
	Balmeen	2%

The understanding between the fishermen is that they should leave 30-50 meters between two operators. Therefore if one is operating his net no other party will come to operate the net at the same site. In this way conflicts are avoided.

Before the 1970's the nets used for this operation were made on the island, later they were bought from the mainland or supplied from the fisheries department on a subsidy.

3. *Bala Fadal, Chandelle - drag net*

This is an indigenous gear and the operation is known as *Bala fadal*. This is also a rectangular shaped net but larger in size than *Adi bala*.

Dimensions: length 20-40 m, width 2-3 m, mesh size 15-25 mm. Nowadays the mesh size has reduced to 5-6 mm.

6-20 sets of *olabala* are also used in this operation. An *olabala* is a fish scaring device and comprises of coconut fronds attached to a 15-20 m long rope. Operation involves 25-30 persons (male) and is operated only during the monsoon in the southern side of the lagoon near Kalpitti and occasionally in the northern end. : the team is divided into two groups. One group stays at the shore and spread out the *chandalibala*. The other group shoots the *olabala* over the reef forming an arc. The fish around the reef get attracted to the *olabala* and swim towards it. The team then pulls the *olabala* towards the shore and the fish swim along until they reach the shore. Here the net operators quickly circle the fish and haul them up. This operation is carried out approximately thrice a week. There are two units of this size on the island. Only one unit operates the *Bala fadal* at a time. The average catch per operation is 250 kg.

Sharing: the fish are equally shared among the operators with two shares each for the owners of the *chandalibala*, boats and *olabala*.

Marketing: The extra catch after taking the required quantity for consumption is sold at the place of landing. The price is around Rs.10 per kg.

Fish Species	Local Name	Percentage
Snapper	Metti, phulariyam	41%
Carangids	Bangada, Kuluval	16%
Parrot fish	Shandi	15%
Unicorn	karakam	6%
Surgeon fish	Neithala	6%
Trigger fish	palli	6%
Remona	Reesam	5%
	Thombu	5%
Gar fish	Oola	5%

4. *Edenna bala-set net*:

These are of two types. Mesh size 12 cm and 14 cm. The nets with 12 cms mesh size are used in specific spaces inside the lagoon. Both the ends of the nets are anchored in the lagoon. Two people (male) operate this net.

Fish Species	Local Name	Percentage
Carangids	Kuluval	40%
Snapper	Metti, Fulariyam	30%
Whip fin majarra	Phurachi	20%
Gar fish	Oola	10%

150 families own this gear, but on a regular basis around 30 families practice. The average catch size is around 4kg. The fish most frequently caught are Carangids and snapper.

Operation: The net is set and anchored within the reef area where the grounds are clear free from obstacles such as branching and boulder corals. These nets are observed morning and evening on a daily basis. The fish entangled or gilled in the net are removed without

hauling the net. The net location is changed if the catch is not good and left in the same place for a week if the catch is good.

5. *Shal Kakal, Chal Kakal – Set Net*

This is a night time operation following tidal changes. They use nets of 12 and 14 cms mesh size.

Operation: The net is set at the entrances *Chals* on the eastern reef for a period lasting 2-3 hours. Two people hold the net at each side, another two people remove the fish that

become entangled or gilled in the net. The net is not hauled to the shore. The catch consist of Red snapper and Reef Cod – *Shammam*.

About 8 to 10 groups indulge in this activity during the monsoon season. As in other net practices, setting the net is on first come first served basis. If all the entrances are occupied by *shal kakal* operators the late comers have to return without placing the net.

The Amin used to grant permit to one group for placing their nets in the lagoon but now there is an understanding between the groups as to who would use which zone for fishing.

6. *Kal moodsal*

This is a simple fishing activity mainly done by children and adults during low tide times throughout the year within the shallow eastern lagoon. Small groups consisting of 3-5 persons, irrespective of social status, education, age or gender, normally carry it out during bad weather season for household consumption. The gear used is simple and consists of one small type of cast net, leaf bag and plastic slippers.

First they select a place where there are many dead coral boulders and fish inside the lagoon. The boulders are covered with a net and disturbed. The fish swim out of their hiding places and are entangled in the net covering the boulder. The children then remove the fish from the net and carry them in the leaf bag. They can catch 10-12 small fish or approximately one kg in this way.

Types of fish, *Nilalam*, *Berifad*, *Kavally*, *feesam*, *Kilakam (juvenile Metty)* and *Lattom*. It is normally carried out 10-20 m from the shore toward the eastern reef during low tide..

Perceptions: despite the shaking of corals and trampling on the reef the practitioners say that this work has nothing to do with corals and reef and depends only on dead boulders. The collection is done in bad weather and is equally shared amongst all the operators.

7. *Wounding gear - Harpooning "Chaduvam Fokal"*:

This primitive method of fishing is still practiced in Agatti Island. The harpooning operations are carried out in the *bar area* which is an area up-to a distance of 300 to 500 m surrounding the reef.

Pookoya haji Tithotlam is a 74 years old expert fisherman in harpooning. His sons are tuna pole-and line fishing and regard harpooning as primitive. Pukoya Haji is also adept at shark fishing and cast net activities. Harpooning requires concentration and only one man harpoons at a time. This is a fair season activity.

He continues to use traditional gears such as – *Ulli* made out of iron, and varying according to the kind of fish to be caught. They can be single hook or three-pronged hook. *Kallu*, - a wooden harpoon rod where the iron ulli is attached and *Parava*, - a wooden model of a fish hanging from a rope. He also uses traditional row boats and has a team of 4 other mates who fish with him. The sizes of the harpoon vary with the areas of fishing and the species of the fish caught. They observe the tidal movement and the phase of the moon. Fish such as *Olatin*, abound at 'fatham kalakathite', or at low tide, during '*chandramasam*', during full moon days, on the 14th, 15th and 16th day, and *chandramasam* 27th, 28th and 29th day.



He observes that deep sea fish such as *ayakura* and *olamin*, move with the current, which happens in conjunction with the position of the star- the name of which could not be ascertained. From the position of the star he can make out which side the desired fish will occur since *ayakura* is usually found to the west and *olamin* to the east of the star. In the past, Pukoya Haji caught 30-40 nos. of *ayakura* and 20-30 nos. of *olamin* in a day. Today he can manage only 3-6 nos.

There are 8-10 groups of 1-3 members each- depending on the craft, involved in this activity.

Operation: Fishermen go with a boat *odam* for harpooning. They watch the current to decide on which direction to go. Once the fish is sighted he throws the harpoon, which is attached to a wooden rod. The harpoon pierce the body of the fish and the rod prevents the fish from escaping while it is hauled up. The operation lasts for 4-5 hours. The number of fish harpooned depends on the skill and luck of the fisherman. The most frequently harpooned fish is Seer. Rays and sharks are found less frequently.

Common name	Local name	% Of catch
Seer Fish	(Ayakura)	70%
Sail Fish	(Elameen)	10%
Sword Fish	(Kuthirameen)	7%
Sharks	(suran)	5%
Sting ray	(Thirandi)	5%
Electric ray	(Kotai)	3%

8. Light and sword/knife

This is an indigenous method of fishing locally known as *crappan fokal*. Males carrying a homemade torch and knife carry out the operation after sunset.

Fishermen walk in the shallow water inside the lagoon with the lighted torch (coconut leaves tied together and lit up at one end) and a knife. The fish are attracted to the light and swim close to it. The fishermen take advantage of them and strike them with a knife. The victims are normally *oola* or garfish. Only experienced fishermen practice this method of fishing in the monsoon season.

9. Octopus hunting-Appal Koothal

The octopus is greatly relished by the local people. Octopus are eaten fresh and are dried and sold to other islands where octopus is not easily available.

They are caught all year round, though the intensity is greater during the fair season. One of our key informants Shafi Aliyamada, 34 years old explained that he hunts Octopus with a 6mm (1m) iron rod during low tide in both the seasons. He does this around the reef area and the jetty. Octopus lie hidden in crevices of coral reef, once spotted, it is pierced with a pointed iron rod. As the octopus writhes out of its hiding place the iron rod is taken out of the water with the octopus. In all, 10-20 people are involved in this activity.

Women may catch octopus if they spot them in shallow waters while they are gleaning the reef. Generally young boys like to hunt for octopus. They snorkel out to the favorite hunting grounds and then skin dive looking for octopus. One stays on the surface while the other skin dives and looks for octopus. When they find one they pierce it and bring it to the surface.

10. Handline

Fishing with a rod or hand line is a common practice and pastime for the male population of Agatti island. It is carried on throughout the year but the intensity increases during the monsoon when there is little else to do. The favorite area for longline fishing is the north shore, jetty areas, Thodu and the bar area around the reef.

28 year-old Abdul Rahaman Chakakal is involved in handline fishing while others in his household are into Tuna fishing. His handline consists of a 6" to 1 ft wide wooden board called '*kutti*' to roll the monofilament fishing line on. He uses *thankis*- nylon fibre; *choodal*- a metal hook; *eyyam*- the lead; *erra* – bait fish and worms – a pole made from the cheerani tree or bamboo pole. The main fish caught are *chemmali*, *madthala*, *metti*, *manjam*, *manakkam*.

11. Shark Fishing

Fatahulla Aliyamada is 63 years old and an expert shark fisherman of Agatti. He is the son of the old Kadarakoya Bendayam. Fatahulla was nominated by the administration and worked with the fisheries department. He was appointed in 1962, and promoted to the post of Engine Driver, and retired as Shark Fishing Instructor in 1995. His sons are into tuna fishing, and at present they own 6 boats (3ft., 2 cylinder engine), and represent the better-off families on the island. They also own a special boat for shark fishing (38 ft., 3m wide, 30HP engine)

He explains that the gears used in this activity are long line, locally known as 'bepidal', operated in open seas, by 2-3 persons from a boat.

The gear used consists of a mainline (6mm polypropylene rope- which used to be cotton in the past) and a branch-line (monofilament), hooks and floats. To the mainline is attached the branch line with hooks at one end at certain intervals, and the floats are attached to the mainline at certain intervals to prevent the line from sinking. The length of the mainline is approximately 10cms.

They fish at daybreak, early hours of sunrise and after sunset, during the periods of the waning moon, or new moon- '*karuthavavu divasathile*'.

Fatahulla catches species such as *firuthalayam*, *nayyam churavu*, *maranchuravu*, *fundi churavu*, and so on. The season is September to May.

Generally, 10-20 nos. of shark may be caught in a day (but these days only 1-3 nos. are caught), and 2-5 nos. of olamin. The baits used are generally the tuna head or any other fish and even goat meat which is thrown away. Shark fishing is another area where the vessels of Sri Lanka and mainland vessels have been reportedly interfering; smaller vessels of Lakshadweep are hardly any match.

The fishing areas frequented are *Mankunne*, *Parali*, *Pitti*, *Perumal par*, *Valiyapnniyam*, *Cheriyapanniyam*, *Manjapara*, *Elikalpeni*.

12. Chula bala baitfish net

This is a baitfish net with 2-4 mm mesh size. 8-10 people are involved in this operation. Bait fishing is carried out from middle of the night to early hours of dawn, and the fish they catch are, generally species of *Spratelloide* locally called '*manja chala*' (yellow bait fish), *Hondeli chala*, *madam chala*, *rehi chala* and others. Good baitfish grounds are found inside the Bangaram lagoon, around perumal par and Thodu in the Agatti lagoon.

We interviewed Kunhikoya Aliyamada, (70 year old) and his father Kadarakoya Bendayam, an illustrious fisherman of Agatti, who at 102 years of age, is the oldest fisherman of Agatti today. They are a family of fishermen who concentrate on tuna and bait fishing. They explained that bait fish numbers have



reduced about 30 years ago when they took up tuna fishing. Kunhikoya remembers catching 50-100 kgs of *hondali*, 4-8 kgs. of *madam*, and 5-10 kgs. Of *rehi*, which have now reduced in number. They explained that in the past, there were only 5 groups operating but now there are 100 groups in this line of fishing, each group consisting of 10 members.

B. Commercial Fishing

Pole and line tuna fishing

This technique originated in Minicoy, and later the fisheries department, popularized this technique in other islands through a systematic effort. Tuna fishing is done with a bamboo pole (3,4 and 5 meter in length) attached to a line (3-4cm in diameter), two-thirds of which is synthetic rope and the rest is 1mm monofilament. At the end of the line is a hook. The important concept in this method is the use of live baitfish. The baitfish is stored in a floating tank anchored within the lagoon, in the traditional form at Minicoy. In Agatti fishermen however skip the overnight storing process and directly place the live bait in the bait tank within the boat. The live baits are always coral/lagoon fish.

In Agatti at present there are 85 boats engaged in tuna fishing. 8-10 people form a team in one boat. Until recently the team composed of a boat driver, bait thrower, two people to chum the water to simulate rain, two people to keep the water tank filled with sea water and four men who do the pole and line fishing. A water-spraying machine has now been included in the Tuna fishing boat and thereby the 4 people involved in water chumming activities are no longer needed. The number of pole and line fishermen has increased to six from four. Two of the new fishing boats are also fitted with GPS sets and a C B radio for communicating with the island.

Anwar Hussain Adiyamkutti, a 25 years old expert at tuna fishing, with the pole-and-line method explained that he came from a family of fishermen. He recalls that his family was poor when he was a small child, but now they are comfortable. Anwar is one of the 10 members in the group involved in tuna fishing, out of the 150 groups involved at Agatti. In the peak season, Anwar, is out on the sea for almost 12 hours a day, leaving before dawn and returning in the evening. Their fishing zones include the areas around Perumal Par *Taklafad*, *Mankunne*, *Ambala*, *mugal*, *Akkatialibe*, *Thekkile Pitti* and *Vadakile Pitti* *iKotta*, *Vadakile mula*, *Thekkile mula*, *Natina Keepadatharam*, *Paraliya Kipadatharam*, *Paraliya mapadatharam*, *Paraliya thekke*.

It must be noted that these zones are the local names given in accordance with the location to the north, south, and so on, and do not correspond to recorded place names of the island. Tuna fishing takes place only during the fair season October-May.

Operation: depending on the tuna fishing ground the boats leave early in the morning. The first step is to collect bait and keep them live in a bait tank inside the boat. The boat then moves to the deep sea scouting for tuna shoals. Once the shoal is sighted the tuna is chummed by throwing the bait into the water and the fishermen start fishing with the pole and line and land the fish in the boat.

Catch composition. Skip jack 70% and yellow fin tuna 30%. Average landings 200 numbers/operation when landing is good and 100 numbers when landing is poor.

In tuna fishing there is no law saying that only one party or boat is allowed to fish from a shoal. The number of boats fishing from a shoal varies with the size of a shoal and

number of boats around. The understanding is that none of the boats will create a problem for the other while fishing from the same shoal.

Share 50% of the total catch goes to the boat owner and 50% are shared amongst the 10 fishermen. Previously the team members took their share home for processing and the whole family was involved in the post harvest operation. These days the fishing boat teams not only share the catch of Tuna but also continue the partnership in post harvest activities of preparing Mas and even marketing the Mas. As soon as the Tuna catch is landed on the shore. The fishermen start cutting and cleaning the Tuna. The heads are chopped off and the body is neatly filleted and the skeleton also removed. All this waste is buried in a pit dug at the seashore itself.

The Tuna Fillets are boiled in a huge pot filled with seawater. After boiling the fillets are smoked on a fire using coconut leaves and husk. Thereafter they are dried in the sun to remove residual moisture. They are then packed in Gunny bags and exported to the mainland markets either through the Co-operative society or directly. Women therefore do not take part in the post harvesting and marketing operations.

C. Reef Gleaning

One can see Gender values in operation in reef related activities. Men are responsible for fishing and women for gathering items of value from the reef since time immemorial. Division of labor in Agatti is on the same principle as man the hunter and provider and women the gatherer and sustainer.

Reef gleaning provides an income for women on the islands. Women and children glean the reef for items of value and gather all kinds of edible shell fish, octopus, ornamental shells and cowries. Today women from fisher families glean the reef in their free time both for pleasure and to supplement their income. Small cowries are sold for Rs. 1/- each and the big cowries used as souvenirs can fetch a price of Rs 25 to 50 depending on the size and beauty. Chank are rare but collected whenever they are found. The women state that they use this money for buying things for the house and children.

There are about 10 households where the people are old and uneducated and live by subsistence means alone (Coconut climbing, thatching and simple fishing operations). In such households cowry collection and reef gleaning forms an important share of the household income. An example is 60 year old M.K Beebi of Moothamkad house. Beebi explained that she has been gleaning the reef from childhood. In the past she would sell her cowries to the mainland, to supplement the family income. Today her sons are tuna fishing, and her activity has considerably reduced. In the months of '*Kanni*', '*thulam*', '*Viricchikam*', '*Chandramasam*', '*dhanurmasam*', she used to go towards Purakkum Puram (east and west of the reef in Kalpitti). She says that katti kavadi are abundant and it is usual to collect 200-400 a day. Valiyakavadi is less abundant and one can collect 10-15 a day. She said that vellakavadi was once a measuring unit. The areas where cowries abound are Thodu, Kalpitti, and the reef area.

Typically women go in a group of 6-10 during low tide to collect cowries. The group can consist of family members and friends. They calculate the tide timetable by observing the waxing and waning of the moon. Cowry collection takes place during the fair season from September to April. Within this period collection time is around 15 days a month. Three days before and three days after the full moon and new moon. The 14th and 27th moon days are the lowest tide dates.

Since cowry collection is a matter of luck and individual concentration and skill. The gleaners can keep whatever they collect as their own. No sharing is involved amongst the group members. However if they have used the services of a boatman to take them to and from the reef each individual in the group has to pay the boatman in cash or cowry. Normally they pay Rs 5 per head or give the boatman 5 cowries each.

The reef gleaners listed 8 types of mollusks, explained where they could be found and ranked them in order relative abundance and value. (Table 4.7)

Table 4.7 Reef Gleaning – Shells Collected and Habitat						
Local Name	English name	Relative abundance Ranking	Cost Ranking	Value	Perception on cowry availability	Habitat
Kattikavadi	Snakehead	⊕⊕⊕⊕⊕ ⊕⊕⊕⊕⊕	3	Cash	+	Reef flat
Vallakavadi*	Money cowry	⊕⊕⊕⊕⊕ ⊕⊕⊕⊕⊕	3	Medicine	+	Seagrass/under boulders
Pullikavadi	Same size as Tiger Cowry	⊕⊕⊕⊕⊕ ⊕⊕⊕⊕⊕	4	Game counters	+	Reef flat
Valiya Kavadi	Tiger cowry	⊕⊕⊕⊕ ⊕⊕⊕⊕	2	Cash	–	Reef flat
Chirimarinja Kavadi	Unknown	⊕⊕⊕⊕ ⊕⊕	5	Cash	+	Reef flat
Chirimalanna Kavadi	Unknown	⊕⊕⊕⊕ ⊕⊕	5	Cash	+	Reef flat
Idampiri,	Tritons trumpet curved to left	⊕⊕ ⊕	1	Cash	–	Reef flat
Valampiri	Tritons trumpet curved to right	⊕⊕⊕ ⊕	2	Cash	–	Reef flat
Chank	Conch	⊕⊕⊕ ⊕	1	Cash	–	Lagoon, outside reef
Pykala 3 type	Spider Conch	⊕⊕⊕ ⊕⊕	3	Cash	+	Reef/lagoon
Cone shell	---	⊕⊕⊕	5	Cash	+	Reef flat
Kallichchi	Mollusc	⊕⊕⊕⊕⊕ ⊕⊕⊕⊕⊕	5	Food	+	Reef/lagoon
Ranking situation from 30 years ago perception on resource availability – Decline in quantity + same or easily available. * A paste made from valla kavadi is used on eye cyst. Source: Group discussion with reef gleaners						

Perceptions

Mulla aged 47 years was one of the key informants about cowry collection in Agatti. She is very knowledgeable about where to collect cowries and how to collect them etc. She enjoys collecting cowries since she feels free and unfettered on the reef surrounded by the deep and vast ocean. In this period she can leave the domestic routine and go into the vastness of the reef, chat with her companions and be herself.

She learnt to collect cowry from her mother and aunts. She has been going to the reef with them from the age of 9 or 10. They mainly took her with them to the eastern reef flat. The eastern reef flat is very shallow and cowries were available in plenty. With practice Mulla became an expert cowry collector. She learnt to glean the reef and poke out cowries from the reef platform and mud flats using sharp sticks and iron hooks. No

special clothing is worn to go for cowry collection. To protect their feet, they wear rubber slippers and shoes to walk on the reef. This gear has not changed since she was a child.

Mulla feels that the cowry quantities are cyclic. Collection is seasonal and takes place only during the fair season. She explains that what they take during the fair season is replaced during the monsoon season. Others believe that other cowries from the deep sea come and take the place of the ones that are collected.

Men and women were asked to Rank the four most important cowries that they collect. (Table 4.8). Both men and women ranked them in the same order

Table 4.8. Ranking Cowries and cowry grounds

A. Ranking Cowry Value				
1	2	3	4	
Valiya	Katti	Money	Pulli	Men
Valiya	Katti	Money	Pulli	Women
B. Ranking Cowry Grounds				
1	2	3	4	
Bangaram	Thoad	Perumalpar	Farap (Mankoona)	Men
Bangaram	Thoad	Kalnittiva	Melananar	Women

and feel that it is most desirable to find Valiya kavadi which has a medicinal value. They were also asked to map the cowry collection grounds and rank them according to abundance in availability. Both men and women feel that the reef at Bangaram followed by Thoad is the best for collecting cowry. Since Men go further away than

women they have ranked Perumal par, however women have ranked reefs that are closer to home and accessible to them.

The women stated that cowry collection no longer remains only women's work. Men and young boys also go out to collect cowries for fun and also for selling them to the tourists. Women feel that they are at a disadvantage now for collecting cowries due to the competition from young men and boys. These boys and men are not restricted by clothing and tides and can go as is convenient for them. They can swim and snorkel and do not need to wait for low tide to collect cowries. They can skin dive and collect big cowries for selling as souvenirs. The women feel that these cowry enthusiasts go even before the low tide and hence can get the choicest pick.

Cowry Marketing

The market for cowries lies in the mainland. They are sold at Mangalore and Kochi. The cowry pickers give their collection to male relatives or friends (*manju* owners) who trade with the mainland. These traders take the cowry and sell them in Mangalore on their behalf. Once they are sold he gives the women the sales money and keeps a small commission for himself.

2. Boulder, Shingle and sand collection

Coral boulders, shingle and sand are collected for building construction purposes. Shingles are the broken pieces of branching coral that get washed ashore. Boulders are big and small massive coral. Boulder coral serves as a ground for the coral planulae to settle and new colonies to form within the lagoon. Removal of coral boulders from the lagoon only results in a sandy bottom and destroys the habitat for new coral growth to take place. Boulder coral is collected from the entire reef area and even the patch reefs found within the lagoon.

Boulders

Boulders can be distinguished as two types:

1. *Kummayatha kall* they can be 1-4 feet in length and breadth. They are used for construction and making lime. This type of boulders are collected by men since it is hard work and one goes into the lagoon. They use boats and crowbars to heave the boulders into the boat. Typically this activity is carried out during low tide period. 2-3 craft loads are collected with one days work. One boat load is equal to 400-500 Kg.
2. *Uralam Kal*: This type of boulder is mainly collected from the eastern sea-shore area. It is smaller in size than *kumayatha kal*. It is used for laying the foundation during the building construction. This boulder is not used for making lime. Collection is carried on by women, children and men. After collection they are placed as heaps on the seashore area.

Boulder collection appears to be indiscriminate and no part of the reef is considered sacred. Boulder collection in the eastern reef goes on throughout the year and the western side in the fair season. Boulders are normally collected for own use and not sold. There is no class distinction for collecting coral boulders and people from all income groups can collect corals for their own use.

Sand

Two types of sand are used in building construction. Typically 5000 to 10000 bags of sand are required to build one house.

1. *Tadeyam kummayath mann*: this is used for making blocks and thick plastering work
2. *Nanakumayatha mann*: is a finer sand and is used for fine plastering work.

Sand is collected from *Badakkam-thala*, *teverna-aar*, *Mammay falliya-aar* and *Fittyafurathala aar* in the North eastern side of the island.

Shingle:

Shingle is collected from all the sea shore area.

There are three types of shingle available.

1. *Fala kall* : this is the biggest size around one foot in length. It is used to make the foundation of a building. One quintal or 100 Kg is collected in one operation.
2. *Jally*: These shingles are 1½ inches in length and width. They are used in masking the roof concrete, floor concrete and making concrete wall bricks. They can collect 100-150 20 kg bags per operation.
3. *Pudi Jally*: this is of very small size and is used for giving a top finish to the floor.

Women and children in the island routinely collect coral shingle for household construction and repairs. The shingle is mixed with lime or cement and pressed in a mould to make bricks for building walls and houses. One bag of shingles sells for Rs 10-15. Whenever a new construction takes place the building owner has to apply to the dept of environment to get permission for gathering shingle. They are normally permitted to utilize 100 bags of 10 –15 kg each. Though most people tend to double this figure. All income groups participate in this activity, there is no class distinction.

D. Scuba diving and snorkeling tourism

After the Late ex-Prime Minister Rajeev Gandhi's visit to Lakshadweep in 1988, the Administration felt that Tourism could provide a boost to the UTL economy. They decided to convert the uninhabited Bangaram Island into a resort Island. They issued a

tender to lease out land in Bangaram for the exclusive use of a resort. The Casino Hotel, Kochi made a bid for this tender and was awarded the lease to run a tourist resort in 1989. An airstrip was built in Agatti at the same time to make Bangaram more easily accessible for western tourist.

This resort is called the Bangaram Island resort. It has grown from a forty bed capacity to a fifty eight bed capacity. Taking advantage of the Airport at Agatti, another tourist resort with 10 cottages or 20 bed capacity called The Agatti Island Beach resort on the island of Agatti became operational in December 1996.

Both resorts are operational all year round and offer water sport facilities such as snorkeling, boating, fishing and scuba diving. The figure shows where the reef related tourism activities take place in Agatti and Bangaram. The high season is from October to April and the low season is from May to September. Off-season discounts are offered.

Scuba diving

Scuba diving as a recreational activity was popularized when the Bangaram Resort was opened in 1989. The resident dive instructor from 1989 to 2000 was a German national named Andreas Heidmann. He discovered and popularized several dive sites around Bangaram. When he left in the year 2000 an Indian company called Laccadives⁵ took over the dive center. It caters for the scuba diving enthusiasts from both resorts. The resident dive instructor is now *Anees Adenwala* and two other trained Islanders assist with the dive operation and escorting tourists. We interviewed Anees Adenwala and learnt the following:

After the 1998 bleaching, The coral lost their color and there was wide spread mortality. He says however that the reefs seem to be recovering and he has observed new recruits in all the dive sites.

There are 9 main dive sites, 4 to the north of Bangaram and 5 to the south where he takes his recreation scuba divers.

The sites to the north of the Island are called : Shallow point, Grand canyon, Ship Wreck Princes Royal- a 200 year old wreck, Thinakara hill.

The sites to the south are called: the barge, little canyon, entrance point, manta point and windmill. The state of the corals is better in these sites and he said that manta point and windmill point show very good coral cover and diversity.

The dive center controls the scuba diving. No unescorted scuba diving is possible and 8 is the maximum number of divers who are taken to a dive site. Two dives are possible during the day, after breakfast and after lunch.

Scuba diving etiquette is explained to all the scuba divers and they are told not to touch or break coral . The dive instructor said that nearly all the western divers who came with him observed good etiquette and were not destructive to the reef. To minimize anchor damage the dive boat would be anchored in a coral growth free spot.

We interviewed some of the tourists to ask them about their dive experience. The first time divers claimed to be satisfied with the facilities and the dive experience. The guest book remarks showed that they felt the diving was fantastic and a great experience.

⁵ Laccadives runs a dive center in Kadmat Island since 1995. Anees Adenwala has been working in Lakshadweep since then and has been posted at Kadmat, Kavaratti and currently Bangaram.

Other scuba divers who have dived in Bangaram over the years such as Klaus Schuappe - a 49 year old Doctor from Germany who was on his fifth visit to Bangaram since 1993 – claims that the dive experience was best in 1993 and 1995.

The undersea experience has not been so good since 1995. Right now as in 1999 much of the coral cover is dead. He feels that this is linked to the bleaching event. This time however he was able to observe new coral recruits at the dive sites.

Snorkelling and glass bottom boats,

The tourists snorkel within the lagoon close to the resorts. Basically they snorkel as far as they can swim. The popular snorkeling location for the tourists at Bangaram is a shipwreck in the far western lagoon. Thodu is a popular snorkeling spot for the tourists from Agatti Island beach resort. A boat is needed to access both locations.

Other water sports

Kayaking, swimming, reef fishing and lagoon cruise goes on around the vast lagoons around Bangaram and Agatti.

Issues brought up by tourists

Tourists at Bangaram and Agatti expressed satisfaction with their holiday. However nearly all the tourists who had gone on a day trip to Thinakkara and Paralli reported that they had seen dead carcasses of turtle.

Tourists also claimed that sometimes they were bothered by young boys who would try to sell them cowry.

The generator was too loud and the tetrapods around Bangaram look unseemly and spoil the serenity and aesthetic beauty of the island.

Over all since tourism is restricted and resident occupancy is low there are never more than one boat full of tourists in any area. The water sports activities therefore do not conflict with fishing activities and vice a versa.

Tension however has crept in between resort operators and the local people. This has got to do with employment and other economic opportunities, which the islanders feel they do not receive.

Figure 5.2 Resource – Activity Map with Ranking during Fair season

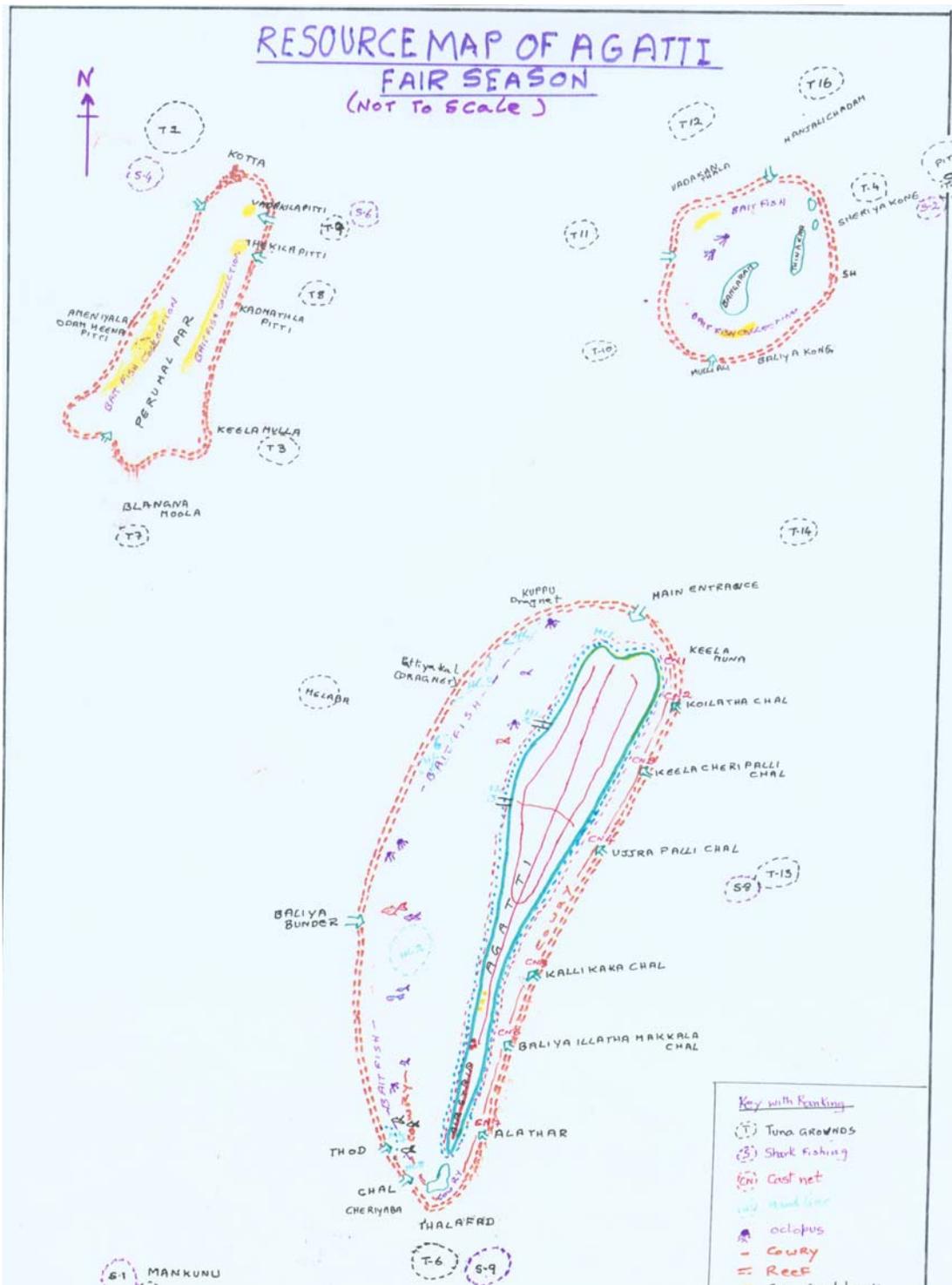


Table 5.1 Preference Ranking of Fishing Areas (Fair Season)

Tuna Fishing T1-T15	Shark S1-S6	Handline HL1-HL9
<ol style="list-style-type: none"> 1. Ambalamugal 2. Kotta 3. Keelamoola 4. Faraliya uda 5. Mankumnu 6. Thalavad 7. Blangnamoola 8. Thekkilapitti 9. vadakkilapitti 10. Bangaram West 11. NW Bangaram 12. Vadakkhan thala 13. Near Urapalli chal 14. Belliya Thala towards Bram 15. Pitti <p>Octopus Catching</p> <p>Through out reef</p>	<ol style="list-style-type: none"> 1. Mankumnu 2. Faraliya uda 3. Blangila moola 4. Pitti 5. Koompuram 6. Near Alathar <p>Bait Fish B1-B8</p> <ol style="list-style-type: none"> 1. Kadamathala pitti 2. Vadakkilapitti 3. Amingala odam meena pitti 4. Bangaram NorthWest 5. Bangaram South West 6. Belliya bundar 7. South of baliya bundar 8. Thodu 9. Pattiyahal. <p>Cowry Collection</p> <p>Throughout the reef</p>	<ol style="list-style-type: none"> 1. Melanura 2. Lagoon Anjumula, Supiyahal, Churavukal, Manambay 3. Fisheries Jetty 4. Main Jetty 5. Pattiyahal 6. Manjathahal 7. Thodu 8. Palliya Ar Chal 9. Throughout seashore <p>Castnetting CN1-CN8</p> <ol style="list-style-type: none"> 1. Melanura 2. Keelamunna, koilathar, Keelacheri, Palli chal 3. Shaikana Palli chal 4. Ujra Palli Chal 5. Kallika chal 6. Baliyayillatha Makhal Chal 7. Alatha Ar 8. Through out shore Area
<p>Note: Ranking in descending order - Highest score 1 this table is in conjunction with resource map 5.2</p>		

- Harpooning (chaddum pokku) – mainly carried out during the fair season. It reaches its peak in the month of October and stops with the onset of the monsoon.
- Handline on Shore – This is less frequent in June and July but fairly frequent in all the other months.
- Handline with Odam (bakkal) – carried on throughout the year whenever the odam sails to and from the Islands.
- Light and Sword (Shuttu-katticchu-kuthal) – This is mostly done between July and September. Presently 30 men in Agatti are adept at this craft.
- Trapping over Boulders (kallu-mudal) – This is rarely practiced at present, except, in a very small way, between May and July.
- Pole and Line Tuna – Takes place between September to May.
- Scuba diving: the scuba diving season begins in September and lasts until April. The winter months December to February are the busiest.
- Snorkelling and other water sports such as lagoon cruise and glass bottom boat trips take place through out the year depending on the weather.

We can note that different reef stakeholders of both genders use the reefs around Agatti for a number of different activities. Activities such as recreational scuba diving and reef gleaning are gender neutral. Fishing is gender specific and is dominated by men.

Figure 5. 3 Resource –Activity Map with Ranking during Monsoon Season

FISHING GROUNDS/RESOURCE MAP OF AGATTI (DURING MONSOON SEASON)

(Not to Scale)

KEY (according to Ranking)

- HL: HAND LINE FISHING**
(WITH OR WITHOUT POLE)
1. Melanuna
 2. Anjumula, Suppiyakal, Chuvankal, Madambay.
 3. Fisheries Jetty
 4. Main Jetty
 5. Manjathakal
 6. Light House area
 7. Thodu
 8. Navaakkazhakkal (Mettiyakal)
 9. Fappala Pallya, Aar
 10. Shore area through out island
- CN: CAST NETTING**
1. Koilatha chal
 2. Keelacheri Pally chal
 3. Shaikina Pally chal
 4. Ujra Pally chal
 5. Kallikkaka chal
 6. Baliyalathia makkala chal
 7. Alathar/Melanuna
 8. Keelanuna
 10. Shore area throughout island
- BF: DRAG NETTING**
BALA FADAL/BALA ATTAL
1. Randikkida
 2. Cheeranyaba
 3. Thodu
 4. Billam
 5. Fappala Pallya, Aar
 6. Fattiyakal
 7. Cheriya Firuvam
- COWRY COLLECTION**
- Throughout Eastern Reef when weather favour
- OCTOPUS CATCHING**
- Throughout Eastern Reef when weather favour
- HARPOONING**
- Outside Eastern Reef throughout - when weather favour
- BALA ADIYAL**
- Shore area throughout the island

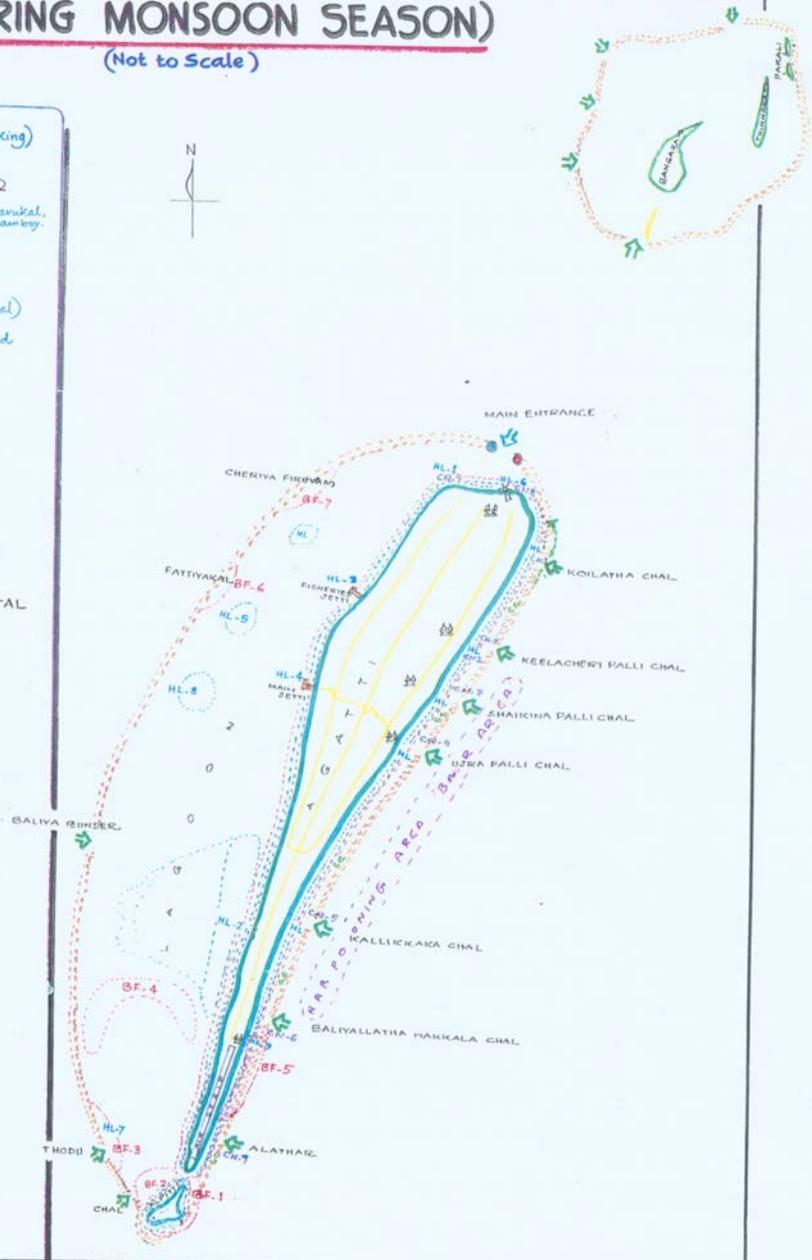


Figure 5.4 Resource- Activity map – Bangaram

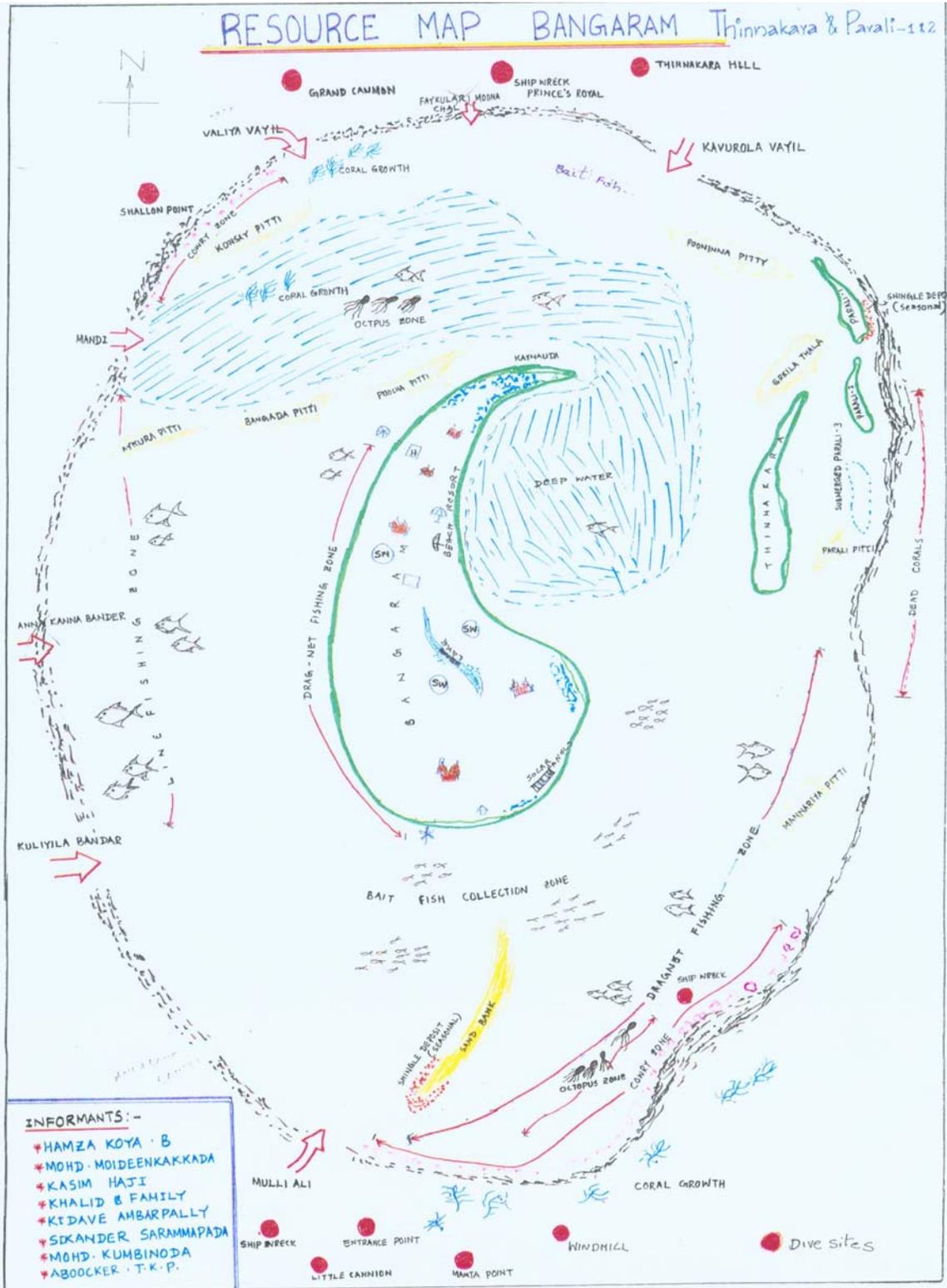


Figure 5.4 Resource- Activity map – Bangaram

Octopus are hunted by both genders. Men hunt them in deep waters in the western reef and around Bangaram whereas women are limited to catching the occasional octopus found in shallow areas while reef gleaning.

Each activity has well defined areas of operation within the lagoon. These activity zones relate to the topography within the lagoon. Generally speaking baitfish are caught in sandy areas and sea grass beds. *Bala fadal* operation needs deep water and so is concentrated in the southwest and North-west of Agatti lagoon. Fairly well defined activity zones are found within the Bangaram lagoon (Figure 5.4). Sometimes different activities occur at the same site. However no apparent conflicts were reported between the different reef users, probably due to the difference of timings of each activity during the day. For instance the same areas are often used for bait fishing and snorkeling. Bait fishing takes place at dawn and tourists go snorkeling after 9:00 a.m.

Perceptions on the Status of the reef resources

Perceptions of the status of reef resources were gathered in focus group discussions and individual opinions were collected in the questionnaire survey. The results of the group discussions with various stakeholders are presented in table 5.1.

With regard to perceptions on the condition of the reef 40% of the fisher households surveyed replied that they had no idea and believed that the corals are neither increasing nor decreasing since 1960. Another 52% felt that there was no change in the reef from the past. They said that the reef grows and decreases as per nature's cycle. 10% felt that the reef was under threat due to increase pressure of reef related activities and the consequent trampling, anchor damage, engine oil spills etc.

They feel that coral growth is cyclic and the corals are able to regenerate over time. They have observed that coral boulders revive even after they are displaced for channel widening for navigation. They report that the reefs that were badly damaged in 1994 and started losing colony in 1998, are now reviving. However they agree that removal of coral boulders can be detrimental to coral growth and attribute over exploitation as one of the reasons for declining coral growth.

The dive instructors at Bangaram also were of the opinion that coral destruction is cyclic. Andreas Heidman, in his 15 years of diving experience in Lakshadweep reports that dive sites destroyed by the crown of thorns regained their beauty after 5-6 years. Anees Adenwala the resident dive instructor, reports that there are new recruits of coral colonies in almost all the dive sites which were devastated by the coral bleaching event in 1998.

The historical transect in figure 5.4 shows the decade wise trends since 1951 for various parameters such as population, number of fishers and correlate them to the state of the coral reef around Agatti in 2001. With regard to fishing the people report that the increase in fish landings is because the boats are exploiting more fishing grounds. They however report a decrease in fish quantity and fish size within the lagoon and bar area. These are the areas that are most easily accessible by any kind of craft from the island. They can relate this to over-fishing but provide no solution for management action for lagoon fishing.

Figure 5.5 Historical Transect

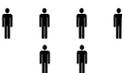
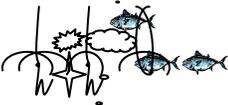
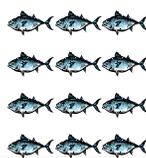
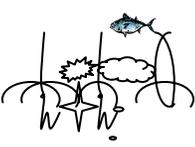
Year	Population	Number of Fishers	Fish Catch	State of Coral reef
1951				
1961				
1971				
1981				
1991				
2001				
Trends	↑+	↑+	↑ +	-(-) ∪ Cyclic
Indicators	<ul style="list-style-type: none"> • More citizens • Increase in house construction • Shortage of fresh water and space –61 Agatti residents have moved to Bangaram. 	<ul style="list-style-type: none"> • Increase in commercial deep sea fishing • Increase in Subsistence fishing during monsoon 	<ul style="list-style-type: none"> • Improved Facility • Deepsea fishing • Fishing further from Island 	<ul style="list-style-type: none"> • Decline in Bait fish and Coral fish • Decline in Live coral cover • Decline in ornamental shells
Reasons	<ul style="list-style-type: none"> • Natural Population growth • Improved Medical facility • Increase in Income and cash flow 	<ul style="list-style-type: none"> • Lack of alternative employment opportunities • Increase in demand for fresh lagoon fish • No regulation for lagoon fishing 	<ul style="list-style-type: none"> • Advanced in Education • Modern fishing technology • Mechanisation • Exploiting more zones and fishing grounds 	<ul style="list-style-type: none"> • Increase in Tuna Fishing • Drag netting during Monsoon • Increase in recreation fishers within lagoon • Pollution from boat engine oil • Decrease in mesh size • Coral bleaching • Increase in Turtles • Increase in Number of shell collectors • Increase in boulder, shingle and sand collection

Table 5.1 Perception of Reef condition and suggestions for management

Parameter Sub-parameter	Perception off resource availability and reef Condition	Knowledge Status	Management action	Suggestions for management /Conservation
Cowry collectors 200-300 80%F 20%M	Availability of cowries is less when compared to past. Today women compete with boys who do not need to wait for low tide since they skin dive and use a dive mask. Western reef is better for cowry and gastropods collection.	Women over 45 years	Dec 2001 notification bans collection	Close areas for 10 years Rotation of sites
Pole & Line Fishing Bait fishing 85 Units of 10 Male	Present status of Tuna fishing is not very good when compared to the past. The catch rate is directly dependent on the availability of bait fish. The main problem cited as affecting the catch size is the scarcity of bait fish.	Men over 45	Promote Tuna fishing	Manage and farm bait fish
Shark fishing Individual Male	No reduction in shark but Shark fishing activity is less popular compared to past because of change in current.	Men over 45	DoE bans shark fishing but DoF Promotes it	Be Consistent
Spear & Harpoon Individual Male	No change	Men over 45	Nil	Nil
Handline and rod fishing Individual Male	Present status is good and catch will vary on the availability of small fishes in the lagoon.	Regular Practice	Nil	Nil
Beechaval-castnet Individual Male	Growth rate of lagoon fish is reduced due to competition for food with sea turtles. Sea turtle population is increasing and they are over-grazing the sea grass, where reef fish lay eggs.	Regular Practice	Nil	Nil
Net operators 3-4 Male	less catch compared to past due to increased exploitation	Regular Practice	Nil	Nil
Octopus catching Individual F/M	Octopus catch is better in Bangaram than Agatti. Group hunting for octopus is very high when compared to the past	Regular Practice	Nil	Nil
Shingle, sand & boulder collectors F/M	Feel that sand and shingle collection will not affect the reef but collection of boulders is not good.	Regular Practice	Regulation and ban	Proper Implementation
Dive operators	Slowly reviving after 1997 bleaching. Feel revival/death are cyclic	Regular Practice	Padi & CMAS certification	Good diver practices, Implement all Bans and notifications
Dive tourist	Dead, some new growth	Comparative	nil	Close area until revival
DST & DoE Scientists	Reef stressed due to natural causes and increased collection of boulder shingle etc.	N.A	Notifications	Manage, regulate or ban activities

The people know which of their activities is harmful. For example they know that trampling and turning over corals while reef gleaning is detrimental to their growth, but do it all the same. One cowry collector suggested that some reef areas could be left untouched for a period of ten years so that it gets some time to revive. Others feel that the law of the commons apply and that they might well be losers if they if they leave a resource to regenerate because a) they may not be lucky enough to find it again and b) someone else with less scruples will take it.

Chapter 6: Market Attributes and Non market use value

Lakshadweep has natural beauty and a vast reservoir of fish resources and hence can be marketed for both non-extractive and extractive reef resources. At the same time the resources are finite and need to be conserved and managed which brings in the question of non-market use value of the reef resources. It is only a balance between these parameters that can bring about sustainable development in the islands.

Until the 1980's the reef resources were valued only for their extractive resource value. The pleasures of Scuba diving and snorkeling were unknown in Lakshadweep. There were no dive operators in India itself. The planners recognized the tourism potential and marketed Lakshadweep as an island paradise with sparkling sands, turquoise seas and swaying palms. Lakshadweep was marketed as a dive destination in the late 1990s, once the planners recognized that people are willing to travel far in search of new and exclusive dive locations. Dive operations are still limited to 3 islands including Bangaram.

Market attributes is discussed as non-extractive value with regard to tourism and scuba diving and extractive value with regard to fisheries and reef gleaning.

1. Market Attributes - Non Extractive

The tourist resorts and scuba diving are examples of activities that provide a non-extractive market value for the reef resources. The fact that the resort makes a profit implies that there are people in the world who are willing to travel far and pay a high price for the privilege of spending time in a pristine habitat. The policy of the Lakshadweep administration is to promote high value low volume tourism.

Tourists can stay at either of the two beach resorts located in the study area known as the Bangaram Island resort and the Agatti Island beach Resort. The number of beds available in both resorts is limited to 58 and 20. Both resorts target International tourists and prices are quoted in US\$ and Indian Rupees.

The resorts follow a three tariff system.

- There highest rate is from 20th December to 21st January
- High season rate 1Oct-20 Dec 2001 & 21 Jan –31 mar 02
- Off season rate April - September

The published rate in the year 2001-2001 was US\$ 150/single occupancy at the Agatti Resort and US\$ 250 at the Bangaram Resort. Bangaram being an uninhabited island is the more exclusive of the two. It is also run according to international standards and has a strong marketing network. The manager told us that the occupancy rate for Bangaram is around 80% in the high season and 20% in the low season. The manager at the Agatti resort said that occupancy rate was around 20% in the high season and a 10% in the off season.

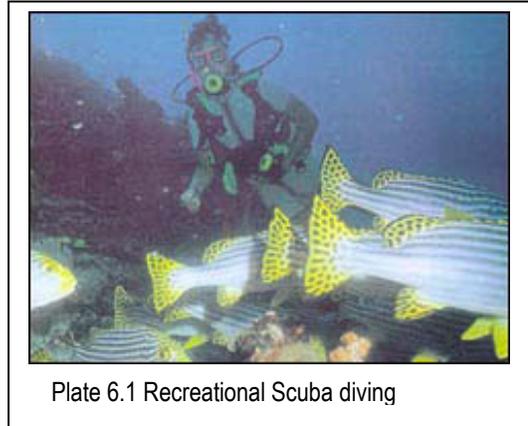


Plate 6.1 Recreational Scuba diving

Scuba diving costs are extra and it costs around \$ 40-60 per dive. This includes the boat and equipment rental. Tourists from Agatti have to pay an extra boat charge to be ferried to Bangaram.

While the resort prices appear to be high it must be remembered that the running costs for the resorts are also high since everything has to be shipped or airlifted from the mainland. Fresh produce has to be flown in at least twice a week.

At Bangaram resort we met several repeat tourists who were coming here for the fourth or fifth time. To quote a tourist:

“The attraction of Bangaram is that the resort is simple yet provides a very high standard of service without detracting from the peace of its natural surroundings. Please keep it that way and we will be back as soon as we can”

Nicholas and Lois Hamilton Fletcher, Scotland

It must be remembered that market attributes depend on the market demand. Tourist's return only when there is stability, peace and the undersea dive experience is great. The year 2000-2001 saw a struggle between the resort operators and the Lakshadweep Administration for the renewal of lease. This brought an element of uncertainty in booking tourists for the resort.

The terrorist attacks on the world trade center in New York on September 11, 2001 also had an effect on world tourism and the resorts had a very low occupancy rate in the Month of Januray 2002.

2. Market Attributes (Extractive)

The market for extractive reef resources lies in the mainland. There is now emerging a small market for fresh fish and other reef resources within the island itself. This market consists of the government employees, 3 fish pickle making units and resorts.

a. Deep sea Fishing

Tuna fish comprises 74%, Lagoon fish 25% and all the other fish make up 1% of the total fish catch for the year 2000. Modern post harvest facilities are not available in

Table 6.1 Fish landings in Agatti year 2000

Oceanic		lagoon	
tuna	1740540	Coral fish	320
Barakuda	360	Gar fish	2660
Sail fish	6090	Goat fish	290
Seer fish	5755	Octopus	1810
Shark	14910	Purches	1750
Cornex	910	Rays	335
Flying fish	120	Trigger fish	140
Rainbow runner	1080	Miscellaneous	567360
	<u>1769765</u>		<u>574665</u>

Total fish catch: 2344430

Agatti and therefore post harvest processing is limited to the pickle making units and producing tuna mass by parboiling and sun drying tuna fillets, salting and drying octopus and shark fins. The other fish catch is sold fresh.

Tuna fishing is dependent on bait collected from the reef area. It is the most energy intensive and capital intensive of the entire reef related activities. The returns are also high according to the income survey a boat owner typically makes around Rs 60,000 annually after paying all the running costs. The crew earns approximately, Rs. 18,000 annually from Tuna fishing. This means one

Tuna team of 10 people makes around Rs 2,40,000 annually. On the basis of this estimate the 85 teams in Agatti make a total income of 20,400,000 Rupees, after deducting their fishing related expenses⁶. According to the fish landings data a total of 1740540 Kg of Tuna fish were landed for a total value of Rupees. 34.81 million.

b. Cowries:

Cowries have a market in the mainland. Big cowries are sold as curios and can fetch a price of Rs 15 each and the small tiger and money cowries are sold for between Rs 0.50 and Re. 1/-. Mr. C. Pookoya, one of the Manju Owner said that he had marketed 250,000 cowries in the year 2000.

c. Coral sand, shingle and boulder

Coral sand, shingle and boulder are required for building construction. Most people collect it for personal use. At a conservative estimate 500 tons of these materials are collected per annum building construction. The market price for a 20 kg bag of any of these materials is around Rs 15-20.

It must be noted that the market value of all the extracted resources only takes into account the cost of labor involved in the extraction process and does not take into account the labor nature puts into growing the resources.

3. Non Market Value

The stakeholder's value the reef for their market attributes whether extractive or non extractive. The Islanders view the reef as happy hunting grounds for octopus, shells and fish. These are finally consumed or sold in the market. Basically it's a demand driven extraction and has a market value irrespective of whether the resource is extracted for subsistence or market.

The extractive value of coral reef resources is well understood by every islander and it is possible to place a value on the resource based on market price. One does not however understand the actual price one pays for removing one target species from the food chain and the impact on the habitat itself. Nature's work is regarded as free and economists can only calculate on the basis of human effort to replenish a resource.

In this section one tried to understand whether the islanders valued the reef for its own sake and whether they felt that conservation measures were necessary.

A perception survey was conducted for three target groups that included both genders:

1. The workshop participants (14)
2. High school students.(60)
3. Fisher households (40)

Each of the target groups was given five minutes and asked to write down the first thing that came to their minds when they thought about reefs. This exercise was carried out basically to assess how receptive people would be to monitor and conserve their natural resources.

⁶ Fishing related expenses includes cost of diesel, nets, gear, and boat repayment.

a. The workshop participants

Protection and safety net (78%)

78% 11 out of the 14 participants felt that the most important non-market use value of the reef is that it provides protection to the island from storm waves. It also provides a safe habitat for juveniles and breeding ground for fish

Existence /Aesthetic Value (64%)

Nine participants cited that the reefs were important since they gave pleasure by its existence. The calm lagoon promoted peace of mind. One could sit on the seashore and contemplate on the vastness of the landscape or swim and snorkel and marvel at seeing all life under water.

Bequest Value (64%)

Nine participants said that it was important to protect/conservate the reef resources for future generations, so that they could also experience the thrill of seeing a living reef.

One participant said that coral reefs should be conserved to enable future research activities.

b. Students

The students of class X and IX were requested to write down the first thing that came to their mind when they thought of coral reefs.

- 100% Agatti is built up of corals and the reef (*paraî*) forms a barrier between the ocean waves and Island said that coral reefs were vital for providing protection for Islanders and a home for marine life and valuable items such as shells.
- 100% said that the reefs and lagoon provides us with a livelihood since we can collect many beautiful shells, construction materials and food fish from the lagoon.
- 40% wrote that the lagoon and reefs were important place for personal recreation
- 30% wrote that Lakshadweep owes its origin to corals.
- 20% wrote that reefs were valuable for their tourism potential since they attract foreigners and scuba divers.
- 20% wrote that the reefs were important since they were very beautiful and a gift from god.
- 50% wrote that the reef habitat must be protected and conserved for future generations.
- One student was concerned that if corals were collected continuously, the reef would deplete.

In a follow up exercise the students were asked what could be done to protect the habitat. This is what they replied:

1. We will not take coral items unnecessarily, they can be used but in limited quantities.
2. we should not break coral boulders and collect only a limited amount of shingle.

3. We should not deposit waste materials in the sea since it looks untidy and they may destroy the corals.
4. Lagoon drag netting should be limited

3. Fisher Households

The fisher households found it very silly to be asked the non-use value of the reefs. The field workers also felt embarrassed that they had to ask this question to fishermen – especially as the lives of fisher households depended on the reef.

We then had to explain that this was an important question to especially ask fishermen and reef gleaners since they were the stakeholders who extracted resources from the reef for their livelihood.

Habitat destruction would mean that they would lose their source of income in the long run. The implications of conservation and management are that they might be able to sustain their livelihood for future generations. Conservation and management also imply that they might lose income in the short run due to restrictions in fishing.

Each and every person we met from a fisher household is aware of the non-market use value of the reef.

- They said that the reef provided protection to the island and islanders from storm waves. The value of this protection cannot be assessed and nor can this god given protection be replaced if it is ever lost.
- The reef provides a habitat for baitfish, which forms the basis of the tuna fishing industry.
- They viewed the lagoon as a god given safety net for food in the event all communication with the mainland failed.

The following responses were elicited with regard to perceptions regarding threats to the reef:

They said threats came from both natural and anthropogenic forces. Storms and big waves damage reef, e.g loss of Paralli 3 in 1978.

Threats from anthropogenic activities include engine oil spill from boats, removal of coral boulders, harbor activities involving blasting and dredging. Anchor damage and boat damage when boats run aground on reefs during low tide. Over fishing within the lagoon.

What is clear is that while they understand the non market value of the reef, they are unwilling to initiate conservation or protection efforts for two reasons. Firstly the law of the commons applies here and each fisher feels that if he does not harvest a resource someone else with fewer scruples will do so. Secondly they feel that reef protection is a government responsibility.

Chapter 7 Stakeholder Characteristics

In this study we are concerned with the relationship between stakeholders and the impacts of human activity on the reef related resources.

The Agatti stakeholders are represented by

1. The Lakshadweep Administration, which has, absolute authority to administer the islands and the seas surrounding it.
2. The Islanders who occupied these Islands several centuries ago and now hold *scheduled tribe status*.
3. A third and more recent category of stakeholders are the resort owners who have leased out island space to run their resorts.
4. NGO's

1. The Administration

The Lakshadweep Islands have always been controlled and administrated by rulers from the mainland of India. In the days of the Arakkal rajas disputes were settled in kootams – a group assembly - by the *karanwars*. Slowly this system vanished and the *karanwars* lost their power to the Island Administration. The British appointed an Amin to represent them in local governance. In the post-independence period, the administration created a Block Development Committee followed by a Citizen's Council comprising 15 members from each island in 1958-59. This was replaced by an Island Council in 1990. All these councils/committees had no real administrative powers and their members were appointed by the administration. In 1997, a *Dweep Panchayat* was formed with democratically elected leaders. There are 3 blocks and 8 wards in Agatti, and the Chairperson is a woman (Amina Beebi). The Dweep Panchayat represents the political party in power and assists the administration. Welfare, employment schemes and Science and Technology projects are routed through the *Dweep Panchayat*.

The Administration has changed hands with the decline and fall of empires, however the direction of economic development continues to come from the mainland of India. The same bureaucratic model as the rest of India is also followed in the UT of Lakshadweep. Around 54 departments govern the people of Lakshadweep. Earlier most of the staff employed came from the mainland; today Islanders themselves fill several of the department posts.

Today the top Administration staff comes on a posting to the Islands with a tenure for 3 years. The top administration comprises:

1. Island Administrator
2. The Collector cum Development Commissioner
3. The Superintendent of Police
4. The Secretary Environment

The other posts as far as possible are filled by Native Islanders. Key posts such as the director of fisheries, tourism, science and technology often remain vacant. They are managed by a deputy director or acting director, who is usually an Islander. Frequently one department head holds an extra charge of another department.

2. The Agatti Islanders

a. Socio-cultural and social status

The first settlers were Hindus. In the 7th century the inhabitants of the islands embraced Islam, following the advocacy of the Islamic religion in the islands by Hazrat Ubaidullah. Traces of the old culture still linger however; despite the influence of Islam, caste system still prevails based on occupation. The ruling powers, made use of the social hierarchy prevalent in these islands and tension often crept up between these groups. This island witnessed a communal – inter-caste- strife in the early 20th century, between the *Koyas* and the *Melacheris*. Owing to the affirmative action schemes of the Government of India, people of the lower caste have also prospered. They have taken to higher education and secured government jobs. On the surface there is no longer a caste differentiation. However during arranged marriages, an alliance is sought from a family of the same caste status.

b. Land Tenure

In 1880⁷ the system of dividing land into blocks was introduced to uninhabited islands of Tinnakara, Bangaram, Parali and Suheli. Bangaram was leased out to the *Amin* at Agatti for 20 years provided he planted a certain stipulated number of coconut trees. The same was done at Kalpitti. In this way, the British administration enjoyed both revenue from land and the profits from the coir trade from the uninhabited and the inhabited islands of Lakshadweep. In 1904, the *Amin* of Agatti surrendered his lease and Bangaram was auctioned for another five-years lease period. The Pandaram lands, moreover, were governed for their commercial interest.

Island	Size (ha)	Land survey records	Govt land (ha)	No of families owning land	
				>1 ha	<1ha
Agatti	270.726	1326	112.80	4	#
Kalpitti	7.192	1114		-	16
Bangaram	56.621	49		12	50
Tinnakara	41.935	37		10	39
Pareli 1	3.505			1	
Pareli 2	2.430			1	
Pareli 3*	0.000			1	
Total	382.022	2526			
*Washed away in 1976 owned by Taloda House, # Figure not known Source: Govt Land records office.					

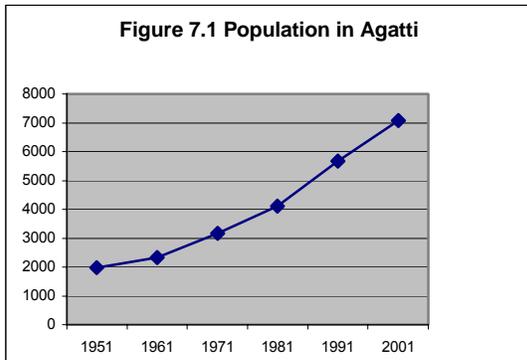
It is interesting to note that even today the Indian administration has continued this system of auctioning and leasing land to mainland parties, such as tourist resort operators. Since Lakshadweep is a tribal territory, land can be bought and sold only by Islanders. Mainlanders can not own land in Lakshadweep. Today, the government owns the most land in Agatti - 112.80 ha. This includes the airport and airstrip area. Four *Tharawads* in Agatti own land more than a ha in size and the others own the rest of it. Sixty-two families own Bangaram Island. Twelve of them have given the same on lease to SPORTS, for thirty

⁷ The British government introduced the policy of ‘letting out’ land to the islanders (who until then did not have a concept of owning land, and this only helped the colonial interest) to grow coconut. This system of ‘cowles’ - that is, “a grant of land, free of assessment for a certain period, or subject to assessment, gradually rising to full assessment, granted to induce ryots to bring under cultivation unpromising wasteland or to plant trees/shrubs for green manure.” [Lakshadweep Gazetteer, p.233] By 1875 the British administration had also drawn up a Land Manual, for fixing boundaries and property, on the Amindivi Islands. Ellis, who had been deputed to these islands on an inspection, refers to a ‘confused’ state of affairs so far as property notions on land were concerned. They also introduced the concept of Pandaram land, owned by the government, and ‘jenmom’ land, of the ‘landlords’. Significantly, the manual also included a term by which minor accretion of land by the action of the sea, also came under government property.

years, who in turn have leased this land to the Casino group from Kerala to run the Bangaram Island Resort.

c. Demography

Figure 7.1 shows that Agatti has a steadily growing population. Agatti showed a decadal growth rate of 23.40 for 1981-1991. The 2001 census reports that the population of Agatti is 7072, with 3688 males and 3384 females.

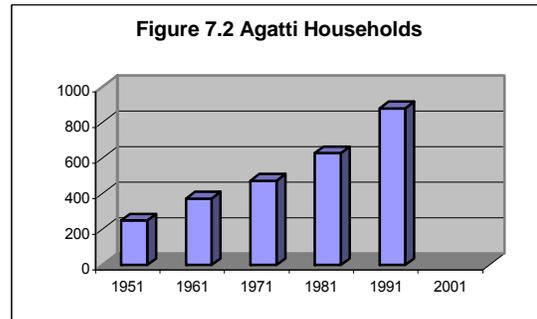


The sex ratio of 918 is unfavourable for females. An explanation for this skewed sex ratio may be the introduction of male labour from Tamilnadu who have been enumerated in this census. Agatti has a birth rate of 22.06, death rate of 5.11. The Infant Mortality Rate is 26.49 and Maternal Mortality rate is 0. All these demography rates are slightly higher than that the Union Territory average. (source: Directorate of Medical Services,

Kavaratti).

Literacy rate here is 88.5 %. out of the total literate population of 5170, females are 2272 and Males 2898.

The population density in 2001 is 1842/sq km as against 1492 /sq km in 1991 and 731/sq km in 1951. The rise in population has led to an increase in the number of households in Agatti which have quadrupled since 1951. The 1991 Census reports a total number of 868 households in Agatti Island. The exact figure for 2001 has not yet been enumerated.⁸



Household survey

The total number of households in Agatti are said to be 870. We conducted a household survey of 203 households or a 20% household survey to assess gender values, reef dependency; main and supplementary sources of Income; and Income distribution across the island population. According to the household survey, that Joint families are the rule. It is common to find three and even four generations living under one roof. The average household size is 9.36. The largest household surveyed consisted of 23 members and the smallest a nuclear family of three.

a. Status of women

These islands are famous for their *Marumukthayam* system adopted from Kerala where property was passed down the female line. Historically the islands have had a matrilineal society. Women therefore enjoy a special status being the owners of the house property. They are free to take up higher studies and work. In fact in seeking a matrimonial alliance, other things being equal both sexes opt for a spouse who has a government job.

The household survey revealed that the joint family or *Tharawad* system is breaking down. The shariat law is gaining popularity for property division. This favors male

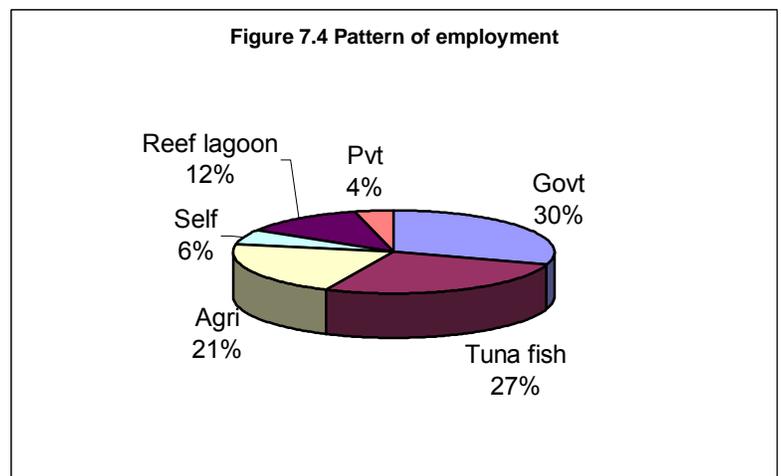
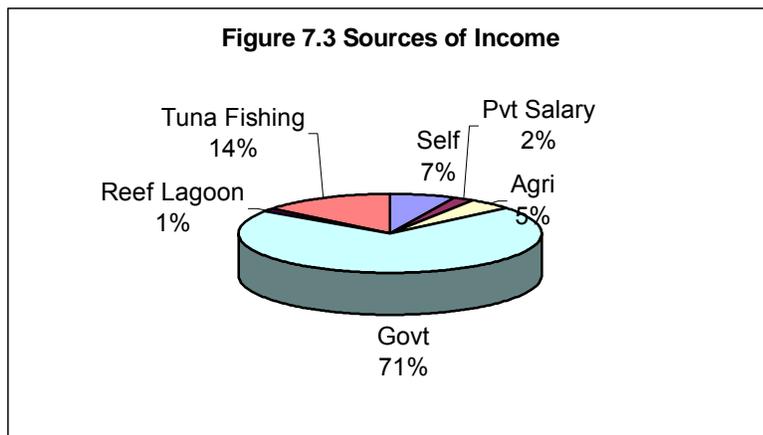
⁸ The Additional Sub divisional office in Agatti gave 870 as the total number of households during the study period.

interests over female interests. Nuclear families and housing are growing and there is a boom in house construction. Sometimes the old *Tharwad* family name is abandoned and the children are identified by the new house name. However the *marumukkathayam* system is still prevalent. 74% of the households surveyed reported that the house they lived in belonged to their mother. The others report that they live in their fathers house (*Makkatayam*) or in their own house built on land inherited from either parent. The head of the household is always cited as male, since the males are the decision makers and bring a cash income to the house.

Women tend not to be self-employed and play a small role in the economic sphere of the Island life. The economic activities of fishing and harvesting coconuts are work assigned to males. The unique situation in Agatti is that even the post harvest work of processing copra and fish is carried out predominantly by males. Women confine themselves to domestic work and only go for employment if they get government office jobs.

b. Sources of Income

Historically the traditional income source came from Coconut plantations and the products derived from the coconut tree – copra and coir. This is the main reason why owning coconut trees continue to have a high prestige value. Every islander strives to own a few coconut trees. The income derived from the coconut plantations is now marginal. Populations have quadrupled and the percapita land and coconut tree owned has reduced.



Commercial exploitation of the marine resources started in the 1960's with the introduction of mechanized fishing boats and the promotion of deep-sea fishing as an Income generating activity by the Government of India.

The main sources of Income now are from tuna fishing, government jobs, self employment (in businesses such as grocery shops, motorcycle repair, teashops) Agriculture and salary employment in Resorts, Madrassa and contract labour. Every household tends to supplement the main source of income with reef related activities such as cast-netting, line fishing, cowry and shingle collection. 90% of the households rear 2-3 goats and chickens as a dietary supplement.

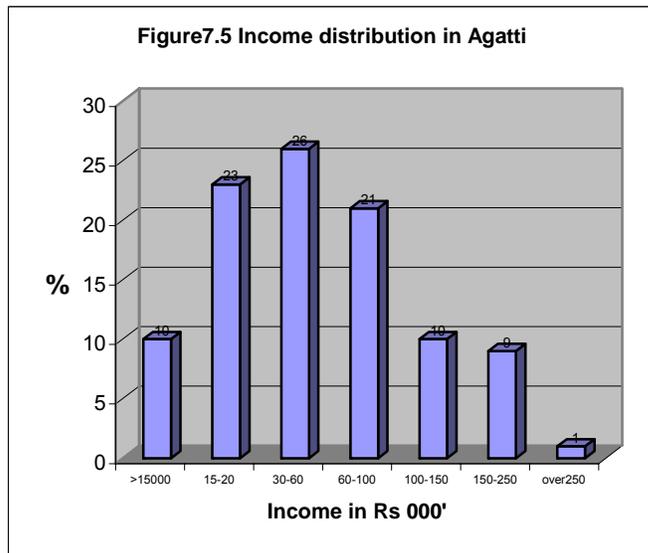
As can be seen from figure 7.3 and 7.4 Government Jobs are the most lucrative income earners. 58% of the households have at least one person employed in government service. 30% of the employed persons are on the government pay scale. They earn 71% of the total income generated in the Island. 49 % of the households have at least one person employed in tuna fishing. These make up 27% of the employed persons are involved in tuna fishing and generate 14% of the total Island Income.

21% of the people are engaged in Agriculture and generate 5% of the total income. 20% of the households report lagoon fishing, shingle, mollusks, Octopus and cowry collection as their main occupation. They make up 12% of the economically active population that depend on the reef/lagoon for their annual income and generate 1 % of the total income.

6% of the economically active population are self employed in businesses and generate 7% of the total income generated in Agatti. 4% of the workers are employed in private concerns such as the beach resorts and generate 2% of the total income.

d. Distribution of Income

Figure 7.5 shows the Income distribution across households in Agatti. Most of the households surveyed had multiple sources of income. The usual combination was



fishing/agriculture and outside employment. If we divide the total income earned by the households by the total number of household population, we get a percapita income of Rs. 7168 and an average household income of Rs. 68000. This would imply that the people of Agatti Island are well to do.

The income earned is not evenly distributed and the household where more than 2 people have a secure government job are considered the wealthiest households. One percent of the households surveyed reported an annual household income of more than Rs 300,000.

At the other end of the spectrum 10% of the total households surveyed, had an annual income of less than Rs 15,000. These households are considered below the poverty line. They lived in very run down conditions and did not have an economically active adult male to support them.

Standard of living

We felt that besides the household survey, it was important to conduct individual interviews with families representing three broad 'types' in this island:

1. A fisher family, with the main income generated from the Tuna fishing activity;
2. A Government Servant with a regular salary;
3. A Thatch maker and reef fisher.

It was felt that such a representative could not be 'spotted' in any of the information so far gathered, which would suggest that there is none in Agatti who is from an economically 'backward' group. This is far from the reality, especially if one were to go back into the history of the islands and the social stratification, which was, till very recently, an important question.

It must be noted, however, that situation in these islands is very different from that in the mainland, and the nature of 'poverty' here must be seen in a different context, for the expenses, the nature of spending, the question of shelter, etc. are unique and cannot be compared with that of an average low-income group representative from other parts of the country. Nevertheless, it is important to also note that the society here is far from equalitarian. The three interviews with three classes in Agatti gave the following information.

Mohammad (aged 65) – makes and sells thatch from coconut leaves for a living. In the past, 30 years from today, he used to beat coconut husk, collecting rat-eaten coconuts, sell that fibre. He used to supplement this by harpooning and fishing with others and get his due share. He himself does not own coconut trees and hence has to take permission from the coconut tree owners to collect leaves. These days he rarely harpoons and the thatch making activity is reduced due to his age -- he finds that he cannot work on the thatch for long hours and other factors. Today he makes about Rs. 200 a year. He says that he makes his ends meet only by the help of fellow islanders. He calls himself, as per his own evaluation, the poorer of the poor in this island.

There are 13 members in his family, including him, 9 being his daughters, 2 grandchildren. One of his daughters in fact is the Chairperson of the panchayat at Agatti, and another works in the coir factory. A third daughter works as a maid in another household. Their monthly spending comes to about 2000 rupees, including costs of sending his younger daughters and grandchildren to school. Education expenses, on an average, come to Rs. 300 per month- since schooling here is almost free of cost.

Apparently, this family does not figure in the list of Below poverty line, that has been sent to the higher authorities from the revenue (ASDO) office.

Vadakukoodam Mohammad (aged 45) is employed by the Casino group, Bangaram, as a boat engine driver. His immediate family includes 7 male and 1 female members. He is the only 'employed' member in this family. It must be noted that most islanders identify employed status with 'government' salaried jobs. Their occupation such as fishing do not count as an employment. He owns a dragnet and castnet, and sells the fish he catches to the Casino resort. Their family income is supplemented by selling copra, mas (dried tuna) to the mainland. He says his family can live comfortably in Agatti within Rs. 5000. His assets include his land-coconut trees, a house, and an odam with outboard engine, besides fishing nets. In his perception, he belongs to the 'medium' group of people, in economic terms- neither too well-off, nor in a bad state, either. In the past his family was involved in coir making and their condition was not to good, he says.

P.A Abdurahman (45 years) works as Insect Collector in the Community Health Services (CHS) of the medical department in Agatti. Besides his salaried government job, he is the joint holder of a stationery and provisions store here. Though he contributes, as per traditional customs, to the larger extended family, presently he stays with his family, which comprises of himself, his wife and a daughter of marriageable age.

He earns more than 1 lakh rupees per annum- from his job, and the shop. His assets are land, agriculture (coconut, copra) - which is again part of the larger family. On an average, he says he needs Rs. 1 lakh to stock his shop, with consumer items from the mainland. According to his view, Rs. 3000 per month is sufficient for a decent living in Agatti. He believes his status is better off than people in his neighborhood. He attributes this mainly to his steady salary income rather than the income from the provision store.

The three heads of households represent occupational status of different kinds. One of them is into fishing and coconut cultivation in a major way, besides holding a salaried job from a tourist-oriented industry. The other holds a government job, and also represents the interests of the business community, while the third- with no access (or limited access) to the resources of both the land and the sea, is representative of the most backward economic class.

Perhaps the tenets of Islam help in terms of communal sharing and the ideas of charity, which makes Mohammad's economic survival in Agatti far better than his counterparts in other states. Also there is very little scope for spending that may also be seen as an important 'relief' factor in such cases.

However, one notices that the Fisheries and other government departments have hardly made any significant interventions in distinguishing the economically lesser-off sections and providing them scope for earning a decent livelihood. The 'blanket' category of Scheduled tribe for the whole island must have helped the higher castes and the more resourceful sections rather than the vulnerable sections of society.

3. The Resort Owners and Dive School Owners

These people represent a third group of Stakeholders. Their entry into the Islands is comparatively recent. They owe their existence in the Islands thanks to the Administrations desire to earn revenue from Tourism. In Agatti the resort owners are represented by:

1. The Casino Group – who runs the Bangaram Island Resort. The owners hail from Kerala and own a chain of eco-theme resorts. This is a very exclusive resort and run with management from the mainland since 1989.
2. The Laccadives – Who run the scuba diving operation in Bangaram. They have been in operation in Lakshadweep since 1995 and took over the Bangaram diving from Andreas – an independent German operator in 2000.
3. The Agatti Island Beach resort – The resort is run with local management but the development funding has come from outside.

The main interest of these stakeholders is the revenue earned from Coral reef tourism. These stakeholders therefore recognize that maintaining clean surroundings and a healthy reef will yield in repeat tourists.

4. The Non Governmental Organizations.

“The need and importance of the involvement of NGO’s in the implementation of schemes/ programmes aimed at welfare and development of the people cannot be over emphasized”

During 1995-96 the Government accorded highest priority for the participation of NGO’s and voluntary organizations in development process for promoting welfare and development activities for the people. On the basis of availing financial benefit from Government on various schemes and projects, large number of voluntary organizations and clubs registered under societies registration act. At present there are 12 voluntary organizations/NGO’s at Agatti. 80% of them are not functioning. Most of them are concerned with the promotion of arts, culture, games and tournaments. The NGO’s formed prior to 1995-96 are working regularly and carrying out various activities:

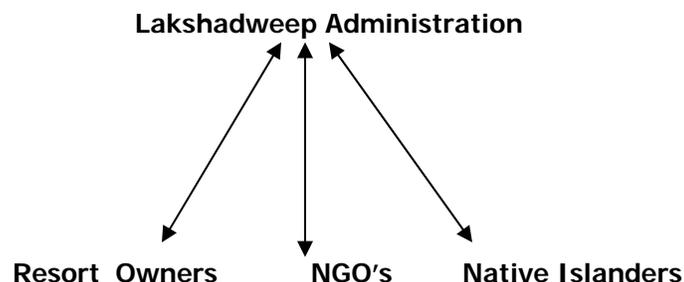
1. Maintenance and upkeep of environment and ecology for healthy existence for a clean and green Lakshadweep
2. Conduct of sports and games tournaments, cultural program’s
3. Promotion of educational activities
4. Promotion of traditional arts and crafts
5. Extend health care awareness
6. Financial aid to the poor and needy students

The NGOs have better access to the people and they will have a realistic approach to the needs of the people and region. They can also point out problems/bottlenecks in the implementation of various government schemes.

Relationship between Stakeholders

The Interaction between the various stakeholders is through the Lakshadweep Administration. The NGOs are dependent on government grants to function. The resort owners can lease the land only from the Administration and not directly from the Landowner. Similarly The island land owner is allowed to lease the land only to the government run Society for the Promotion of Recreation and tourism (SPORTS). In this way the administration controls the revenue from all developmental activities

Figure 7.6 Relationship between Stakeholders



Direct transactions between the native islanders and investors from outside is not possible. The islanders therefore has little to do with the development of tourism in the Islands and sees very little of the direct revenue generated from tourism. This despite the fact that they own the land where the resort stands. On the other hand all Islanders enjoy the benefit of subsidized transport, electricity and other infrastructure.

Chapter 8: Resource Governance

A. Customary Laws and Practices

We held a panel discussion at the socio-economic workshop where seven elders were invited to discuss customary law, practices and traditions in the Agatti Islands. Subsequently two focused group discussions were held with knowledgeable fishermen to learn about customary practices on resource usage and sharing. The aim was to find out whether the Agatti Islanders had developed any customary laws or practices in relation with the usage of reef resources and fishing. The resource persons were given a set of key questions and subjects that needed to be discussed with reference to the customary laws of their society.

The elders explained that during the olden days the people of Lakshadweep were isolated. They formed a closed society that followed unwritten codes dictated by the elders. There was no administrator to tell us how to live, where to fish, how to grow crops etc. The *Karanwars* or guardians of the Tharawads determined property rights but nowadays courts and judges determine property rights.

Property rights

Mr. Shamsuddin Moulavi Keelapura was the spokesman for the panel. He gave a detailed description of the various rules pertaining to various aspects of their community. The property rights in general are governed on adjudgement of the following:

Ahleel Farlu: Claimant Rights of close heirs

Aheel Asafat: Subsidiary rights

Sahul Arham: Distant rights

Adopted rights. This is not of importance in the prevailing situation.

The thrust given in property division is to ensure that none in a particular tharawad (Joint Family property) goes without a share for their subsistence. The decision on property division among the joint families will be based on:

- (i) *Thingalaycha (Monday) property* i.e. property division of which will be affected based on shariat law by which two thirds will go to the male members and one third to the female members. If only one male member is surviving at the time of partition he would get 66% and the rest would be attached to the joint family. In case only one female is surviving then 50% would be given to her and rest merged with the tharawad property.
- (ii) *Belliyajycha (Friday) property*: During the past it was strictly treated as tharawad property governed by Marumakkatayam laws. (Matriarchal system) given to the female members of the joint family if so called for and in that the female members will remain in the same tharawad or will live in a separate family house with the same name of the main tharawad. It is known that the system is followed among Nair families of North Malabar and among Muslim families in a particular part of Calicut

There is a fast tendency and demand now to shift the property rights as prescribed in Shariat law to own property for nuclear families. Whereas women in general prefer to retain the Tharawad property as in the past considering the benefit of perpetuation of the tharawad name and fame.

Family property is handed down to the daughters of the household and they do not leave the house. It is the male child who has to leave the house once he gets married. This is the system of the *Marumakatayam*, adopted from the North Kerala communities who are a matriarchal community. It is also called the '*Kudumbawakaf*'. The names of the houses end with terms such as 'pura' and 'illam', which are Malayalam words.

Then the '*makatayam*' rule was brought as per the dictates of the Muslim Shariat law that ensures that the property of the father is given to all the children. In that 2/3d is given to the male members and 1/3 to the female members. As per this law the male child gets the major share of the property. There is a gradual shift from the Marumakatayam to the Makkatayam system.

Nowadays land ownership is decided by the administration. When the island area increases due to accretion by natural processes the newly emerged land becomes government property. Earlier this land would become the property of the tharawad alongside which the land had increased. Similarly if land was lost due to erosion the tharawad had to bear the loss. All this gain and loss of land by the tharawad was looked upon as an act of god and accepted by all the people. In 1975 the administration brought a decree that the new increases in land area belong to the island administration and not the islanders. This decree however did not take into consideration compensation to be given to those who lost land due to erosion.

Fresh water usage

Water is a commodity directly given by the grace of almighty. During the past there was small-scale rainwater collection from the open spaces in big vessels kept on raised ground to avoid contamination. This water was specially used for drinking and in the preparation of medicinal items.

The wells are dug in places where hard/loose bedrocks are struck. Generally it is noticed that water received from beneath the hard rocks are better in quality.

The people in the past made very prudent use of water respecting the teachings of the *Koran* and *Hadith* whereas now wasteful usage is practiced. The fragile Acquifer is under threat already because of the increasing demand on it. The numbers of wells have increased and water is no longer hand drawn but electric pumps are in use by all the households.

Cleanliness and sanitation

On matters pertaining to cleanliness and sanitation there were strict rules in the past. The Amin, could penalize citizens who did not volunteer to do cleaning work. The men and women in-groups would organize cleaning campaigns and bury the waste in pits. This was organized during the Haj season and other important festival times. The bathing ponds were also cleaned in a similar manner.

The Amin would organize rat hunts to control the pest and all the residents of the area would volunteer for the hunt. The beaches were kept clean. Prisoners were ordered to clean streets and beaches as part of their punishment.

Law and order

The Amin was in charge of the law and order situation and he had a police force called the *Kavalkar*. Criminal offence like killing someone never happened on the islands. Family disputes were settled by the Karanvarans in consultation with the Amin and Khazis etc. This system has disintegrated now.

Table 8.1 Customary Practices in Agatti Island

	Past	Present	Explanation
1	Property Rights		
	As directed by the Marumakatayam code. It was called the, Kudumbawakaf, a direct influence from Kerala Matriarchal Society.	We have the Marumakatayam and the Makka-thayam code as dictated by the Shariat there is a gradual shift to having only one code that of Makkatayam.	Many of the elder men we interviewed felt that Makkathayam code was better but the women said that They preferred the Marumakkathayam code
2	FRESH WATER		
	We had wells but no so many. No purpose. Mosque tanks were cleaned regularly as ordered by the Amin. We also had small dugout ponds to collect rainwater.	Too many wells, No rainwater harvesting (except for Govt. Installed tanks since 1996) The mosque tanks are kept clean by putting pistia plants. once a year people are directed by the priest to clean the ponds. .	The holy book says that water is a commodity the value of which will appreciate with time. But the elders feel that people waste a lot of water.and prudent use to be practiced.
3	SANITATION		
	The Amin would organize men for 'rat huntis, odam hauling and launching. Women were asked to clean the mosque.	The dweep panchayat is today responsible for Island cleanliness. They bury the organic waste and dump the non-biodegradable waste in the bins provided by the administration.	Special cleaning around the house takes place on festival days.
4	Law & Order		
	The Amin punished defaulters by ordering them to clean the streets & beaches. Elders would settle disputes with discussion.	A case is taken to the courts or the police only if they cannot settle the matter with the help of elders.	--
5	Marriage and divorce		
	Very few divorces, child marriage was common, Marriage is conducted with Nikah as dictated by Islam.	Still the same, no child marriage	We have a low divorce rate because we have a long engagement period during which if they do not want to marry, they can break the engagement.
6	Children		
	Children were sent to the "Oath Palli" attached to the mosque for their first training in religion. One teacher for 25-30 children.	Anganwadi, Nursery schools, run by the government. They also continue to go to "Oath palli"	--
7	Elders		
	Were respected and their children looked after their needs	The situation remains the same	--
8	Lagoon Usage		
	Areas of lagoon were marked for fishing grounds and the Amin would allot grounds to different groups. The Amin was given a share of the catch. The catch was distributed equally the owners of the nets would get a special share	The fishing grounds are still referred to with local names but no one is consulted for permits. There is an understanding between families and disputes are avoided.	There seems to be no codes on lagoon use. They understand the importance of the reefs. They are well aware that they protect the lagoon and island from storms and tidal waves. They do not percieve any threat to the reef, hence do not think that any action needs to be taken to protect the reefs. They believe that the reefs have the capacity to regenerate on their own.

Fishing and Lagoon Usage rights

The islanders are well conversant with the lagoon, reef and surrounding seas. They have place names to describe the significant features and fishing grounds. The lagoon and reef is regarded as a common property resource. All the islanders have an equal right to use the lagoon and reef resources. “*A first come first served*” code is observed amongst the net and line fishers. If all the choice fishing places are taken the latecomer will leave. Two nets will not be placed in the same area at the same time.

In the past fishing groups would take permission from the *Amin* and go for fishing to the grounds allotted by him. The *Amin* was given a share of the catch, normally one of the best or biggest fishes. The fish catch is divided into an equal share for all the team members and gear owners. If a boat is used fifty percent of the catch goes to the boat owner and the rest is divided equally amongst the team members.

Construction material

The reefs give us construction material to construct our houses. We made lime for white washing the houses. Nobody took material in excess but then we were fewer in number. The shingle is washed ashore and we feel it's all right to take that. This is what our forefathers did. Since 1990 we have shifted to using cement and other materials made available from the mainland.

Conclusion:

From the focused group discussions and repeated interviews with knowledgeable people of both genders, we concluded that there were no customary laws but general understandings between people of the community about resource sharing in the lagoon.

The people respect each other's rights and this was an effective way of avoiding disputes amongst themselves. There are written codes for property division, marriage, law and order but not about lagoon use. This has not meant a total disregard of the resource and people have been careful not to use destructive methods. The people see the importance of the reef and understand its significance. They believe the reef will revive by itself and is not under threat. They have a vast understanding of the lagoon and all the resources in it. This understanding needs to be put to use and any management practices that will be chalked out must show regard for the knowledge of the traditional people.

B. Applicable protection Acts and Current legal status

Several acts provide for regulation of activities potentially influencing coral reefs and associated flora and fauna in UT of Lakshadweep. These acts are presented in Table 6.1. It can be noted that until 1972 all the laws and notifications addressed the settlement and land issues in Lakshadweep.

The 1972 Wild life Protection Act was first to include corals as a protected species. This act has been amended in 1974, 1986 and 2001 to include more species from coral reefs under schedule A, for protection.

In 1991 a coastal zone regulation Act of 1991 that declared coastal stretches as Coastal Regulation Zone (CRZ) and regulated activities in the CRZ was passed for all India coverage. The Lakshadweep Administration modified the CRZ in 1996 since the islands are very small in size that if the CRZ was to be strictly followed no one could inhabit or carryout any activity in Lakshadweep.

The 1996 CRZ notification states that:

Table 8.2 Laws applicable to Land regulation and Biodiversity in Lakshadweep	
Dates	Laws
1959	1. Laccadive Islands & Minicoy Regulation an Rules 2. Survey and Boundary Regulations – this was modified in 1976 and 1979 supplementary rules were published.
1965	The Laccadive, Minicoy and Amindivi Islands land revenue and tenancy regulations. To provide for the settlement and assessment of land revenue rights relating to land in the UT of Lakshadweep. By ministry of law (department of legislative) New Delhi – 15 th July 1965
1968	The Laccadive, Minicoy and Amindivi Islands land revenue and tenancy regulation rules.
1973	Laccadive Minicoy & Amindivi islands (Alternation of name) Act – renamed as Lakshadweep by ministry of Home affairs, GoI, New Delhi – 15 th October, 1973.
1979	Survey and Boundary Regulations Supplementary Rules.
	<i>Biodiversity/Coast Management</i>
1972	Wild Life Protection Act
1973	1. Wild (Life Transactions& Taxidency) Lakshadweep rules 2. Lakshadweep Wild Life (Stock declaration) Rules. By Ministry of Agriculture, GOI, New Delhi – Nov, 1973.
1991	Coastal Zone Regulation by Ministry of Environment and Forests, GOI, New Delhi 19 th Feb, 1991 This regulation financed under section – 3 (1) and section – 3 (2) of the Environment (protection) act 1986 and Rule – 5 (3) of DoE (Protection) rules, 1986. Declaring coastal stretches as Coastal Regulation Zone (CRZ) and regulating activities in the CRZ.
1996	Coastal Zone Management Plan for UT of Lakshadweep by DSTE, Kavaratti 20 th Nov, 1996.
1998	Lakshadweep Protection of Corals By-laws. Published by the UT of Lakshadweep Administrtaion (DST&E), Kavaratti 4 Aug, 1998. For protection of the coral to preserve the environment of Lakshadweep Island. This law framed on basis of the regulation 82 (1) (g) of Lakshadweep Panchayat Regulations, 1994) Lakshadweep Protection of Corals(Amendments) to By-laws. Regarding collection of coral shingle, boulder and sands etc. and declaring coastal stretches as coastal regulation zone (CRZ) and regulation of activities within the CRZ. Lakshadweep Sanitation Conservancy By-law. Prohibiting the use of Non biodegradable wastes hazardous to the Islands.
2000	The Lakshadweep Marine Fishing Regulation no 3 of 2000 published by the Ministry of law Justice and Company Affairs (Department of Legislatives) New Delhi: 21 st September, 2000. This regulation provides for the regulation of fishing and fishing vessels in the lagoon and sea around the UT of Lakshadweep.
2001	The Lakshadweep Marine Fishing Regulation & Rules by Lakshadweep Administration (Department of fisheries) Kavaratti – 24 th February, 2001. According to this fishing by a ship or boat fitted with mechanical means of propulsion may be regulated, restricted or prohibited in any specified area under clause (b) of the sub- section (1) of section - 4. Notification by the Ministry of Environment and forest banning collection of corals & molluscscs.Volxxxvii. No 53, Friday December 21, 2001

“coral stones, shingles / boulders and sand from the beaches and coastal waters are not allowed to be removed or disturbed. (The collection of corals is allowed for scientific studies / for museum specimens with specific permission from the competent authority)”. A note was attached which said

“ Note: Till such time an alternate building material is available collection of shingles from the beach in regulated manner is allowed with specific permission from the competent authority of Lakshadweep Administration.”

The Lakshadweep Administration modified the 1996 ruling that banned the use of coral for building material. The notification number 17/2/98 says that while boulder collection is banned, people can collect shingles by obtaining a permit from the environment wardens. Non-permit holders would be regarded as offenders. The environment wardens have the duty of issuing permits and punishing offenders.

In 1998 another notification was issued, stating that people desirous of collecting shingle need to apply for a permit and remit Rupees 5/- per 20 kg bag of that they wished to collect.

Compliance with governance

One can see piles of shingle, sand and rubble lying all over the island. At the same time no one has applied for a permit to collect these material in 2000-2001. Records show that 22 permits were issued in 1996 to collect a total of 4325 bags of Shingle. In 1997 45 permits were issued to collect 11400 bags. In both years the applicants had applied for double that quantity. A man who had recently built his house stated that while he had received a permit for 150 bags, he had collected around 300 to complete his house construction. It is therefore safe to assume that islanders collect exactly the amount they need irrespective of what the permit says.

It is interesting to note that the number of permit applicants abruptly declined when a permit fee was levied in 1998. Field observations show that shingle collection is carried on regardless. The administration therefore has no longer a record of how much shingle is collected or benefited with remittance for shingle collection.

Island stakeholders explain that one needs a minimum of 400 - 500 bags of shingle in order to construct a modest two-bedroom house. Each bag of shingle weighs 20 kg. Which means 8-10 tons of shingle is required per house constructed. Islanders also estimate that a minimum of 20 houses are constructed every year. By a conservative estimate this would mean that (20 houses x 10 tons of shingle) at least 200 tons of shingle are collected and used within the island annually. This estimate is supported by the data collected by monitoring shingle collection.

Tourism:

With regard to tourism the following statement has been made:

“the negative impact of tourism, generation of sewage, waste, increased consumption of water and change in landscape etc. An extremely low volume but high value nature tourism is the underlying approach for tourism in islands.”

The Govt. of India awarded the National Tourism Award for best eco-tourism to this Administration for the year 1996-97. The Tourist resorts are regulated since they are given a fixed short-term lease and either party can cancel renewal.

C. Local efforts

Local efforts in Lakshadweep are in reality only the government endeavor to protect the reefs. Traditional customary laws in Lakshadweep deal only with harvest sharing and

there appear to be no customary practices towards reef protection. This despite the fact that every citizen of Lakshadweep knows that the islands are a creation of corals and that the reef protects the islands from storm damage and wave erosion.

The NGOs in Lakshadweep have come up only to participate in Government schemes and do not seem have a vision of their own.

Table 5 describes the management efforts during the five-year and annual plans.

Table 8.3 - Management Action in the five year plans		
	Coral Reef Conservation in 5 Year Plans	Remarks
1956 – 1979 5 year plans and annual plans	Emphasis on Social and Community development Focused on encouraging people to take up fisheries as a profession in Northern Islands.	Every Plan had a budget for blasting rocks. Agatti Island electrified.
1980-85	Under the sector Fisheries, Scheme No 15 Plan to declare Suheli Par as a Marine National Park	Not implemented since Suheli is an important fishing ground for the islanders.
1986-90	Sector Tourism: while tourism has been a component in previous V year plans. For the first time the plan documents refer to Lakshadweep as a Paradise for swimmers and deep sea divers. Four schemes were floated. Scheme 1 – Construction of huts Scheme 2- tourist Information Centres Scheme 3 -Boat Cruising in Lagoon and speed boat Scheme 6- Air strip in Agatti	Ban on blasting reef for harbour activities. Bangaram leased to Casino group of hotels Airport at Agatti All implemented
VIII 1991-96	Stress on off shore Fisheries and tourism	Implemented
XI 1997-2002	Included Environment Impact Assessment for all the departmental activities Stress on Tourism development	Agatti Island beach resort started. EA not effective.
Annual plan 2001-2002	Building jetties for embarkation/disembarkation on the eastern side of the island during the monsoon after EIA	Already started.

At the National Development Council meeting in January 1997 the Lakshadweep administrator declared that “ the corner stone of all policies in the 9th plan is going to be ecology and environment”.

This declaration is based on the realization that the long term survival of the Union Territory depends upon the protection, preservation and conservation of its unique and extremely fragile eco-system. All development plans in the islands have to be ecologically compatible and must avoid ecological stress. In pursuance of the above policy, the following management action plans were initiated.

1. The Department of science, technology and environment prepared an Environment Impact Assessment report of the 9th plan document in which Environment Impact statement in respect of each of the departmental schemes has been prepared and stated from Chapter 1-15. According to them the statement which will have a direct beneficial impact on coral reef management are the following:
 - i. Cattle rearing is incompatible with the island ecology and so should be halted.
 - ii. All toilets should be biological toilets to eliminate sewage
 - iii. Stress on Non conventional energy use
 - iv. Environment audit of all existing factories in all Government and private sectors to be conducted.
 - v. The shipping vessels should be so designed that the wastes generated should not be dumped into the lagoon but should be stored and disposed in the seas far from the islands.
 - vi. When new vessels meant to enter the lagoons are to be procured it should be ensured that the draft of the vessels should be limited to the existing depth of the channel and further deepening, dredging will not be permitted as prescribed by the CRZMP
 - vii. Scheme No. 8 providing harbour facilities in all the islands by widening channels and extending and widening jetties should be dropped and no dredging work be done in the lagoon as this increases sedimentation which will ultimately effect the health of the corals.
2. Building Material Board: To reduce the pressure on coral shingle, boulder and sand collection the housing board and co-operative society supplies construction material from the mailland at subsidised cost.
3. Action initiated to ban plastic / polythene materials. A draft notification has already been published inviting suggestions from public.
4. Other environmental actions include promoting the use of renewable energy and rain water harvesting.

Lakshadweep coral Reef Monitoring Network:

An initiative to monitor the health and socio-economic impacts on coral Reefs has been started in 2000.

They propose to monitor the degradation of corals both inside and outside the reef by regular diving and to employ protective measures to prepare a master plan for the conservation of corals.

Environmental wardens and Wildlife wardens have been appointed in each of the inhabited islands. They have been given scuba diving training. Their duty is to see that no coral shingle collection takes place and the islanders do not fish endangered marine animals. In 1999 one chief conservator of forests has been allotted a post in the Administration of Lakshadweep to develop a management plan for the coral reefs of Lakshadweep.

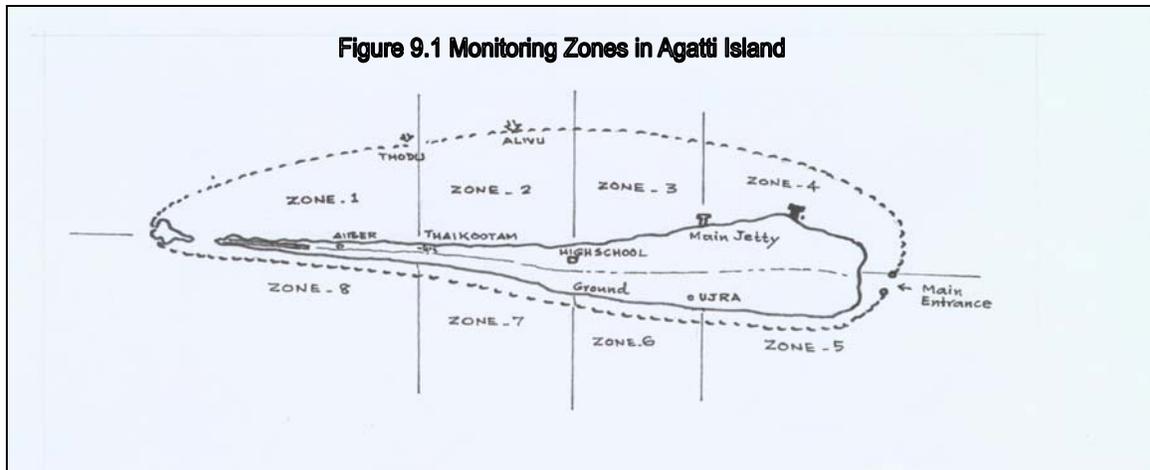
Chapter 9: Monitoring Reef related Activities

The Agatti team monitored reef related activities from July to December 2001. The methodology for carrying out the monitoring has been presented in Chapter 2. This chapter contains the results of the monitoring exercises.

Agatti Island was divided into 8 zones as shown in 9.1. The reef related activities were gathered at each zone with the aim to identify and predict problem areas in reef resource use of different stakeholders in the U T of Lakshadweep.

The following questions were addressed:

- a. Is there a variation of reef-based activities within the lagoon and reef area?
- b. Is there a seasonality of resource use?
- c. Do different stakeholders use the same reef area. If so is there a room for conflict.
- d. Are illegal activities carried out?
- e. Identify stress zones for recuperation within the lagoon and reef area.



The entire reef related activities presented in chapter 5 were taken under consideration. The data for each zone was collected on a daily basis and then consolidated into a seasonal statement for the fair and monsoon season.

1. Boulder collection

Figure 9.2 gives the pattern of boulder collection in Agatti Island. Boulder collection is a banned activity and the administration is under the impression that this activity has completely stopped.

Boulders are collected both during the monsoon and fair season in all the zones in the eastern reef. The heaviest toll in the eastern reef is along 5,6 and 7. This is important because there is only a very shallow lagoon separating the island from the eastern reef and the people can just wade into the lagoon with crowbars and remove the boulder irrespective of the weather. 4-5 people are involved in each operation and around 500 kg of boulder are collected in a single operation.

Plate 9.1 Boulder Piles



Photo: V.Hoon, 2002

Plate 9.2 Shingle Piles



Photo: V.Hoon 2002

Plate 9.3 Sand Collection



V.Hoon 2002

Figur 9.2 Boulder Collection

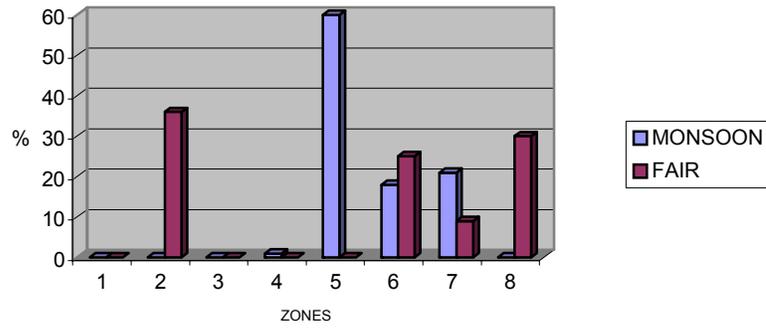


Figure 9.3 Shingle Collection

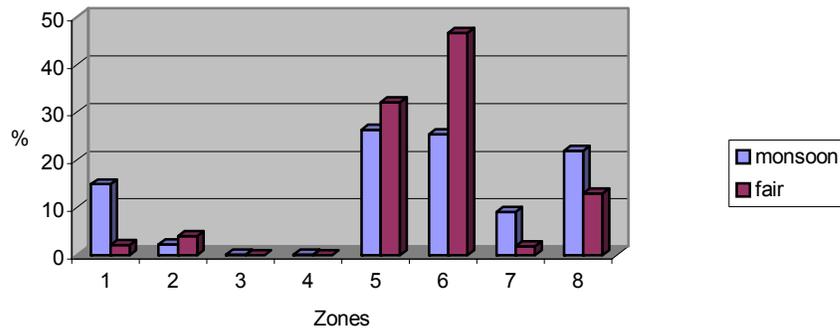
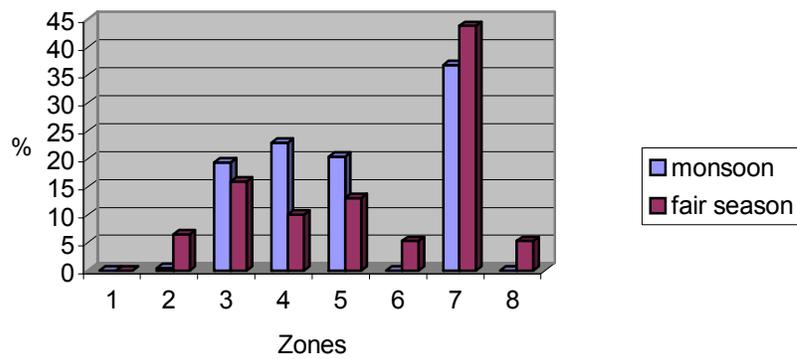


Figure 9.4 Sand Collection



During the fair season when the weather is more conducive to outdoor activity the people go further and maximum boulder collection took place in zone 2 and 8.

It is noteworthy that Zone 2 contains two entrance points for boats, Thoad and Alivu. There is a lot of boats traffic in this route and extra effort need not be taken for extracting coral boulders.

The airstrip lies adjacent to zone 8 and despite being a high security area boulder collection goes on during the fair season. The boulder collected from this zone consists of mining the coral platform adjacent to the shore.

Boulder collection appears to be indiscriminate and no part of the reef is considered sacred. The monitoring carried out from July to December showed that maximum boulder collection activity goes on in the eastern reef and south western reef shore near Thodu (Figure 5.1). Boulder collection in the eastern reef goes on throughout the year. The highest collection takes place in the month of October which is the start of the fair season. A reason for the high collection of boulders in October is that this is also the main season to start construction activities. Boulders are used for laying foundations, thus, they are most in demand at this time. Boulders are normally collected for own use and not sold. There is no class distinction for collecting coral boulders and people from all income groups can collect corals for their own use.

A total of 197 loads of boulder were collected in the months July-Aug. Each load is equal to approximately 500 Kg. This means that 98500 Kg or 98 tons of boulder were collected in this period. This includes both dead and live corals. This despite the fact that boulder collection is a strictly banned activity.

Shingle collection

Shingle collection is a regulated activity and the people who wish to collect shingles must apply with the technical assistant of the Department of Science and technology for a permit to collect shingle. Those who are given the permit have to deposit a fee of Rs 5 per bag of shingle to be collected.

The Permit records showed that no one had applied to collect shingle at the island since 1998. Yet shingle are collected from all over the island shores both during the monsoon and fair season. The maximum collection is from zone 5-6 in the eastern reef and the next highest collection is from Kalpitti area (zone 1 & 8).

Sand collection

Sand collection goes on the shore all around the island during the fair season. The monsoon activity is confined to zone 3,4, 5 and 7.

Over all there seems to be an indiscriminate collection of coral boulder, shingle and sand from all around the island. The maximum stress appears to be along the eastern shore and reef and along zone 2 of the western shore. It is significant to note that tetra pods are dropped in huge numbers in these zones to prevent sea erosion.

Fishing and Gleaning

There are several methods used in lagoon fishing throughout the year. The methods range from a single man effort such as fishing with rods, lines and castnet. The fishing techniques and gear used have been described in detail in chapter 4.

Several kinds of dragnet fishing also are carried out in the shore lagoon and reef area and they range from 3-4 person operation such as in bala attal, adiyal and idal and a 30 person operation as in bala fadal.

Figure 9.5 Fishing in the Monsoon season

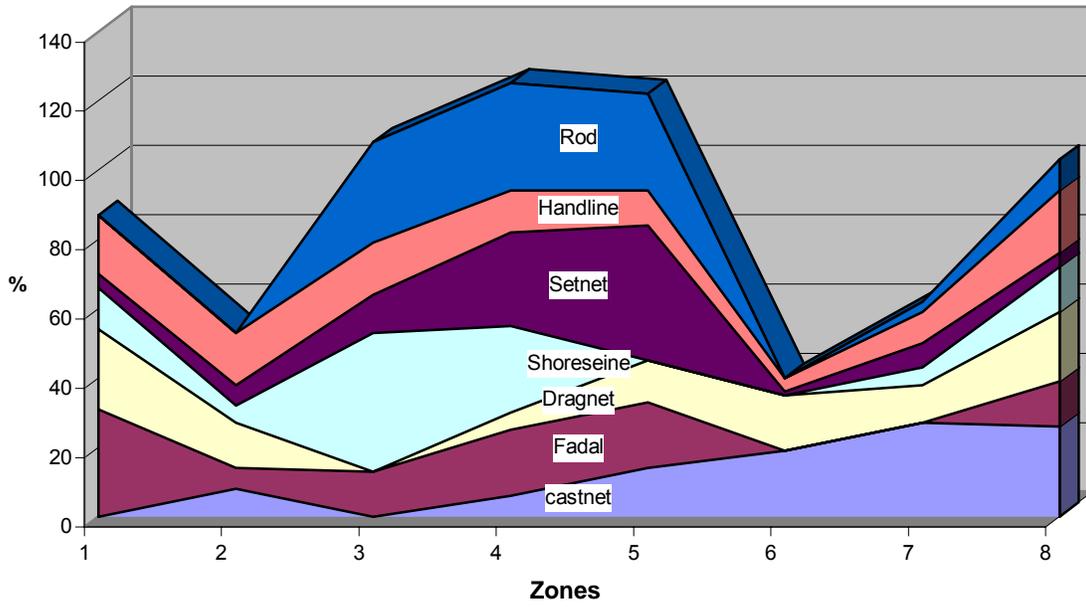
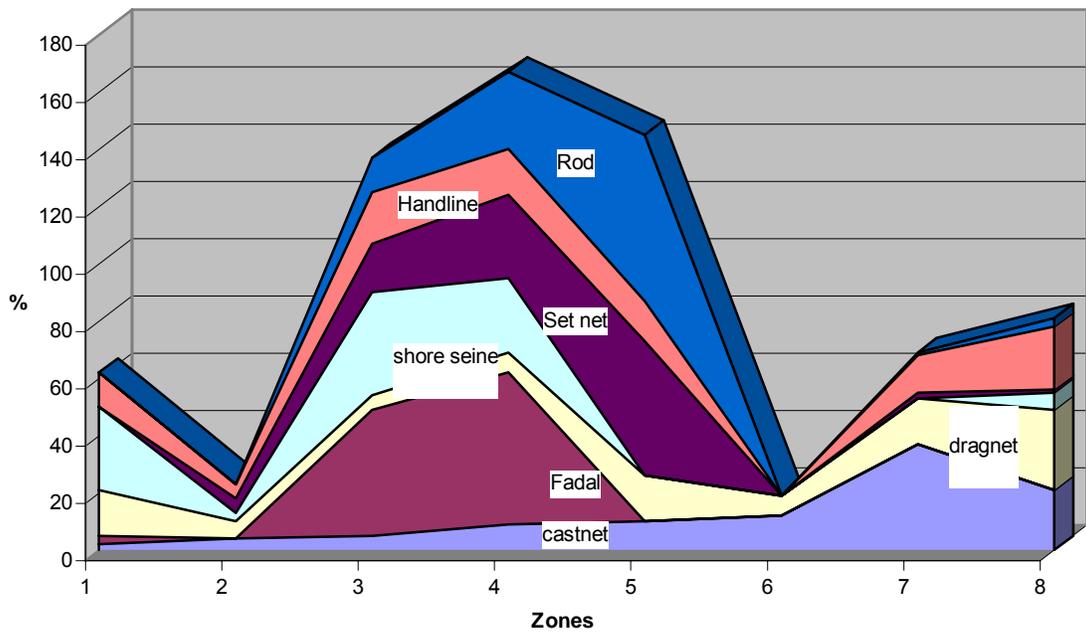


Figure 9.6 Fishing During the Fair Season



As can be seen from Figures 9.5 and 9.6 the intensity of fishing and gleaning is greatest on the eastern reef.

- People use fishing rods and hand-line in their free time throughout the year. The most popular fishing areas are from the jetties in the western lagoon corresponding to zone 3 and 4. Another popular place is zone 5. Rod fishing during the monsoon months is greater than in the fair season.
- Set net nets are placed within the lagoon and at the small entrances in the reef that fall within zones 1, 3 and 4
- Shore seine activity is carried out throughout the year and is concentrated in zones 1, 3 and 4.
- Dragnet operated throughout the year mainly in the western lagoon.
- Bala fadal operated in the western lagoon throughout the year. Peak time is in the month of October coinciding with the onset of the tuna fishing season.
- Cast netting from the shore is a single man operation. It takes place throughout the year and in all the zones. 813 operations were observed in the monsoon months from July-August and 764 operations were observed during the fair season months from October-December. It does not disturb the corals when the nets are operated from the shore. It is more intensive in the eastern lagoon than the western lagoon. And is most intensive in zones 7 and 8.

Bait Fishing

Fishing for live bait for the tuna operation takes place during the tuna fishing season. The Agatti fishermen started tuna fishing in August in 2001 hence we can note that bait has been collected during the monsoon season. Baitfish is collected only in the western lagoon zones 1-4. The bait fishers mainly collected bait from zone 3 and 4.

Figure 9.7 BAIT FISHING

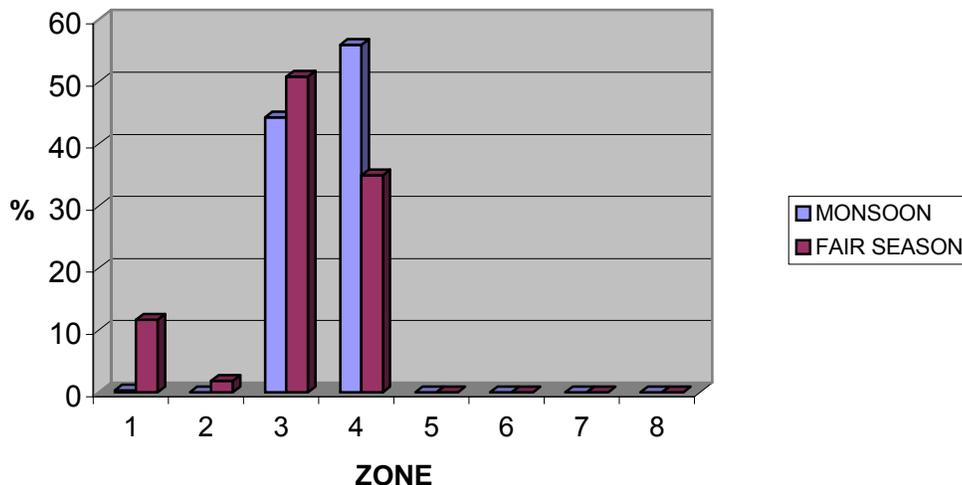


Table 9.1 shows that during the six-month period that the monitoring was conducted, 52,603 people used the reef for fishing and reef gleaning. This means that at an average 290 people access the lagoon and reef on a daily basis. The number of people using the reef is greater in the fair season months than the monsoon months.

Table 9.1 Number of People who used the reef for fishing and gleaning					
	Persons involved	Jul-Sep	Oct-Dec	Total units	Total persons
Rod Fishing	1	391	154	540	540
Handline	1	7425	4431	11856	11856
Castnet (<i>bala beesal</i>)	1	813	764	1577	1577
Drag net (<i>bala attal</i>)	3	2168	1756	3745	11235
Set net (<i>bala idal</i>)	3	713	607	1320	3960
Shore seine (<i>bala adiyal</i>)	4	1030	641	1671	6684
Bala Fadal	30	16	59	75	2250
Cowry collection	1	1706	12770	14477	540
Octopus hunting	1	1336	4130	5469	11856
Bait fishing	10	890	1703	2596	1577
Kalmoodal - Boulder trap	2	46	218	264	528
		16534	27233	43590	52603

Summing up

Is there a seasonality of resource use?

There is seasonality in the pattern of resource use and significantly fishing and gleaning activities within the lagoon and close to the reef is greater during the fair season than the monsoon season. The eastern reef is much more stressed than the western reef. A shallow lagoon separates the reef from the island. One can wade to the reef even during high tide. Perumal par is not used during the monsoon.

Is there a variation of reef-based activities within the lagoon and reef area?

There is a variation of reef-based activities within the reef and lagoon area. The effort involved in each activity ranges from one person using a cast net or hand line to 30 people involved in the *balafadal* operation.

Do different stakeholders use the same reef area? If so, is there a room for conflict?

- Zone 1 and 2 that coincides with the two boat entrance points namely, Thoada and Aliv are also where the maximum number of activities by different stakeholders takes place. The corals near Thoada are in fairly good condition. The Resort brings its tourists here to view corals by snorkeling or by glass bottom boat. The reef gleaners rank thoada highly for cowry collection. All sorts of net fishing activities including *balafadal* take place close to the Thoada area and the Kalpitti area.

No conflicts were reported between the different stakeholders. The fishermen have a clear code of conduct between themselves. The resort tourists are few in number and no

more than one boat and a few snorkellers access the lagoon and reef and hence a conflict situation has not arisen.

- Zone 3 & 4 are areas with high concentration of population. It is the Tuna fishing boats landing site. The fishery Jetty and Passenger Jetty is located here. There is a heavy concentration of tetra-pods along this coast to combat sea erosion. In 1984 this area also experiences blasting and dredging for channel deepening. Since this area already faces sea erosion shingles are not collected here.

Are illegal activities carried out ?

Government notifications banning or regulating the collection of coral boulders, shingle and sand are disregarded.

Identify stress zones for recuperation within the lagoon and reef area.

The entire reef and lagoon area is stressed because too many people use the reef both for subsistence or leisure time activities. The eastern zones (5,6,7,8) are used throughout the year and never get a rest.

Thoad and Kalpitti area in the southern end of the Island have a great aesthetic value and have a fairly good live coral cover. These are also the areas favored for sand and shingle collection, fishing and gleaning.

Chapter 10: Conclusion, Key Learning's and Future Prospects

Chapter one to eight has provided us with base-line information about the socio-economic and cultural status of the people who live in the Lakshadweep Islands. Chapter nine has provided us with the current status of reef related activities carried out by the islanders. We now try to concentrate on events that have brought about change in the past 30 years.

Developmental Thrust

We can see the following changes in the developmental thrust in Lakshadweep:

Before 1960: The economy depended upon coconut plantations. Copra and coir production were the main income earners. Women labored very hard to produce coir fibre and ropes. Lakshadweep was famous as the Island of the golden fibre. Subsistence fishing limited to around the reef and lagoon.

1960-1985: The development thrust was on welfare activities, education, electrification, communication, ship transport, basic medical facilities etc. Coir production and women's coir making skills lose importance as nylon ropes come into the market.

Thrust on Fisheries development. Pole & Line tuna fishing techniques was transferred from Minicoy to Agatti and all the other Islands.

Subsidy for purchasing boats and diesel, Fishing Co-operatives formed for bulk supply of fishing equipment and selling fish products. Subsistence fishing within lagoons and reef continues

1986-1990: Tourism to be developd with caution. Over night tourism to be confined to uninhabited Islands with freshwater source. Bangaram Resort with scuba diving facilities started in 1989.

1991-2000: Thrust on tourism – tourist huts built on all the islands. Agatti Island beach resort started in December 1996. There was a recognition of environmental problems – banning use of plastics, need for conservation, management and monitoring coral reef resources. The administration introduces a regulation on collection of coral shingle and sand. Subsistence fishing and reef gleaning continue.

2001 - Plans to build airstrips and Jetties on the eastern shore for all the Islands beginning with Kavaratti. Safety measures for fishing boats, radio communication sets and hand held Global Positioning Systems GPS being popularized. Department of fisheries promotes shark fishing and department of Environment puts a ban on shark fishing, collection of coral and related species.

The 1990s have seen a major change in the perceptions and aspirations of the Agatti Islanders. The developmental thrust in the decades 1960-1990 was on improving the education and living standard of the People of Lakshadweep. Agatti was electrified in 1968-69. Remarkable strides were made and now the Islands boast of a literacy rate of 89%. The Islanders were no longer isolated from each other. They could avail long distance direct dialing connections. The telephone brought separated families together. Pole and line Tuna fishing was in place and provide the people with a stable income.

A sizeable proportion of the people of Lakshadweep is well educated and have entered the job market. They now hold key positions in the administrative set-up and participate with equal footing in making development plans. The thrust seems to be on self-determined development. The Dweep Panchayat body with its elected leaders can endure that the local voices are heard.

The decade 1990-2000 has seen a major change in the attitude towards promoting tourism based on coral reefs. The Island youth have been exposed to foreign tourists and scuba divers. With the location of a dive school in Kadmat Island, island youth had the opportunity to be trained in scuba diving. Since 1990, all the Island Administrators and other key staff connected with the Department of Tourism, Science and Technology and Environment have been exposed to scuba diving and many of them are now certified scuba divers.

The attitude towards tourism has changed. Earlier tourism was regarded as taboo on the inhabited Islands for two reasons:

- a) the limited fresh water supply
- b) Islanders have a scheduled tribe or protected status. Literacy levels were low and the Island Development Authority were concerned about the impact of tourism on the Island and Islanders. They felt that the islanders were naïve and innocent and hence had to be protected from unnecessary outside influences.

Now that the Islanders themselves are in the forefront of planning for the future of Lakshadweep they feel eco-tourism is a panacea for the Islands. Tourism is being advocated as a high value, low volume industry. In order to maximize earnings from tourism global tenders are being proposed in which an uninhabited island or space on a thinly inhabited island will be leased out to the highest bidder. There is a difference in the way government bureaucrats and fishermen view the development of activities and the value of the coral reef and lagoon.

Problems and issues

Demography

The main threat due to anthropogenic forces is the increase in population. The population of Agatti at the time of independence was less than 2,000. In 2001 the population had gone up to 7072. This means the population has more than tripled since independence.

This growth in population coupled with modernization of the society and popularity of the nuclear family has put great pressure on the limited land, fresh water, and lagoon-reef resources..

A point that came out from the discussions and in course of general conversations with people was that fishing as a commercial activity, and as a hobby, is so ingrained in most of the people here, that men take 'leave' from their regular jobs to join their mates in fishing and young boys enjoy their vacations fishing during the 'fair' season. In this way , they feel that fishing as a vocation will survive for a long time to come, despite the fact that several youngsters prefer to find better jobs, and better education.

Household dependency on reef resources

All households have multiple sources of income and have some dependency on reef resources.

50% of the island households have at least one member who earns a government salary

40% of the island households are secure from tuna fishing

10% of the households are below the poverty line.

Status of women

Lakshadweep is known for being a matrilineal society, Marumukkatayam kept the status of women high now the following changes are noted:

1. Nuclear families: and nuclear housing, the children take the new houses name and not the Tharawad name.
2. The Shariat law is gaining popularity for asset and property division and this favors male inheritance over female inheritance

Women are free to pursue higher education and take up jobs. Infact other things being equal an employed spouse is the first choice.

Fishing and Fish landings:

The Fish landings at Agatti have increased due to the increase in deep sea tuna fishing activity. The fishermen today go further in search of fishing grounds. The fishing and gleaning activities in the lagoon continue for both subsistence and recreation, despite the developmental thrust on deep-sea fishing and tourism.

The Department of fisheries collects fish landings from all the tuna fishing boats and other boats that operate within the lagoon. They however do not collect fish landing data from the cast net fishermen and the hook and line fishermen.

The monsoon season is the time that has been hardly addressed by the department of fisheries, considering that this is the time when the fishermen look for means of sustenance. The islanders themselves feel that there has been an increase in fishing activity within the lagoon. There is also an increase in demand for fresh lagoon fish. At least 40% of the households also have the purchasing power to buy fresh fish from others. This does lead to over fishing within the lagoon during the lean monsoon season.

A greater number of fishers cast their net within the lagoon, which has led to a decline in per-capita fish catch. We observed that the mesh size used during drag-netting is sometime very small. There appears to be no regulation with lagoon fishing during the monsoon period and there is practically no period that is closed for fishing. This is important since the breeding season for the fish is just before the monsoon. These fish breed within the lagoon since the natural reef enclosure provides the juveniles with an element of safety.

Government Notifications and Bans

Every discussion held with the people showed that they found all the conservation measures and bans unreasonable.

1. *Turtle ban:* The islanders relate the decline for coral fish and bait fish population to the increase turtle population. The population of the green and hawksbill turtle has been steadily growing. They link the reduction of lagoon fish population with turtles grazing sea grass. Islanders say that turtles eat the sea grass that is the habitat for some lagoon fishes to lay their eggs. The turtles inadvertently eat or scatter the fish eggs when they graze on the sea grass, thereby reducing the chances of the eggs from hatching.
2. *Collection of coral shingle and boulders:* The people perceive coral shingle collection as their right and are unable to see how this can destroy the island. They explain that shingles are like broken and dead twigs and branches of a tree that wash ashore. This is part of circle of life and is utilized for construction on the islands itself. When the houses break the shingle will return to the island for

island building and hence there can be no harm in collecting shingle. They wanted an explanation for the disappearance of Parralli III. They made the point that no person had ever collected a shingle or boulder from there and yet it disappeared.

The islanders said that previous to the law people only collected the amount of shingle they needed for their own construction purposes. Now because of the permit system, only some have the privilege of collecting shingle. These people tend to hoard shingle and sell it at a premium. Shingle sells for Rs 15-20 per bag. Currently around 12 people supplement their livelihood income through shingle collection alone.

Table 10.2 - Anthropogenic threats to Reef Resources			
Activity	Consequences	Action taken	Remarks
Blasting in Lagoon	Coral mortality, reef damage	Ban , GOI 1990	No blasting since 1984. The Agatti islanders attribute the change in the half beak shoal movement from the entrance to outside the eastern reef shore to the blasting in 1984.
Dredging in lagoons	Coral mortality, erosion	Regulate	
Building Jetties on the eastern side	Large scale coral mortality, damage.	Regulate	EIA not scientifically carried out and terrapods have been thrown into the sea on the eastern reef at Amini Island even before jetty building has been authorized.
Collection of shingle	Erosion	Regulate with license	Unlicensed collection continues
Collection of boulder	Coral mortality and hampers regrowth	Ban, GOI 1990	Collection continues
Collection of sand	Erosion	Regulate with license	Unlicensed collection continues
Reef Gleaning/ walking	Reef damage by walking & poking with iron rods, overturning coral heads. Habitat damage	GOI notification banning collection of mollusks in 2002	Heavy stress observed on the near shore reefs especially on the eastern side of islands. Habitat damage
Trapping over boulder			
Octopus catching		NIL	
Drag net fishing with small mesh size in the monsoon season.	Coral mortality and juvenile population reduction	Nil	The monsoon season is the main breeding period for fish. Hence unrestricted fishing of juveniles will bring a decline in fish catch.
Bait fishing	Decline in bait fish	--	Culture of live baits
Tourism	Garbage/sewage	regulate	Day arrivals are encouraged. Resort tourists and scuba divers are very limited. The dive instructors are aware of conservation and encourage good practices. Tourists are encouraged to leave behind only footprints and takeaway only memories.
Collection of shells, corals etc.	Reef damage	ban	
Boating/	Anchor damage	regulate	
Scuba diving/	Inexperience	regulate	
Snorkeling	Flipper damage	regulate	
Research for bio-active compounds	Large scale collection of marine organisms	regulate	Don't know the status.

The Lakshadweep Administration is concerned with environmental protection. Several laws, and notifications regulating and banning the use of coral reef resources have been published.

Implementation is poor and coral reef resources continue to be collected despite bans. The islanders are against all bans. They feel alienated from the very resources that they have used from time immemorial. They are quick to seize any opportunity to disregard the bans because of the weak implementation. There is one environment warden for each island who is in charge of issuing permits to allow a limited quantity of shingle collection. He also has powers to issue notices and fine offenders. Field observations and discussions show that it is impossible for this single environment warden to work effectively and hence they turn a blind eye to the collections or report them as old collections.

The local people have never been taken into confidence and their consensus has not been sought before issuing the bans. Attitude of the people is that since it is the government who issues the ban; let them protect the reef and all the species included in the ban. At the same time some Islanders state that the local administration is not serious about implementing the bans. In the case of shingle, boulder and sand the notifications have led to increased collection and hoarding by certain individuals.

Little is known about the carrying capacity of the reef. Bio-physical monitoring is not carried out on a routine or regular basis. Both qualitative and quantitative bio-physical information on local reef conditions is not available and the little information that does exist does not correlate with the resource-activity map prepared by the fishermen. It becomes therefore difficult to assess whether anthropogenic activities or natural calamities are the worst offenders. Such information is essential to prepare a plan that integrates conservation and local economic development. This information is also essential to logically convince the local people about the gravity of the situation.

Islanders are literate and hence can be educated on the importance of coral reefs. They are already aware that they owe their existence to reef building corals. Through integrated conservation and management approaches the livelihood security of resident populations could be greatly enhanced. In order for timely detection of anomalies and threats we need to collect data by biophysical and socio-economic monitoring simultaneously.

Next steps

To sum up the challenge that has emerged from this study and discussions with the various stakeholder groups is to create mechanisms by which the management authority – The Lakshadweep Administration – is able to work with the other stakeholders group rather than in conflict. This can be done through awareness and consensus building.

The LCRMN has a mandate to create a network to monitor the biophysical and socioeconomic aspects of reef resources. As a nodal agency for monitoring purposes they need to involve the other relevant departments (DST, DoE, DoF), Dweep Panchayat, schools, NGO's to take interest in monitoring and providing data to them.

The six months of reef related activity monitoring has shown that implementation of laws and bans needs to be more effective.

1. Consensus building: through continuous public meetings and awareness campaigns involving all professions, age, and gender groups. We must take an island stakeholders participatory approach for: a) assessing resources, b) fixing levels of exploitation; c) imposing size regulation, d) periodic closure during breeding season of sensitive species to permit recovery and e) establishing Zoning - demarcation of areas for different uses including one undisturbed core area near every island.

2. Transparency with regards prohibition rules: people are not aware of impact adverse or otherwise on environment. There is a need to take into confidence people in conservation methods.
3. The role of the environment warden could be changed from policeman to consensus builder and provider of information.
4. Biophysical monitoring needs to be carried out the various fishing grounds identified in the resource maps.
5. The public could be involved to a greater degree through an awareness program with an - Adopt a Reef - action component.
6. The tourist's resorts with dive schools could hold reef check survey programs with the help of dive tourists at least twice a year at their dive sites to provide qualitative bio-physical data on the state of the reef.
7. The schools can start reef clubs and the students could adopt a small patch of reef in the lagoon. They will need to visit the patch on a regular basis to monitor and document what they see in terms of coral biodiversity conditions. They can do simple transects and fish counts. This would also contribute to both the biophysical and socio-economic data.
8. Population of Turtles (since this issue is coming up from people all the time) Its impact (good or bad over long term) Close observation essential. To study over long-term conflicts that may arise with expansion of tourist related activities (water sports etc. – opening up of resorts in traditional fishing zones) Conflicts over resources of sea. Shrinking of fishing zones.

The information thus gathered needs to be given wide publicity so that more and more people take interest in the LCRMN. The success of the program will depend on the involvement of all the stakeholders, youth, students, enthusiasts and interested individuals.

With such basic information available from grassroots, a people friendly, conservation, monitoring and development plan could be achieved with the participation of the Island Administration and the Islanders in which due weight is given to understanding the dependency of the local community on the coral reefs.

Appendix 2.1 Key Parameters and information sources for Agatti island

	Parameter/ Sub-Parameter	Information Source Key Informant/Stakeholder	Technique
1	Reef Related Activity	Dept of Science & Tech., Dept of Environment	Discussion
	Cowry collection	Fatima Kunpara, Bamban Uriyoda, Beebi Moothakada, Kamarunnisa B.M, Jameela, M Subaida, TT Pookoya Haji, Aboobacker Kandinada, PPC Attakidave Ella, Najmudheen M, Shop keepers	Observation Semi Structured Interview, Focus group Discussion, Seasonal calendar, Location Map, Resource Map, Time Line
	Shingle collection	Environment Warden, and house constructors	
	Boulder Collection	Sheik Abdul Rahman.	
	Fishing	Department of Fisheries	
	Hand Line shore (<i>Eriya</i>)	T. Abdul Azeez, K, Abdul rahaman, B. Abdul Khaleel, C.K Abdul Rahaman	
	Hand line boat (<i>bakka</i>)		
	Cast netting (<i>BalaBeesal</i>)	Mohammed Kadappurath, KK Basheer , T. Sidheeque	
	Shore netting (<i>Bala Adiyal</i>)	C.K Mohammed, K. Muhammad, Kasmi Cheriya, T.K. Khalid	
	Drag netting (<i>Bala Fadal</i>)	Sidheeque Thekthiruvathepa, Mohammed S, Yousuf K, PP Zakariya	
	Octopus hunting (<i>Appal Kuthal</i>)	A.Shaffi, R Sakariya, T Abdul Azeez, U Bamban, K Abdul Rahaman, T Sidheeque	
	Harpooning (<i>Chaduvam fokal</i>)	T. Seedheeque (55), Bamban Uriyoda (55) KK Yousuf, Kunhikoya Aliyamada, U Kunhikoya, T.T. Pookoya Haji. KK, Koyassan	
	Light & sound (<i>Chootu Kondal</i>)	Primary	
	Trapping over boulders (<i>Kalmoodall</i>)	U. Mariyam, K Kadeesha	
Tuna Pole & Line (<i>choora bakka</i>)	Kunhikoya Aliyamada, Ummerkoya, P Muthukoya, P. Ashik, M.Mohammed, A.K Anwar Hussain		
Bait Netting (<i>Oori Fiddi Kal</i>)			
Fishing Shark	K.Aboobacker (56), U.Basha Haji (57), M.Aboobacker (45), M. Mohammedkoya, TT Pookoya Haji, A Fathahulla Aliymmada, Kasim Koothapada		
	Tourism Diving Snorkeling Fishing Boating	SPORTS, Dept of Tourism, Dive Operator LACCADIVE Casino Resort, AIBER, Pykalas, Indian Airlines, Tourists	Interview, seasonal calendar, Location Map
2	Island Stakeholders Island demography (M/F) Literacy (M/F) Occupation (M/F) Per capita Income	Published statistics Islanders	Secondary publications SSI Primary Survey
3	Stakeholder Perceptions Reef Conditions Threats to reef Beliefs	Dept of Science and Technology and Environment Islanders	Primary Survey
4	Organization & Resource governance Govt Laws and Acts Customary law, traditions	Dept Science and Technology Island Administration Island elders, Shamsuddin Maulvi, V.M. Shamsuddin, P. Kunhi Koya, Ms. Hairumbi, K. Aboobacker, K.P Koya Hajee, C.P Qasmi, Ms. U Mariam teacher	Secondary FGD, Interviews
	NGO involvement	Discussion with Members of 12 NGO's	Primary

5	Traditional Knowledge Folk Taxonomy Abundance/seasonality/ Locations/Place names	Same Key Informants listed in Reef related activities. Fishing practioners	FGD, Resource Map
6	Community Services & Facilities Public utilities Education estab. Child care, Elderly Care Tele-Communications Entertainment Markets Transportation House type, Sanitation/Toilets	Relevant Government Departments The public.	Published Information SSI Observations Secondary
7	Market Attributes (Extractive) Quantity Extracted Market/Value Price Storage facility Product Quality Transport facility	Island Administration and Cooperative Marketing records Private Transporters Records Shop keepers records	SSI FGD
8	Market Attributes (Non Extractive) Tourism related Package Price Occupancy rate Perception Ratings	Jose Dominic - Casino Hotel, Kochi, Chery. P. Cherian – Bangaram resort Manager. Anees Adenwala, Diving Instructor, Laccadives. Manager Agatti-Agatti Island Beach Resort Tourists Present and Guest book	SSI Resource map
9	Non Market/Non Use Value Indirect Value Existence value Bequest value	Islanders School Children Visitors	Opinion Survey

Appendix 2.2 Tracking Worksheet

Parameter	Sub-parameter	Stake holder groups	Information source	Data collection methods	Visualization techniques	Data collected by	Data provided by	Date
Island Profile			Pub. Sources	Ob, SSI Visits Transects	Island map	Ayub, Moosa Koya, OG Moosa, Hemal, Hajra, Thaju & Vineeta	SELF	Apr 12-17 Jun 2-15 Jan 2002
1. Reef Use pattern	Cowry collection, Boulder Shingle & Sand	Cowry collectors DST & DOE	SG	Ob, SSI	Resource map, ranking (location cowrie value) Calander	Hajra, Thajunnissa Shahanaz Moosa Koya Abbbacker	15 informants 10 women and 5 men	11/4/2001 May and June
	Fishing Pole &Line Baitfishing Shark fishing Spear & Harpooning Handline Net operators Fish with log Beechaval-castnet Octopus catching	Fishermen Dept of fisheries	SG Fish Dept	Ob, SSI, Oral history FGI	Resource map Ranking Fish abundance Ranking Location Seasonal Calander	Abdul Shookur Ayub, Aashik O.G Moosa Moosa Koya Uma Maheswari	40 fishermen	11/4/2001 May and June
	Tourism	SPORTS Resort Managers Dive operators Tourist Local Entrepreneurs	SG Dept of Tourism	Ob, SSI Informal discussion		M.I Cheriya Koya Poo Koya Abdul Rahaman Moosakoya Vineeta Hoon Hemal Kanvinde	Bangaram Resort Manager AIBER Manger Tourists Casino, Kochi Sport Staff	9-4-01 11-04-01 18-1-02 9-6-02 10-6-01

Parameter	Sub-parameter	Stake holder groups	Information source	Date collection methods	Visualization techniques	Data collected by	Data provided by	Date
3.Resource Governance	Govt laws & Acts	Administ-ration	DST DoE	Secondary Research	Nil	Poo Koya Amir, Mohamad Ali	Relavent departments	11-4-01
	Traditional practices	Island Inhabitants	Elders Religious leaders	SSI, FGD stories	Time line	SSK, Anitha Moosa Koya Uma Maheswari	Key Informants	April June
4. Island Demography	Total Pop Male/Femal Literates Illiterates IMR/MMR	Island Inhabitants Census dept	DoInformation &Statistics	Secondary research	NIL	Vineeta hoon	Relavent Departments & Published materials	June
5.Community Services	Public Utilities Markets Transport	PWD, PORT ASDO, S&T Health	Relavent Departments	Secondary research	Nil	O.G Moosa Amir, Poo Koya, Uma maheswari, Moosa Koya AE Ayub Thaju &Hajra	Relavent Departments	April May & June
6.Market Attributes (Extractive)	Qty Extracted Mkt Value Storage F'ity Product Quality Transport F'ity	Manju Owners Co-op Society	Manju Owners Co-op Society	SSI and discussion Old reports	Nil	MI Cheriya koya Uma Maheswari Thaju and Hajra	Manju Owners Co-op Society	April 01 June 01
7. Market Attributes (Non Extractive)	Tourism	AIBER Tourist Aerodrome Mgr	AIBER Tourist Aerodrome Mgr	SSI	Nil	MI, Poo Koya, Amir		
8.Non Market/Non Use Value	perceptions	Women Elders, Children		Perception survey	Nil	All workshop participants School children & 50 Islanders		

Appendix 3.1 Agatti Island Transects

Zone	Lagoon	Beach	Land	Beach	Lagoon
A. Tower, Northern end 2.30 pm 20-05-2001					
Resources	Boat entrance point.	Tetra pods, shingle, Kanni trees and Mulli spike grass	2 concrete benches to sit and relax. Wireless tower, road, Mosque, residential houses, thatched huts. Goats and chickens foraging. Piles of harvested coconuts, water tanks and electrical posts and garbage bins. Piles of construction material, blue metal <i>jelly</i> , shingles, coral boulders lying around. There is a neem tree, coconut trees, cheerani and Kani tree. An Agriculture farm plot with Chilly, Papaya, Moringa, Tomatoe, Curry leaf and brinjals.	Tetrapods on the beach.	Shallow lagoon
Activities & people involved	Tuna fishing boat passing through	3 boys collect shingle, 4 men relax	Boys play cricket and Women, wash clothes, fill bucket with tap water and hang clothes on line to dry.	8 women, 2 men & 4 children engaged in shingle collection	Women reef gleaning
Problems reported	Too many turtles, too little fish	Sea erosion	Plastic waste garbage on ground not bins.	Erosion	--
B. FISHERIES JETTY (1.00 pm) 11.4.2001 west to east distance approximately 1 km					
Resources	Wide lagoon, 10 boats, Clear water Fish, Seagrass, Jetty	The beach rises 2 m from the lagoon. Tetrapods are used against sea erosion. There is a, fenced Drying area.	The land is flat. As we move away from the beach we come across houses, Mosques, Private and Mosque bathing tanks, wells. Two concrete roads. Piles of house construction materials such as : coral shingle, small coral boulders & mainland granite jelly. Heaps of coconut, husk, & ribs. A fenced area for drying Tuna-mas and copra. Goats and hens forage in the open space. There is a manmade depression inland. This area is known as -- <i>Kadu</i> or forest of Coconut Trees. Young trees are seen in the depression. Moringa and Bread Fruit trees can be seen here and there. One can see Banana, Papaya, Guava Bread-fruit, Neem, Kari leaf in the agriculture development plots.	Piles of coral Shingle hens & ducks	Shallow lagoon, Reef close by clear water.
Activities & people involved	Boats anchored MNG owners and workers Loading & un-loading goods. Men fish with rods. boys swim.	Copra drying, boat yards, Tuna landing & cleaning	Non functional Ice Plant, tea shop beside the jetty, The Department of fisheries office, workshop and masmeen processing Unit. Saw mill, House construction. Coconut harvested and left for collection on the ground. Women & Men sitting in verandah of house. Boys cycling. Children playing cricket, Man making bricks, women following goats & Taking children for food	Copra drying	Collecting shingle
Problems	Plastic Waste, esp. woven plastic bags.	Waste on beach beach erosion	Water tanks are turbid/green. Piles of shingle and Jelly. Diverse horticulture crops are seen only in Agriculture Department plots. Plastic & other garbage in the depression. Gives the island a dirty appearance.	Sea erosion	
C. Transect from Science and technology office 20-05-2001 (2:30 pm) 1 km					
Resources	1 tuna fishing boat, 4 small boats, 2 barges	Boats and boat huts	DST office, residences. Piles of coral shingle, sand and blue metal. Coconut trees, Goats and hens. Other trees are cheerani, papaya, moringa, banana and bread fruit. Mosque and wooden bench and water tank.	Shingle, sand	Clear water, shingles
Activity & people involved	--	3 women relaxing	One women grinding chillies, one man and two women making fence. Other women are collecting firewood and children play.	Copra drying man sitting	One boy cast netting
Problems	--	Shore erosion	Dirt stagnent water, mosquito breeding,	Sea erosion and waste	Over use

D. Main Jetty near the dak bunglow 11-04-2001 &:30 a.m 1 km					
Resources	The main Jetty for embarkation & disembarkation. Seagrass, fish, turtles & C.fronds in the clear water.	Boat building and jetty construction materials	Flat land, Port & Harbour offices, residential houses, Tea shops, water Tanks, Roads, Mosques, schools, shops. Several residential homes have sintex tanks for water storage. Hens, goats, calves, coconut plantations, Coconuts, nurseries, chakka trees, small, Enclosures with other plants. There are piles of jelly, shingles, sand, boulders stored in the house compounds.	Sea erosion Tree roots exposed, Piles of shingle	shingle Fish, crabs & other aquatic life
Activities & People involved	Boats anchored Old men fishing with shore seine. Men watch from jetty	Men taking boats from beach into the lagoon	Girls going with books, women wasning clothes & vessels, dehusking coconut, gathering fuel, sweeping yard, looking after goats. Men harvesting coconut, dehusking nuts, drip irrigating young c-nut trees. Rain water harvesting	Coconuts being harvested	Men fishing Women collecting shingles.
Problem	Small fish size Plastic waste		Plastic waste & Decomposing coconut fronds in Depressions. Water is turbid in bathing tanks. Pink water in bathing ponds	Sea erosion	
E. Telephone exchange(police quarters) (5pm) distance 1 km west to east.					
Resource	clear water, , Fish & Other aquatic life	Tetrapods Coconut fuel	Flat land, Telephone exchange, Police Living quarters, Residential houses, mosque, roads, schools power house, water tank, bathing tanks, wells, coconut, husk, fuel, fronds, shingle, Jelly, sand, bricks, wires, Hen, Goats, calves Coconuts, young, papaya, payar, Bread fruit, chembu, Unchalakka, Brahmiphul, paivattila, sapota. Mosque, residential houses, Houses of coconut thatch, water tanks, carpenter workshop	Sand, Hen , Ducks, Tetra pods	Water, fish, sea weeds, No boats
Activity People involved	4 Small Boats people unloading coconuts from boat from Bangaram. Coconut fronds in water	Sleeping arrangements copra, tuna & Lagoon fish	Boys on cycles, Playing cricket, women stitching,gathering, fuel food, Carpenter Carpenter-cleaning/sharpening tool. Men Dehusking , coconuts. Coconut collected & separated into fuel etc. Old men cleaning coconuts copra drying	Copra drying Fish drying	
Problems	-	Sea erosion	Cleanliness, depressions have garbage, Water tanks dirty	Sea erosion	
F. Govt. High School (11 am)					
Resources	Lagoons	Fiber Pitas, Tetrapods, Hollow blocks	Same as in A + High School, Lime making Pits, Playground, Open air stage, Meera collecting on coconuts	Sand	
Activity People involved	Two small boats, lot of big boats anchored. Coconut leaves, are soaking	Copra drying, MAS drying, Lagoon fish drying	Women gather firewood & wash vessels, draw water from well. Children play. Men pluck and deshusk coconuts	Copra drying. Old man shiting.	leaves soaking
Problem	-	Erosion	Garbage on every where, fuel woods not neatly piled	Erosion	
G. Airport – Tourist resort (island width 200 meters 9:30 a.m					
Resources	Clear lagoon, boat jetty	Umbrellas and beach chairs	Airport, Tea shop, Tourist Resort. Coconut tress and Casurina trees	fencing	--
Activity People involved	Tourists swimming and snorkelling	Tourists sunbathing	Hotel staff cleaning and serving tea	Man cast netting	reef glean
Problems	Plastic bags wound on branching coral	---	Too few tourists	---	Sand deposit on corals

Appendix 3.3 List of Corals

KINGDOM METAZOA

PHYLUM CNIDARIA

CLASS : Anthozoa

SUB CLASS : HEXACORALIA

ORDER : Scleractinia

SUBORDER : Astrocoeniina

FAMILY : Thamnasteriidae

1. *Psammocora contigua* (Esper, 1797)
2. *Psammocora profundacella* (Gardiner, 1898)

FAMILY : Pocilloporidae

3. *Pocillopora damicornis* (Linnaeus, 1758)
4. *Pocillopora eydouxi* (Edwards et Haime, 1860)
5. *Pocillopora verrucosa* (Ellis et Solander, 1786)
6. *Stylophora pistillata* (Esper, 1797)

FAMILY : Acroporidae

7. *Acropora (Acropora) aspera* (Dana, 1846)
- * 8. *Acropora (Acropora) austera* (Dana, 1846)
9. *Acropora (Acropora) corymbosa* (Lamarck, 1816)
10. *Acropora (Acropora) danai* (Edwards et Haime, 1860)
11. *Acropora (Acropora) formosa* (Dana, 1846)
12. *Acropora (Acropora) forskali* (Ehrenberg, 1834)
13. *Acropora (Acropora) granulose* (Edwards et Haime, 1860)
14. *Acropora (Acropora) humilis* (Dana, 1846)
15. *Acropora (Acropora) hyacinthus* (Dana, 1846)
- * 16. *Acropora (Acropora) latistella* (Brook, 1892)
- * 17. *Acropora (Acropora) millepora?* (Ehrenberg, 1834)
18. *Acropora (Acropora) monticulosa* (Bruggemanna, 1879)
19. *Acropora (Acropora) nasuta* (Dana, 1846)
- * 20. *Acropora (Acropora) nobilis* (Dana, 1846)
- * 21. *Acropora (Acropora) paniculata?* (Verrill, 1866)
- * 22. *Acropora (Acropora) pulchra* (Brook, 1891)
23. *Acropora (Acropora) robusta* Dana, 1846)
24. *Acropora (Acropora) teres* (Verrill, 1866)
25. *Acropora (Acropora) valida* (Dana, 1846)
26. *Acropora (Isoopora) pallifera* (Lamarck, 1816)
- * 27. *Astreopora listeri* (Bernard, 1896)
28. *Astreopora myriophthalma* (Lamarck, 1816)
- * 29. *Astreopora ocellata* (Bernard, 1896)
30. *Montipora foliosa* Pallas, 1766)
- * 31. *Montipora foveolata* Dana, 1846)
32. *Montipora berculosa* (Lamarck, 1816)
33. *Montipora gescens* (Bernard, 1897)
34. *Montipora venosa* (Ehrenberg, 1834)

SUBORDER : Fungiina

FAMILY : Agariciidae

35. *Gardineroseris planulata* (Dana, 1846)
- * 36. *Pachyseris rugosa?* (Lamarck, 1801)
- * 37. *Pavona decussata* (Dana, 1846)
38. *Pavona varians* (Verrill, 1864)
39. *Pavona venosa* (Ehrenberg, 1834)

FAMILY : Fungiidae

- * 40. *Fungia (Darafungia) scruposa* (Klunzinger, 1879)
41. *Fungia (fungia) fungites* Linnaeus, 1758)
42. *Fungia (Pleyractis) scutaria* (Lamarck, 1801)
- * 43. *Fungia (Verallofungia) concinna* (Verrill, 1864)

FAMILY : Poritidae

44. *Goriopora labota* (Edwards et Haime, 1860)
45. *Goriopora stokesi* (Edwards et Haime, 1851)
- * 46. *Porites (porites) compressa* (Dana, 1846)
- * 47. *Porites (porites) lichen* (Dana, 1846)
48. *Porites (porites) lutea* (Edwards et Haime, 1860)
- * 49. *Porites (porites) nigrescens* (Dana, 1848)
50. *Porites (porites) solida* (Forsskal, 1775)
51. *Porites (synarea) rus* (Forsskal, 1775)

SUBORDER : Faviina

FAMILY : Faviidae

52. *Cyphastrea microphthalma* (Lamarck, 1816)
53. *Cyphastrea, erailia* (Forsskal, 1775)
54. *Diploastrea helipora* (Lamarck, 1816)
55. *Echinopora lamellose* (Esper, 1795)
56. *Favia fuvus?* (Forsskal, 1775)
- * 57. *Favia matthai* (Vaughan, 1918)
58. *Favia pallida* (Dana, 1846)
- * 59. *Favia roumana* (Gardiner, 1899)
60. *Favites chdila* (Ellis et Solander, 1786)
61. *Favites flexuosa* (Dana, 1846)
62. *Favites halicora* (Ehrenberg, 1834)
- * 63. *Favites russelli* (Wells, 1954)
- * 64. *Goniastrea edwardsi* (Chevalier, 1971)
65. *Gonistrea pectinata* (Ehrenberg, 1834)
66. *Gonistrea retiformis* (Lamarck, 1816)
- * 67. *Hydnophora exesa* (Pallas, 1766)
68. *Hydnophora microcono* (Lamarck, 1816)
69. *Leptastrea bottae* (Edwards et Haime, 1849)
70. *Leptastrea purpurea* (Dana, 1846)
71. *Leptastrea transversa* (Klunzinger 1879)
72. *Leptoriaphrygia* (Ellis et Solander, 1786)
- * 73. *Monastrea curta* (Dana, 1846)
- * 74. *Monastrea magnistellata* (Chevalier, 1971)
- * 75. *Monastrea valenciennesi* (Edwards et Haime, 1848)
76. *Platygyra dacdalea* (Ellis et Solander, 1786)
77. *Platygyra lamellina* (Ehrenberg, 1834)
78. *Platygyra sinensis* (Edwards et Haime, 1849)
79. *Plesiastrea versipora* (Lamarck, 1816)

FAMILY : Ocalmidae

80. *Galaxea astreata* (Lamarck, 1816)
81. *Galaxea fascicularis* (Linnaeus, 1767)

FAMILY : Mussidae

82. *Acanthastrea echinata* (Dana, 1846)
83. *Lobophylla corymbosa* (Forsskal, 1775)
84. *Symphylha recta* (Dana, 1846)

85. *Symphylha radians* (Edwards et haime, 1849)
 SUBORDER : Caryophylliina
 FAMILY : Caryophylliidae
86. *Euphyllia Euphyllia glabrescens* (Chamisso et Eysenhad, 1821)
- * 87. *Paracyathus* sp.
 SUBORDER : Dendrophylliina
 FAMILY : Dendrophylliidae
- * 88. *Dendrophyllia* Sp.
89. *Tubastrea aurea* (Quoy et Gaimard, 1833)
- * 90. *Turbinaria frondens* (Dana, 1846)
91. *Turbinaria mesenterina* (Lamarck, 1816)
 SUBCLASS : Octocorallia
 ORDER : Stolonifera
 FAMILY : Tubiporidae
92. *Tubipora musica* Linnaeus, 1758
 ORDER : Coenothecalia
 FAMILY : Helioporidae
93. *Heliopora coerulea* (Pallas, 1766)
 CLASS : Hydrozoa
 ORDER : Milleporina
 FAMILY : Milleporidae
94. *Millepora eresa* (Forsskal, 1775)
95. *Millepora dichotoma* (Forsskal, 1775)
96. *Millepora platyphylla* (Hemprich et Ehrenberg, 1834)

Source: Rodrigues, C.L (1996) *Taxonomic and Ecological Survey of the Lakshadweep for Perumal Par Marine National Park*, Dept of Marine Sciences and Marine biotechnology, Goa University, Goa.

Appendix 4.1 FOLK TAXONOMY WITH REFERENCE TO FISHES AND FISHING GROUND

Reef Related	Gears Used		TYPES OF FISH/MOLLUSES		RANKING	LOCATION	GENDER	No. of Units/
Activity	Local name	English name	Local name	Scientific Name	Fish Abundance			Persons
Appal Kuthal	Appal Kol	Iron Rod	Appal	Octopus		Thod, Balliyailatha		
Octopus Hunting	Kavi	Hooked Iron Rod				Makkala Chal, Aliv		
	Chana Kol					Patanava, All reef area	♂♂♀	45
Bala Beeshal	Beeshi Bala	Cast Net	1. Kulluval	Cerangids Stellatus	x x x x x	Mela muna,		
Cast Netting	Kotta	Coconut leaf bag	2. Fiyada	--	x x x x	Pallia Aar,		
1. Shore Operation	Sandex	Pair of Slippers/shoe	3. Manakam	Goat Fish	x x x x	Keela muna	♂♂	25
			4. Furachi	Whip Fin Majjara	x x x	Kalpittiya Purukkumpar		
			5. Nillalam	Sturgeon fishes	x x x	Ujrayya chal		
			6. Mookam	Thread Fishes	x x x	Chekina Palliya chal		
			7. Ball Meen	--	x	Pittiya Chal		
			8. Thidira	Mullets	x	Koilatha chal		
			9. Oola	Gar Fish	x	Kunthale par		
			10. Poonchi	sea chubs	x	Tower Aar		
			11. Bangada	Cerangids	x	Parrapp		
2. Reef operation			1. Phrungunny	squirrel fishes/Soldier fish	x x x x x			
(Normally Night)			2. Kanakaduam	--	x x x x x	near entrences		
			3. Chemmali	Snapper	x x x x	same as above		75
			4. Manakom	Goat Fish	x x x x			
			5. Varipad	Sturgeon fishes	x x x			
			6. Fala	Sturgeon fishes	x x			
			7. Manjam	Emperor	x x			
			8. Oola	Gar Fish	x			

Reef Related	Gears Used		TYPES OF FISH/MOLLUSES		RANKING	LOCATION	GENDER	No. of Units/ Persons
Activity	Local name	English name	Local name	Scientific Name	Fish Abundance			
Drag Netting	Adibala	Drag net	1. Furachi	Whip Fin Majjara	x x x x x x x	Mala Munna, Vadakom		
A. Bala Adiyal	Baliyal	Coir rope	2. Kulluval	C. Stellatus	x x x x x x	Thala, Purathpalliya Aar	♂ ♂	40
Shore Netting	Kotta	bag for fish	3. Manakom	Mulloidichthy S	x x x x x	Kunnena Aar,	♂ ♂	
			4. Mural	Half Beak	x x x x x	Theku Mepeda Thada	♂ ♂	
			5. Ouram	--	x x x	Theku Keepada Thala		
			6. Fiyada	--	x x x	keepada Thala		
			7. Oola	Gar Fish	x x	Police club Aar		
			8. Thidra	Mullets	x	Mepeda Thaliya aar		
			9. Bangada	Cerangids	x	Fibre Factory aar		
			10. Oram	Rabbit Fish	x	Aadaniya Palliya aar		
			11. Lammam	--	x	Tourist hut, Airport Aar Beliyodatha aar		
B. Bala Attal	Attal bala	drag net	1. Chemmali	Snapper	x x x x x x x x x x	Kalpittiya	♂ ♂ ♂ ♂	
	Olabala-2	coconut frond rope	2. Kilukkom	Emperors	x x x x x x x x x x	Purakum puram	♂ ♂ ♂ ♂	
	Balayil	coir rope	3. Oola	Gar fish	x x x x x	Airport aar	♂ ♂ ♂ ♂	
	kotta	bag for fish	4. Manakom	Goat Fish	x x x x x	Kallukakke aar	♂ ♂	
	sandex	shoes	5. Chandy	Callyodan sp	x x x x	Chadi para aar		
			6. Naithala	Sturgeon fish	x x x x	Ujra palliya Aar		
			7. Karukom	Sturgeon fish	x x x x	Vedimeunna Aar		
			8. Perunganny	Squirrel/soldier fish	x x x	Groundina aar		
			9. Kankaduvam	--	x x x	Adiyana Palliya aar		
			10. Lattom	--	x x	Kunnina aar		
			11. Kulakkathi	Big eyes emperor	x x			

Reef Related	Gears Used		TYPES OF FISH/MOLLUSES		RANKING	LOCATION	GENDER	No. of Units/
Activity	Local name	English name	Local name	Scientific Name	Fish Abundance			Persons
C. Bala Fadal	Big ody -2	boats	1. Metty	Emperor	x x x x x x x x x x	Melacheri		5
	Olabala -45'	coconut frond rope	2. Chemmali	Red Snapper	x x x x x x x x x x	Cheera Niyava		
	Balayil -50 m	coir rope	3. Karukom	sturgeon fish	x x x x x x x x x x	Kupp		
	Thani	water	4. Naithala	sturgeon fish	x x x x x x x x x x	Pattiya kal	♂♂♂♂♂	
	Adibala	cast net	5. Chandi	callyodon sp	x x x x x x x x x x	Thod	♂♂♂♂♂	
	Purabala	drag net	6. Kulluval	cerrangids	x x x x x x x x	Cheriya Perumon	♂♂♂♂♂♂	
	Kandali bala	drag net	7. Oola	Gar Fish	x x x x x x	Parrappu	♂♂♂♂♂♂	
			8. Falli	Trigger Fish	x x x x x x	Palliya aar	♂♂♂♂♂♂	
			9. Thomp	box fishes	x x x x	Billom	♂♂♂♂♂♂	
			10. Fulariyam	Snapper	x x x x	Randikada		
			11. Feesom	callyodon sp	x x	Bangaram Kaiyna		
			12. Kolas	barracudas	x x	Mepada Tharam		
			13. Mural	half beak	x x	Keepada Tharam		
			14. Oram	rabbit fish	x			
			15. Ilimeen	--	x			
			16. Chemaniyam	--	x			
Chadum Pokk Harpooning	Odam - 1	boat	1. Ayakura	Seer Fish	x x x x x	Thalafad		20
	Thula - 1	Oar	2. Shurav	Shark	x x x	Koompuram	♂♂♂♂♂♂	
	Kalu- 3	Harpoon Pole	i. Firuthaliam	Shark		Valiyathala	♂♂♂♂♂♂	
	Fah - 1	Sail	ii. Manachurav	Shark		Valiyakon	♂♂♂♂♂♂	
	Kumb - 1	Sail Rod (Mast)	iii. Thirandi Churav	Guitar Fish		Paraliya Vadakom Tharom		
	Uli -1	Harpoon	iv. Kalla churav	Shark		Majeli Chadam		
	Kood Uli - 1	Triple hook Harpoon	v. Manabalkody	--		Melaba		
	Ott Uli - 2	Single hook harpoon	vi. Maram Churav	Black tip shark		Kandampar		
	Marakalu -1	---	3. Ola meen	Merlin	x x x	All Barana		
	Akathuli -1	Inner hook	4. Kudirameen	Sword fish	x	Paraliya keel		
	Faravakol	wooden fish	5. Maram	Indian Dog shark	x			
	Ove -1	---	6. Thirandi	Sting Ray	x			
	Kavi -1	Stick with Iron hook	7. Kottar	Electric Ray	x			

Reef Related	Gears Used		TYPES OF FISH/MOLLUSES		RANKING	LOCATION	GENDER	No. of Units/	
Activity	Local name	English name	Local name	Scientific Name	Fish Abundance			Persons	
Handline -Shore	Thangees - 4 sets	lines	1.Chemmali	Snapper	x x x x x	Alive (keela alive)			
			2. Kilukom	Emperor/pig face bream	x x x x	Cheeraniyava chal			
A. Eriyal	choondal	hooks	3. Kulluval	Cerangids	x x	Jetty -1		50	
	Kathi-1	knife	4. Metty	Emperor/pig face bream	x	Keelava reef	♂♂		
	Sanji		5. Fally	Trigger Fish	x	Airport aar			
	Era	Bait	6 Oola	Gar fish	x	Light house aar			
	Eayem	Lead sinker	7.Furachi	Cerangids	x	Vadakkella muna			
			8. Chammam	Reef Cod	x	Ujrra palliya aar			
			9. Malanji	--	x	Shekina palliya aar			
	Handline with boat	Thangees - 6 sets	lines	1. Metty	Emperor/pig face bream	x x x x x			
B. Bakkal	Choondal	hooks	2. Chemmali	Snapper	x x x x x	Aliv			
	Odam or barkass	boat	3. Manjam	Brown Reef Cod	x x x x x	Cheeraniyava	♂♂♂		
	Kavi	hooked pole	4. Chammam	Reef Cod	x x x	Thod			
	Era	bait	5. Kulluval	Cerangids	x x	Baliya Bander			
	anchor	anchor	6. Fulariyam	Snapper	x x	Parrappu			
	Thandu 2-3 sets		7. Palli	Trigger Fish	x x	Manjathakkal			
	Thani,	water	8. Shabudu Kallam	--	x	Mettiyakal			
	kathi	knife	9. Oola	Gar Fish	x	Chammanalia chal			
	kutty eaayam	small lead sinker	10. Karatty	Trigger Fish	x x	Uppathal chal			
			11. Kallalam	--	x				
C. Kol Attikal	Kol	wooden Pole	1. Fankuluval	Trigger Fish	x x x x x	Main Jetty, Fisheries jetty		15	
	Fishing with rod/log	Thangees	Lines	2. Bankada	Trigger Fish	x x x	Melamunna,		
		Choondal	lead sinkers	3. Feeyada	--	x x	Papada palliya aar		♂♂♂♂♂
		Kathi, kotta	knife & bag				Kunninauda		

Reef Related	Gears Used		TYPES OF FISH/MOLLUSES		RANKING	LOCATION	GENDER	No. of Units/
Activity	Local name	English name	Local name	Scientific Name	Fish Abundance			Persons
Choot Kathich Kuthal (Light and Sword)	Choot	Flame Torch	1. Ferunganny	Squirrel/Soldier fish	x x x x x	Keelaba (Ern lagoon)		30
	Kathi	Knife	2. Kankaduvam	Squirrel/Soldier fish	x x x x x	Kalpittiya Purakumpuram		
	Kotta	Bag	3. Mural	Half beak	x x x	Chal	♂♂♂♂	
	Chavalam	Kuth	4. Oola	gar fish	x x			
	Sandex	Shoes	5. Keram	Gar fish	x x			
			6. Manakom	Goat fish	x x			
Kalmoodal (Trapping over Boulders)	Kalmudna bala	boulder covering net	1. Nilalam	--	x x x x x	Keelapaar (Ern reef)		6
		small cast net	2. Chamman	reef cod	x x x	Kalpittiya Purukam puram	♂♂♂	
	Kotta	bag	3. Varipad	Sturgeon Fish	x x			
	Sandex 1 jodi	pair of slippers	4. Manakom	Goat Fish	x			
			5. Kilukom	Emperor/Pig face bream	x			
Chooraa Bakkal Pole and line Tuna Fishing	Pablo boat	Mechanised Boat						85
	Choorakol -12	Pole	1. Mas Chooraa	Skip Jack	x x x x x x x x x x x x x x	Ambalmugal		
	Chooraa Choondal -20	Hooks	2. Ravundi Chooraa	Little Tunny	x x x x x x x x x x	Kotta 3 sides		
	Chalabala-1	Bait net	3. Latti	Little Tunny	x x x x x x x x x x	keelamoola		
	Olabala -2	coconut frond rope	4. Cheviyam	Big eye Tuna	x x x x x	Paraliyada thalapad		
	Challapetty -1	---	5. Kindel Chooraa	Yellow Fin	x x x x x	Bilangina moola		
	Chalabatty - 2	---	6. Fallam Chooraa	Symnosarda sp	x x	Anchu Mottam		
	Othikom	---				Mannkunam, Moosa bar		
	Chudithom	---				Mandi, Kunninauda		
Balayil - 5	coir ropes				Paraliya Keepada Tharam			
Oori Pidikal or Chala Pidika Bait fish Collection	Chalabala -1		1. Manja Chala		x x x x x x x x x x x x x x	Bangaram, Kosy pitti,		85
	Olabala-2, Chal		2. Rahiya	Sprattilloids japonicus	x x x x x x x x x x	Poonina pitti, Poocha pitty		
	Petty, Chalakori,		3. Bella Chala		x x x x x x x x	Ayakura pitti, Bangada pitti	♂♂♂♂♂♂	
	Othikom, Boat Ret)-1		4. Madam Chala		x x x x x x x x	Agatti pitty, Billatha -2 sides	♂♂♂♂♂	
			5. Bodhi		x x x x x x x x	P'par, Thekila & Vadekila pitty	♂♂♂♂♂	
					Aminyala odam Meena pitty			

Reef Related	Gears Used		TYPES OF FISH/MOLLUSES		RANKING	LOCATION	GENDER	No. of Units/
Activity	Local name	English name	Local name	Scientific Name	Fish Abundance			Persons
Kavady Edukkal Cowry Collection	Iron Rod		1. Black Katty Kavadi	Snake head	x x x x x x x x x x x x x	All reef Area, Thod		100
	Small Bag		2. Bellakavady	money cowry	x x x x x	East of Kalpitti, mandiyauada	♂♀	
	Shoes		3. Baliya Kavady	Tiger Cowry	x x	Mulli Alivna Keepada		
			4. Pulli Kavadi	Tiger cowry	x	Tharam		
Bepidal, Bala Idal Shark Fishing	Mechanised boat		1. Thirandy Churav	guitar fish	x x x x x	Mankunnu		15
	1/2 " Nool	1/2" cotton twine	2. Atta Churav	shark	x x	Parali pitt		
	Boyya	Buoy	3. Bella Churav	shark	x	Perumalapar		
	Thirukkani	Steel wire	4. Poocha Choorav	shark	x	Beliyapani	♂♂♂	
	Choondal	Hook	5. Nayyam Churav	shark	x	Manjappar	♂♂♂	
	Anchor	Anchor	6. Meen Churav	shark	x	Cheriyapani		
	Baliyal	Rope	7. Balam Churav	shark	x	Elikalpeni		
	Bala	Net	8. Mara Churav	shark	x			
			9. Komban Churav	shark	x			
			10. Shirak Balam	shark	x			
			11. Piruthaliyam	shark	x			

Appendix 7.1 Government Notifications

ADMINISTRATION OF THE UNION TERRITORY OF LAKSHADWEEP

Kavaratti – 073 555, dated the 4th March, 1983

CIRCULAR

Sub: Union Territory of Lakshadweep – conservation of corals and other fauna and flora—Orders issued.

F.No. 48/1/83-Fy.: The Lakshadweep archipelago is formed of coral atolls and, therefore, the very existence of these islands depends upon the coral reef and coral growth. The corals support a variety of animal and plant life forming an ecosystem of its own, the disturbance of which will alter the balance and adversely affect the entire aquatic life in the lagoon and the area outside. This will be disastrous for the fishery of the area which depends mainly on the live balt resources of the lagoon and reef around. The destruction of the coral habitat also destroys the beauty of the colourful lagoons. Due to indiscriminate destruction of the corals in recent times, already much damage has been caused in the lagoon life, rendering a desolate look, Therefore, in order to ensure the very existence of these islands and to preserve the beauty and ecosystem of the lagoons for the future generations of the inhabitants of Lakshadweep in particular and for the country in general the following restrictions are imposed with immediate effect.

Destruction and collection of corals, whether dead or living, from the lagoon of any island or from its reef or outside the reef by any individual or institution, are completely banned except with written permission of competent authority in special cases, after satisfying that such collection will not have adverse affect.

Collecting and selling corals as By individuals are completely prohibited. In the case of Handicraft Societies, however, limited and restricted collection and sales will be allowed on written permission after assessing the resources in each island.

Tourists on no account will be allowed to destroy or collect corals from anywhere in Lakshadweep.

Fishing with in the lagoon is allowed only for domestic consumption and is permitted to only the inhabitants of Lakshadweep.

Fishing inside the lagoon and on the reef which include catching fish, collection of see shells, weeds and any other aquatic life is completely banned for tourists. However, they will be allowed fishing outside the reef for sports.

The blasting and removal of corals and boulders by the Lakshadweep Harbour Department will hereafter be only in consultation with the Administration.

The above orders apply to all the inhabited and uninhabited islands of the Union Territory of Lakshadweep.

Sd/-
(OMESH SAIGAL)
Administrator

The Lakshadweep Gazette

Published By Authority

Extraordinary

Vol.xxxiv. No. 31, Friday 30th October, 1998 / 8th Karthika, 1920 (SAKA)

MINISTRY OF ENVIRONMENT AND FORESTS
ADMINISTRATION OF THE
UNION TERRITORY OF LAKSHADWEEP
(DEPARTMENT OF SCIENCE TECHNOLOGY & ENVIRONMENT)
Kavaratti island, dated : 29.10.1998

NOTIFICATION
LAKSHADWEEP PROTECTION OF CORALS (AMENDMENT)
BYE- LAWS, 1998

F.No. 17/2/98 – ST & E: In exercise of power conferred to Administrator, Union Territory of Lakshadweep by regulation 82 (i) 9g) of Lakshadweep Panchayath Regulation, 1994: the Administrator, Union Territory of Lakshadweep hereby makes the following bye-law.

1. (1) This bye-laws may be called "Lakshadweep Protection of Corals (Amendment_ bye-laws, 1998

(2) It shall come into force with immediate effect

2. In Section 4 of the Lakshadweep Protection of Corals bye-law 1998 (hereinafter referred to as CF principal bye-law)

(1) Sub-section (a) shall be omitted

(2) After clause (a) of the principal bye-law the following clause shall be inserted.

(b) The Wild Life Wardens Chief Wild Life Warden on being satisfied of the bonafide requirement may issue a permit after inspecting the site of collection for a maximum of 15 bags with each bag weighing not more than 20 kg. On payment of permit fees of Rs.5/- (Rupees Five) only per bag.

3. For Section 6 of the principal bye-laws, the following shall be substituted, namely:

4. Cognizance of offence

The court of Judicial Magistrate shall take cognizance of offence under this bye-laws in their respective jurisdiction on a complaint made by Wild Life Warden / Technical Assistant / Environment Warden of the Department of Science, Technology and Environment, Lakshadweep or any officer authorized in this behalf by the Administration by notification.

Sd/-
(RAJEEV TALWAR)
Administrator

The problem of collection of coral shingles has been discussed at various form in the Union Territory. It was recommended that loose coral shingles lying on the shore should be allowed to be collected for the purpose of construction. It was recommended that these could be mixed with cement to form blocks and thereby replace bricks which have to be imported from the mainland. This would reduce the cost of construction of permanent houses in the islands. This recommendation has been made by wise and experienced islanders in super session of the ban to dig coral shingles along the shore. Hence taking into account the advice of District Panchayat Members, village Panchayat members and Scientists like Dr. Ali Manikfan, it would be appropriate to ban the digging of coral shingles, but to allow collection of loose shingles that lie around the edges of the islands.

In order to reduce digging up of the shore and consequent damage to the coral shore line, e.g. on the western side of the Coast Guard land, the Deputy Conservation ofthe Chief Wild Life Warden (which activity also covers preservation of the environment and ecology) may delegate such powers to the Police so as to stop any indiscriminate digging up on the shore line and transportation of coral singles in bulk.

The Lakshadweep Gazette

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Vol. XXXIV, No. 18, Monday, 10th August 1998/ 19th SRAVANA, 1920 (SAKA)

ADMINISTRATION OF THE UNION TERRITORY OF LAKSHADWEEP DEPARTMENT OF SCIENCE, TECHNOLOGY &

ENVIRONMENT

F.No. 17.2.98-ST&E: WHEREAS the coral has to be protected to preserve the environment of Lakshadweep Islands.

NOW, therefore, the Administrator U.T. of Lakshadweep in exercise of the powers conferred by Regulation 82 (1) (g) of Lakshadweep Panchayat Regulations 1994, hereby makes following bye-laws namely:

1. (1) These bye-laws may be called Lakshadweep Protect of Corals Bye-Laws, 1998.
(2) They extent to the whole of U.T. of Lakshadweep.
(3) They shall come into force w.e.f. 01.10.1998.
2. No person shall excavate or cause to be excavated corals in any form including coral boulders, pebbles, shingles, sands without permit issued by Wild Life Wardens / Chief Wild Life Warden, Lakshadweep Administration.
3. No person shall use or cause to be used any corals in any form including coral boulders, pebbles, shingles, sands for construction or for any other purpose except as permitted in the duly issued permit.
4. (a) For obtaining permit to excavate corals in any form for a bonafide use, application in the prescribed form as in the enclosed schedule shall be moved before the Wild Life Wardens / Chief Wild Life Warden.
(b) The Wild Life Wardens / Chief Wild Life Warden on being satisfied of the bonafide requirement may issue a permit after inspecting the site of excavation for a maximum off 5 bags with each bag weighing not more than 20 kg. on payment of permit fees of Rs. 100/- Rs.5/- each bag.
5. Whoever fails to comply with or contravenes any provision of these bye-laws or directions issued there under shall in respect of each such failure or contravention be punishable with a fine which may extent to Rs. 100/- and shall be liable for the seizure of the corals in any form excavated or in his possession.

6. Cognizance of offence:

The Court of Judicial Magistrate shall take cognizance of offence under these bye-laws in their respective jurisdiction on a complaint made by the Wild Life Warden, Lakshadweep Administration or an officer authorized in this behalf by the Administrator by Notification.

7. Compounding of offence:

An offence under these bye-laws may be compounded on payment of a fince of Rs. 100/- by the offender for each of the offence.

Sd/-
(RAJEEV TALWAR)

Administrator

(To be published in an extraordinary issue of Lakshadweep Gazette)
Administration of the Union Territory of Lakshadweep
Directorate of Science, Technology & Environment
Kavaratti, dated 17.7.1998

NOTIFICATION

F.No. 17.2.96-ST & E : Whereas, to ensure that non-biodegradable waste is deposited only in the garbage bins eliminating littering, as also to minimize generation of non-bio-degradable waste hazardous to the islands prohibiting the use of polythene / plastic materials for packing and carrying consumer goods, draft bye-laws viz. Lakshadweep Sanitation and Conservancy bye-laws was published in the Lakshadweep Times of 27th May 1996 inviting comments to reach the Deputy Director (S&T) on or before 24th June, 1996).

And Whereas the comments so received have been only considered.

Now, therefore, the Administrator, U.T. of Lakshadweep, in exercise of the powers conferred by section 82 of the Lakshadweep panchayats Regulations, 1994 hereby makes the following bye-laws, namely:

These bye-laws may be called Lakshadweep Sanitation conservancy Bye-Laws, 1998.

They extend to the whole U.T. of Lakshadweep

They shall come into force on such date as notified in the Official Gazette and different dates may be appointed for different islands.

In these bye-laws, unless the context otherwise requires:

Definitions as given in Lakshadweep Panchayat Regulations 1994 shall be applicable.

The "Prohibited substance" means substance prohibited by notification in the Official Gazette, under bye-law 4.

Non-bio-degradable rubbish means waste which does not degrade by natural biological process and includes polythene, plastic, glass, tetra wastes.

Bio-degradable rubbish means waste which is degradable by natural biological process and includes food leftovers, tree leaves, coconut husk and pith paper waste but exclude human excreta.

No person shall dispose off or cause to be disposed off non-bio-degradable waste in any place or manner except into garbage bin when provided for collection of bio-degradable waste.

No person shall dispose off or cause to be disposed off bio-degradable waste in any place or manner except into garbage bin when provided for collection of bio-degradable waste.

Administrator may be notification in the Official Gazette prohibit use of non-bio-degradable substance to the extent as may be specified in such notification.

On and from the date specified in the notification issued under sub-section (1) no person shall use such prohibited substance to the extent specified therein.

Penalty for contravention of the bye-laws, whoever fails to comply with or contravenes any provision of this bye-laws or directions issued there under shall in respect of each such failure or contravention be punishable with a fine which may extend to Rs. 100/-

Cognizance of offence : No court shall take cognizance under these bye-laws except on a complaint made by the Environment Warden of Dept. of Science, Technology and Environment, Lakshadweep Administration or an officer authorized in the behalf by the Administrator by notification in the Gazette.

Compounding of offence : An offence under these bye-laws may be compounded on payment of fine of Rs. 100/- by the offender for each offence.

Sd/-.

(RAJEEV TALWAR)

Administrator

To The Manager, Lakshadweep Govt. Press (2 copies) for publishing in extra-ordinary issue of Lakshadweep Gazette.

The Lakshadweep Gazette

Published By Authority
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Vol. xxxvii. No. 35, TUESDAY, 18th SEPTEMBER, 2001/27th BHADRA, 1923 (SAKA)

MINISTRY OF ENVIRONMENT AND FORESTS NOTIFICATION

New Delhi, the 11th July, 2001

S.O.665 (E):- In exercise of the powers conferred by Sub-section (1) of section 61 of the wild Life (Protection) Act, 1972). The central Government, being of the opinion that it is expedient so to do, hereby makes the following further amendments in Schedule I and schedule III of the said Act with effect from the date of publication of this notification in the Official Gazette, namely:-

1. In Schedule 1 to the said Act:-

(a) in Part II A relating to "fishes", after entry 1, the following enteries shall be inserted, namely

2. Shark and Ray (All Elasmobranchii)
3. Sea Horse (All Sygnathidians)
4. Giant Grouper (Epinephelus lanceolatus);

(b) after part IV, relating to Crustacea & Insects, the following Parts shall be inserted, namely:-

"Part IV A – Coelenterates

1. Reef Building Coral (All Scleractinians).
2. Black Coral (All Antipatharians).
3. Organ Pipe Coral (Tubipora musica)
4. Fire Coral (All Milipora Species).
5. Sea Fan (All Gorgonians)

PART IV B – Mollusca

1. Charonia tritonis	27. Turbo marmopratus
2. Lambis truncata	28. Trochus niloticus
3. Lambis chiragra	29. Xancus pyrum
4. Lambis chiragra arthritica	30. Harpulina lapponica.
5. Lambis millepeda	31. Harpulina arausiaca
6. Lambis crocea	32. Tudicla spiralis.
7. Lambis scorpius	33. Cypracsis rufa
8. Conus bengalensis	34. Cassis cornuta.
9. Conus malne-edwardsi	35. Murex palmrosae.
10. Conus textile.	36. Murex haustellum
11. Conus nobilis	37. Murex ramosus
12. Conus geographus	38. Strombus plicatus sibbaldi
13. Conus marmoreus	39. Strombus listeris
14. Cypraea lamancina	40. Fasciolaria trapazium.
15. Cypraea cribaria	41. Fusinus longicaudus
16. Cypraea tigris	42. Mitra mitra
17. Cypraea mappa	43. Mitra papalis
18. Cypraea talpa.	44. Cymatium pileare
19. Cypraea carneola.	45. Nautilus pompilius.
20. Cypraea mauritiana	46. Tridacna maxima
21. Cypraea onyx	47. Tridacna squamosa.
22. Cypraea argus.	48. Hippopus hippopus.
23. Cypraea testudinaria	49. Piter erycina.
24. Cypraea moneta	50. Pteria brevilata.
25. Ovula Ovum	51. Placenta placenta
26. Volva volva	52. Paphia ala-papilionis."

Part IC C-Echinodermata

Sea Cucumber (All Holothurians)

2. In Schedule III to the said Act, after entry 19 relating to Wild Pig, the following entry shall be inserted namely:-
"20 Sponges (All Calcareans)."

[F.No. 1-4/95/WL-I]

S.C. ShARMA, Addl. Director General of Forests (WL).

Note: The entries in various Schedules of the Wildlife (Protection) Act, 1972 have been amended from time to time. The last notification in this regard was issued vide S.O. 474 (E) dated the 29th May, 2001

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MINISTRY OF ENVIRONMENT AND FORESTS NOTIFICATION

New Delhi, the 21st decembe., 2001

S.O..... (E):- In exercise of the powers conferred by Sub-section (1) of section 61 of the wild Life (Protection) Act, 1972 (53 of 1972), the Central Government, being of the opinion that it is expedient so to do, hereby makes the following further amendments in Schedule I and schedule III of the said Act with effect from the date of publication of this notification in the Official Gazette, namely:-

3. In Schedule 1 to the said Act:-

(a) in Part II A relating to "fishes", for serial number 2 and the entry relating thereto, the following serial number and enteries shall be substituted, namely

"2. Shark and Ray

- (i) Anoxypristis cuspidate
- (ii) Carcharhinus hemiodon
- (iii) Glyphius gangeticus
- (iv) Glyphius glyphius
- (v) Himantura fluviatilis
- (vi) Pristis microdon
- (vii) Pristis zijsron
- (viii) Rhynchobatus djiddensis
- (ix) Urgymnus asperimus."

(b) For Part IV B, relating to Mollusca and the enteries there relating to, the following Part IVB and the enteries shall be substituted, namely:-

- 1. Cassis cornuta
- 2. Charonia tritonis
- 3. Conus malne-edwardsi
- 4. Cypracsis rufa
- 5. Hippopus hippopus.
- 6. Nautilus pompilius.
- 7. Tridacna maxima
- 8. Tridacna squamosa.
- 9. Tudicla spiralis.

2. In Schedule IV to the said Act, after serial number 18 and the enteries relating thereto, the following serial numbers and enteries shall be added, namely:-

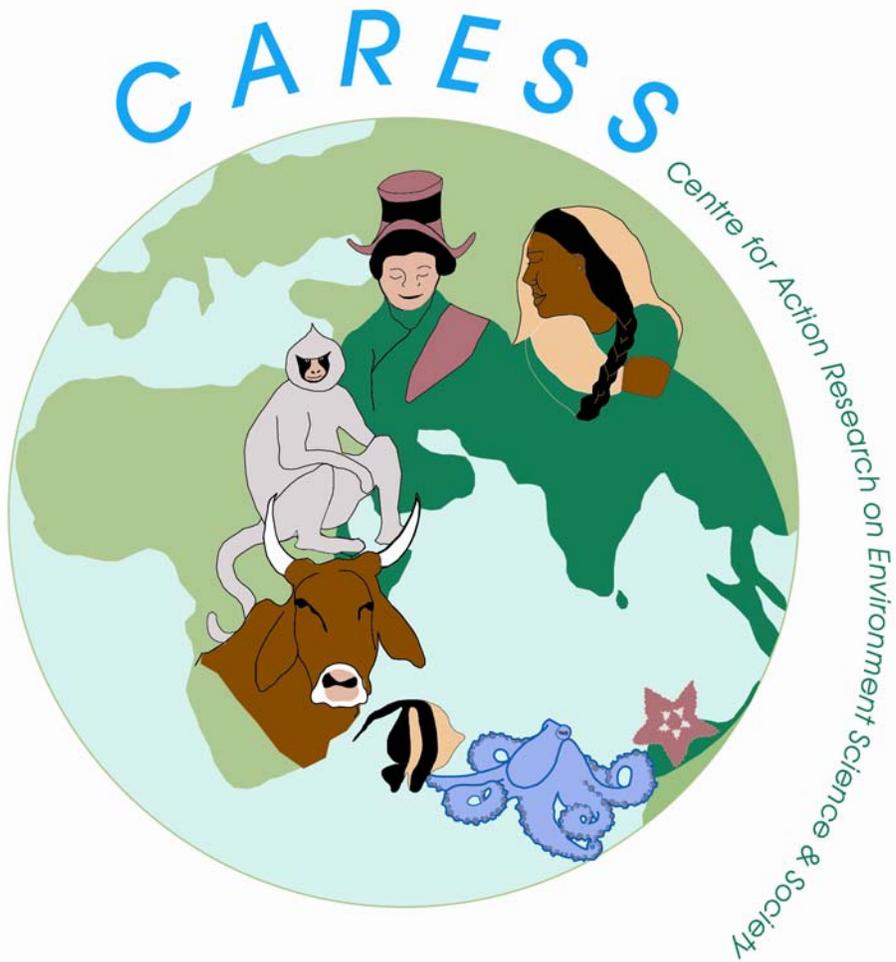
"19 Mollusca

- (i) Cypraea lamancina
- (ii) Cypraea mappa
- (iii) Cypraea talpa.
- (iv) Fasciolaria trapazium.
- (v) Harpulina arausiaca
- (vi) Lambis chiragra
- (vii) Lambis chiragra arthritica
- (viii) Lambis crocea
- (ix) Lambis millepeda
- (x) Lambis scorpius
- (xi) Lambis truncata
- (xii) Placenta placenta
- (xiii) Strombus plicatus siboldi
- (xiv) Trochus niloticus
- (xv) Turbo marmopratus

(S.C. ShARMA,
Additional Director General of Forests (WL).
To the Government of India
(F.No.1-4/95 WL-1)

Note: The various Schedules of the Wildlife (Protection) Act, 1972 were amended from time to time and the last notification in this regard was issued on 12th July, 2001 vide S.O. 665 (E) dated the 11th July, 2001

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