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MARINE LIVING RESOURCES OF THE UNION TERRITORY OF LAKSHADWEEP —

An Indicative Survey With Suggestions For Development

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INTRODUCTION

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The Union Territory of Lakshadweep, consisting of several inhabited and uninhabited islands, lie between 08°00'N and 12°30'N latitudes and 71°00'E and 74°00'E longitudes. The remoteness of the island territory from the mainland has forced the inhabitants to live in isolation amidst injustice, poverty, ignorance and ill health. Coconut and tuna formed the mainstay of the economy of the islanders. The lagoons and the surrounding waters are replete with a wide variety of flora and fauna. The tunas and the food fishes were being exploited ever since human settlement. The islands became a Union Territory of India in 1956. Since then there has been rapid progress especially in the fields of agriculture, fisheries, education, health etc. Next in importance to agriculture, the fisheries sector plays an important role in the economy of the islands.

Geomorphology

The tiniest of Union Territory of India, Lakshadweep is located on the Laccadive-Chagos ridge which is supposed to be the continuation of the Aravali mountains. The islands are believed to be the remnants of the submerged mountain cliffs and formed as a result of coral formation. The submarine bank that supports the atolls rises from depth ranging from 1500 metres to 4000 metres. The Laccadive, Maldive and Chagos Archipelagoes form a contiguous submarine bank covering a distance of over 2000 km. The atolls of the island rest on an underwater platform of about 100 fathom deep. The islands have formed as a result of many thousand years of reef building activity and the geological changes took place especially during Pleistocene period. The subsidence of a volcanic island resulted in the formation of a fringing reef and the continued subsidence allowed this grow upwards. With the submerging of the island the atoll is formed encircling the lagoon. The rim of the atolls can grow only to a height which would prevent its exposure during low tides. A reef may be about 300 m across with channels in its perimeter which allow the inflow of tidal waters in the lagoon. The islands are formed by the accumulation of coral sand in the form of sand bars with the action of wind, waves and currents. Later it got compressed into sand stone. In course of time vegetation got established and the consequent ecological succession took place. The height of the land above sea level in the islands is generally 1-2 metres. Coral boulders are heaped up on one side of some of the islands due to natural calamities like cyclones and heavy storms.

The archipelago consists of 12 atolls, three reefs and five submerged banks. There are 36 islands covering an area of 32 Sq. km. Of these only 10 islands, namely, Androth, Amini, Agatti, Bitra, Chetlat, Kadmat, Kalpeni, Kavaratti, Kiltan and Minicoy are inhabited. Among the unhabited islands, Bangaram is a tourist resort and Suheli is a coconut growing and fishing centre. Pitti or the bird island is small reef with sand bank covering an area of 1.2 hectare lying north west of Kavaratti where terns in thousands visit for nesting. The details of inhabited islands are given in table 1.

Information in detail about Lakshadweep relating to georaphical features, land flora and fauna, history etc are given by Ellis (1924) and Mannadiar (1977). Except Androth all the islands have a lagoon, some of which are fast getting filled up by calcareous sand. Bitra has perhaps the most magnificient lagoon. Minicoy has a large and deep lagoon with a boat channel on the northern side giving safe access and anchorage to vessels of about 3 m draught. The outer edges of atolls drop precipitously to the ocean floor. Mostly on the eastern side the atolls overhang the precipitous shelf. The eastern side is generally more sheltered from

Table 1. The names and details of the inhabited island in the UT of Lakshadweep.

Name	Georgraphic location	Distance from Cochin (N. M)	Area in Sq. km.	Area in hectares	Population 1971	Population 1981	Language
Agatti	Lat. 10°51'N Long. 72°11'E	248	2.7	271	3155	4111	Malayalam
Amini	Lat.11°07'N Long. 72°44'E	220	2.6	259	4542	5367	,,
Androth	Lat. 10°49'N Long. 73°41'E	158	4.8	484	5424	6812	,,
Bitra	Lat. 11°36'N Long. 72°43'E	261	0.1	10	112	181	,,
Chetlat	Lat. 11°41'N Long. 72°10'E	233	1.0	104	1200	1484	,
Kadmat	Lat. 11°13'N Long. 72°47'E	220	3.1	213	2416	3114	,,
Kalpeni	Lat. 10°05'N Long. 73°39'E	155	2.3	228	3152	3543	,,
Kavaratti	Lat. 10°33'N Long. 72°38'E	213	3.6	363	4420	6604	,,
Kiltan	Lat. 11°29'N Long: 73°E	218	1.6	163	2046	2375	,,
Minicoy	Lat. 08°17'N Long. 73°04'E	215	4.4	437	5342	6658	Mahl (Divehi)

wind and current. The islands, ranging in area from 1 ha. to nearly 440 ha., are little specks in the Indian Ocean. They are beautiful, idyllic and strategically located from the point of view of economic and defence considerations of India. Being oceanic islands, the continental shelf around them is limited to about 4336 sq. km. But considering the lagoon area of about 4200 sq.km., 20,000 sq. km. of territorial waters and about 400,000 sq. km. of oceanic zone, Lakshadweep is one of the largest territories of our nation.

Climate

The climate, more or less comparable to that of the coastal areas of Kerala, is warm and humid but bearable. The average rainfall is about 1640 mm for Minicoy and 1504 mm for Amini. The rainiest months are June to September with June receiving the maximum. Maximum temperature may range from 35°C to 38°C and minimum from 17°C to 18°C. Occasionally cyclonic storms occur, the oldest and the most serious recorded being the one that struck Kalpeni and Androth on April 15, 1847 (Mannadiar, 1977). The subsequent ones were in 1891, 1922, 1948, 1963 and 1965 but never of the magnitude of the first one (Jones 1986)

Mineral resources

The mineral resources of the island consist of low grade phosphate derived out of bird droppings before the islands were colonised by man and calcium carbonate sands. Exploitation of these are linked with the very existence of the islands and any attempt made in this direction should not turn out suicidal.

Natural resources

The most important items coming under the flora and fauna of the islands are the coconut trees and fishes which form the mainstay of the economy of the islands. Though there are several kinds of plants in the islands none of them has as much importance as the coconut

tree. It forms the real tree of life of islanders and every part of it is of use to them. No cereal of any significant importance is grown in the islands. The flora of the islands consists mainly Banana (Vazha) (*Musa paradisiaca*), Chembu (*Colocasia antiquorum*), drumstick 'Moringakki' (*Moringa oleifera*) bread fruit - 'Chakka' (*Artocarpus incisa*) and Wild almond (*Terminalia catappa*) Some of the shrub plants are Kanni (*Scaevola koenigii*), Punna (*Calophyllum inophyllum*), Chavok (*Casuarina equisetifolia*) and Cherrani (*Thespesia populnea*) which are unevenly grown throughout the islands. Tapioca, yam, gourds, legumes etc are also cultivated. A variety of wild herbs and shrubs grow and new plants occasionally introduced from the mainland. The area available is so limited, the population is on the increase and there is shortage of fresh water leaving very little scope for large-scale cultivation.

Until the territory came under the Central Administration, large-scale fishing has been in vogue in Minicoy. Remarkable strides have been made in fishery development during the last thirty years. The CMFRI made a comprehensive study of the fish fauna of the entire archipelago. There is no land fauna of any special importance except perhaps the tree rat, which is of a very distructive nature.

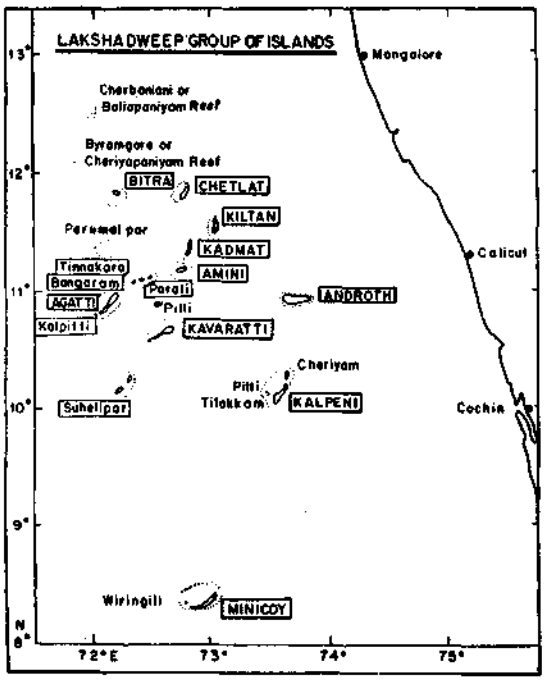

Fig. 1. The Lekshadweep group of islands. The islands marked inside boxes indicate those surveyed during the present investigation.

Social and cultural background

The people in the islands are all muslims who are very devoted to their religion. They are peace loving, and criminal records are few, though litigation cases arising out of property disputes are rather high.

The early migrants were mostly from the mainland India, especially from Malabar. A certain type of caste system was in existance

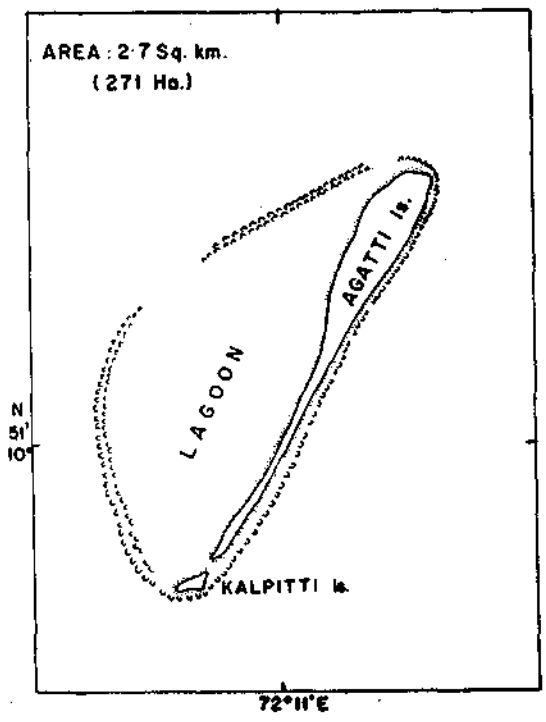

Fig. 2. Agatti and Kalpitti Islands

before Islamisation. The social structure in Minicoy bears close affinities with that of Maldives. The *Attiri* or village system is of special kind there and women play a dominant role in the society, unlike anywhere else among the Muslims. The social conditions in the Lakshadweep bears close resemblance to those in Maldives. The people of the southern most island, Minicoy, are ethinically related to Maldivians and speak the Mahl Chalet or Divehi language while the rest of the islanders speak Malayalam with a characteristic local slang. Culturally they are closely related to Kerala.

Realising the importance of oceanic tuna fisheries, the Central Marine Fisheries Research Institute established a Research Centre at Minicoy in 1958, and the Department of Fisheries

Lakshadweep was established in 1959. During the past 30 years research activities carried out by the scientists of CMFRI as well as scientists of other research organisations mainly going from the mainland have furthered our knowledge on the fishery reaources, their potential, fishing methods, fishery biology of commercially important tunas and bait fishes, and environmental

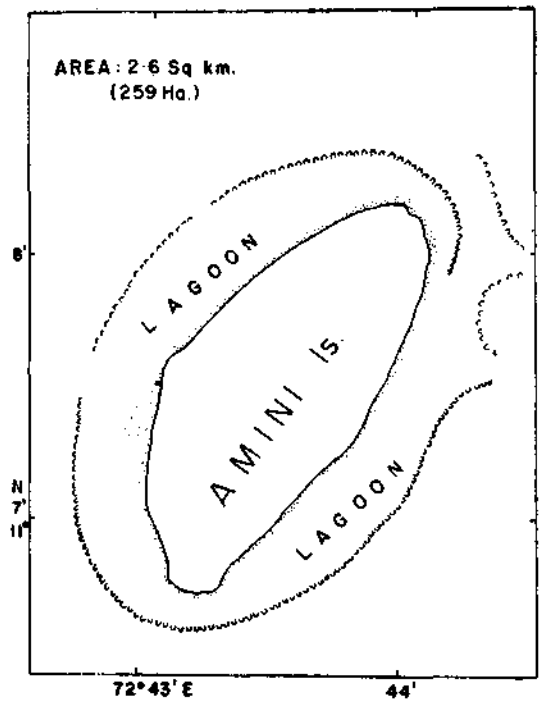

Fig. 3. Amini Island

characteristics. Research on corals and coral reefs has been strengthened. But, except for the useful information available from Minicoy in the south, little is known trom the northern islands, mainly because the Institute could not undertake survey/research programmes for want or manpower and infrastructural facilities.

The recent interest in the development of Lakshadweep through modern scientific and technological inputs has brought into a sharper focus on the marine wealth. The efforts aim at assessing these resources for exploitation for the economic benefits of the people of the islands as well as for improving the national economy without jeopardising the ecosystem and the resources which are unique to these islands.

The Futurology workshop held in July 1986 organised by the Department of Science and Technology, Government of India, and the Lakshadweep Administration has identified definite areas for evaluation under each subject, such as agriculture, fisheries etc. Based on the S&T inputs suggested at this workshop and also the main objective of the Institute during the VII Plan, *viz.*, to assess the underexploited and unexploited resources of the EEZ, the CMFRI undertook a comprehensive and indicative survey of the fishery potential of the various islands under the leadership of Dr. P. S. B. R. James, Director, CMFRI. An action plan for the survey was drawn up by the end of 1986. Regarding the modalities for uniform collection of data and facilities and equipments needed for the survey the team leaders and members had detailed briefing at Headquarters, Cochin. The survey was accomplished by 24 scientists of CMFRI from identified fields, divided into three teams and each team surveying a group of islands for a period of one month, from January to March 1987.

The comprehensive survey mainly aimed at an overall assessment of the various fishery resources, especially tunas and baitfishes, their potential, evaluation of ancillary marine resources such as ornamental fishes, sea cucumbers and sponges, impact of environmental damages caused to the ecosystems such as coral reefs, identifying areas and species suitable for mariculture in the islands and for suggesting measures that would form the basis for evolving suitable strategies of exploitation.

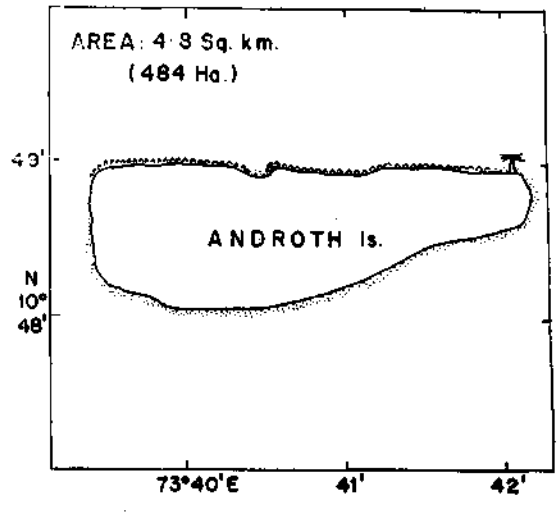

Fig. 4. Androth Island

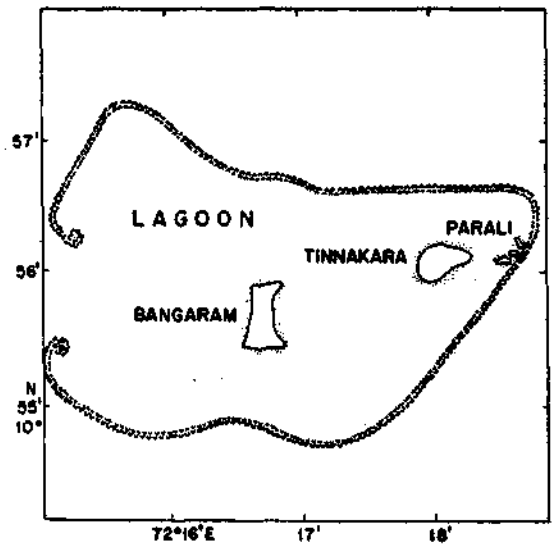

Fig. 5. Bangaram, Tinnakara and Pareli Islands

The objectives as defined covered the following :

1) Collection of basic information on the present status of exploitation of the marine fishery resources including data on infrastructure facilities and manpower.

2) Identification and estimation of non-conventional, underexploited and unexploited resources.

3) Faunistic survey with estimates of abundance of ancillary resources, such as ornamental fishes, echinoderms, sponges, molluscs, crustaceans and seaweeds.

4) Aimed survey of the bait fish resources in the lagoon, reef flat and adjacent sea, looking into possibilities for development of these resources.

5) Investigation of ecology of lagoon, reef and adjacent sea to understand the environmental parameters and productivity.

6) Survey of the mariculture potential of the islands in terms of species, seed availability and suitablity of sites.

7) Estimation of ecological damage caused by man-made changes on the entire marine ecosystem, particularly coral reef and possibilities of protection/rebuilding of the ecosystem.

8) Consideration of setting up of National Marine Parks in the islands.

Since survey of this nature would not be possible during the southwest monsoon, January to March 87 was chosen for carrying out the programme. The first team was in the islands from 3 January to 8 February and surveyed Amini, Kadmat, Kiltan and Chetlat. The second team surveyed the islands Agatti, Kalipatti, Bangaram, Tinnakara, Parli and Bitra from 5 February to 4 March. The third team conducted survey of Kavaratti, Suheli Par, Minicoy and Kalpeni from 5 March to 3 April. The Project Leader Dr. P. S. B. R. James, Director, CMFRI, along with two other Scientists Dr. P. P. Pillai and Shri A. A. Jayaprakash visited Minicoy, Kavaratti, Agatti and Bangaram to make an on-the-spot study of the pole-and-line fishery for skipjack, live-bait fishes, coral reef ecosystem, the associated flora and fauna and other ancillary marine resources. The discussions he held with the Administrator and Director of Fisheries Lakhshadweep could identify the major constraints and programmes to be implemented for future development.

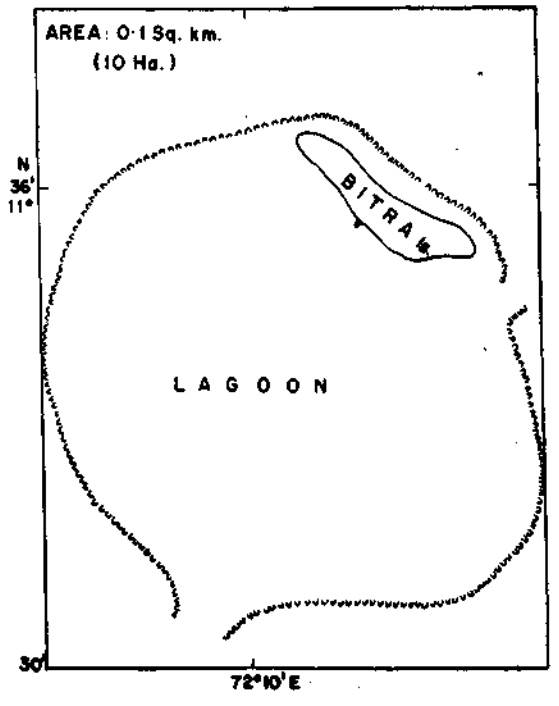

Fig. 6. Bitra Island

The composition of the various teams were as follows :

Project Leader : Dr. P. S. B. R. James, Director, CMFRI, Cochin

Team 1 : Dr. C. S. Gopinadha Pillai (Associate Leader), Dr. V. S. R. Moorthy, Dr.

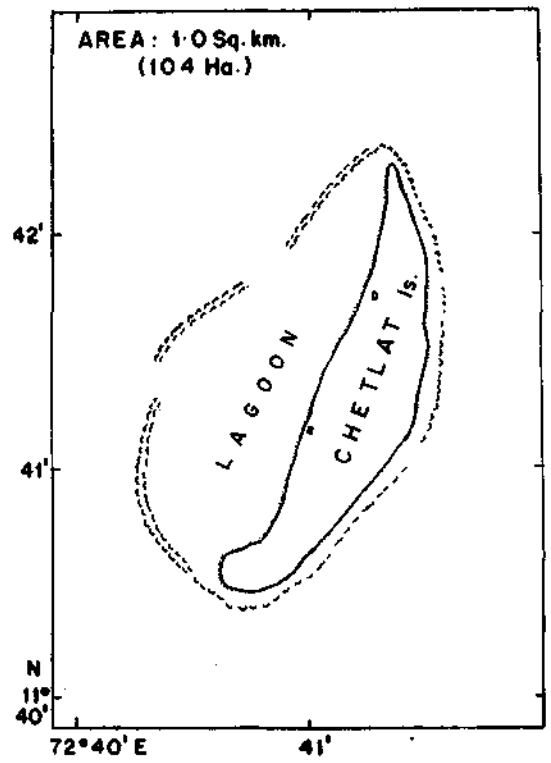

Fig. 7. Chetlat Island

G. Sudhakara Rao, Dr. D. B. James, S/Shri K. Ramdoss, K. Kaladharan, I. David Raj (Scientists) and K. K. Kunhikoya (Tech. Asst.)

Team 2 : Shri M. Kumaran (Assoctate Leader), Dr. C. Suseelan, S/Shri K. K. Appukuttan, S. V. Alavandi, A. Chellam, K. P. Said Koya (Scientists), S. Kalimuthu (Tech. Asst.) and P. Kojan Koya (Fieldman).

Team 3 : Dr. R. S. Lal Mohan, Dr. P. A. Thomas, Dr. N. Kaliaperumal, S/Shri M. Kathirvel, K. G. Girijavallabhan, A. C. C. Victor, M. M. Meiyappan (Scientists) and Mohamed Koya (Lab. Attendant).

The three teams successfully completed the survey of the different islands (Fig. 1-12) as per schedule. A large volume of data and scientific materials on various resources of fin fishes, crustaceans, molluscs, sea cucumbers, sponges, corals, coral reefs and seaweeds have been collected. The environmental damages caused by natural factors and due to human interference in each island have been assessed and measures suggested including the need for establishing marine parks and reserves in this area. Studies on hydrology and ecology of the lagoon, reef and adjacent sea have been made. Special emphasis was laid to survey the mariculture potential of the islands. The materials collected during the survey were analysed independently and collectively by the scientists who prepared reports according to their specialisations, using all the materials and data collected by the three teams.

Earlier studies as well as the present survey have indicated the need for further exploitation of the untapped resources of tuna. Introduction of large pole-and-line units, purse seiners and longliners can augment production. The reported potential is 90,000 tonnes (Jones & Banerji 1973). Finfishes other than tuna could be exploited by gillnetting and hooks and lines. Since FADs can augment production, experiments to fabricate these having a long life will be worth trying. Attention should be focussed to conduct experiments on artificial breeding and culture of live-baits. Experiments to reduce

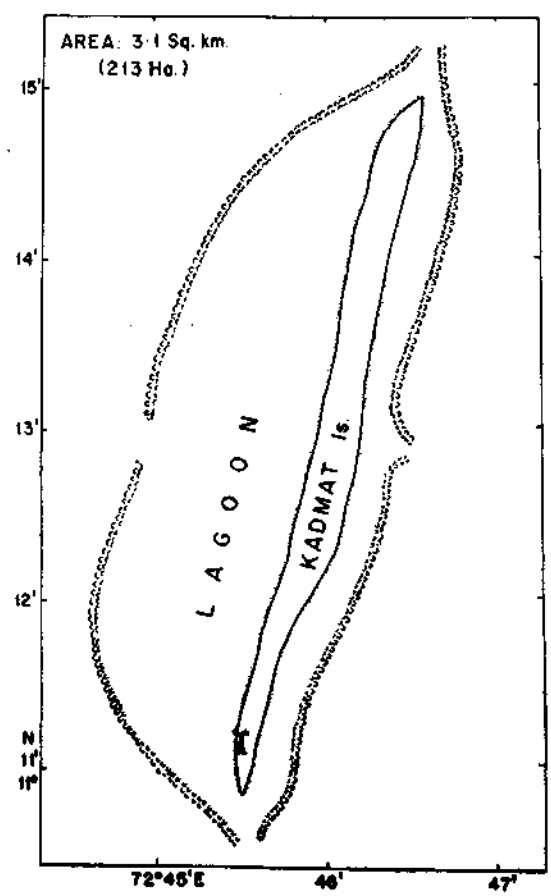

Fig. 8. Kadmat Island

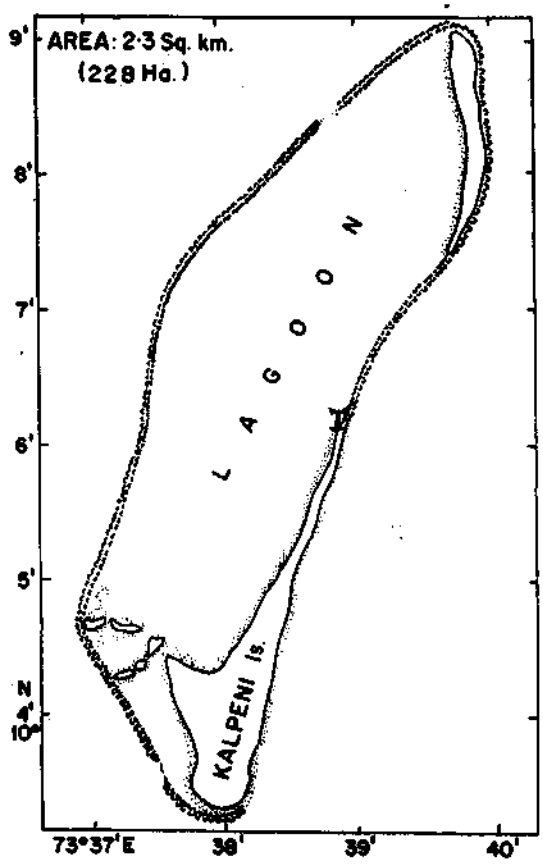

Fig. 9. Kalpeni Island

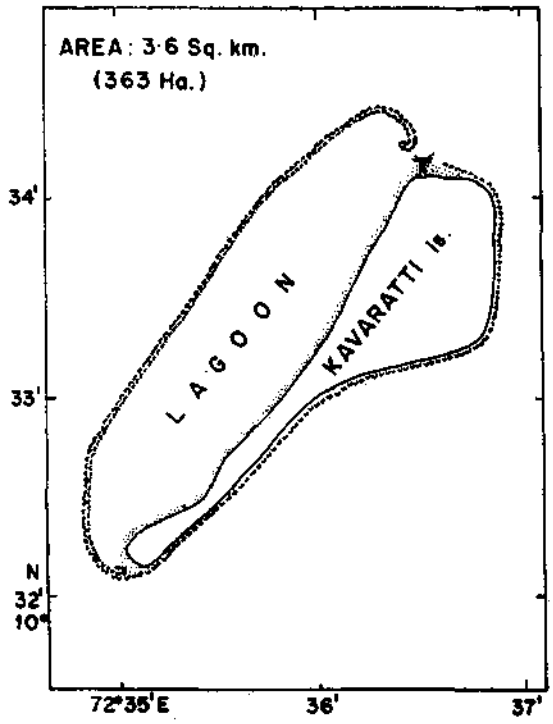

Fig. 10. Kavaratti Island

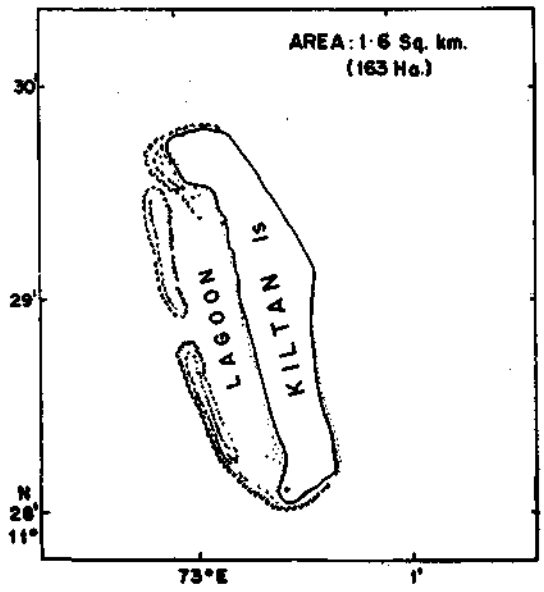

Fig. 11. Kiltan Island

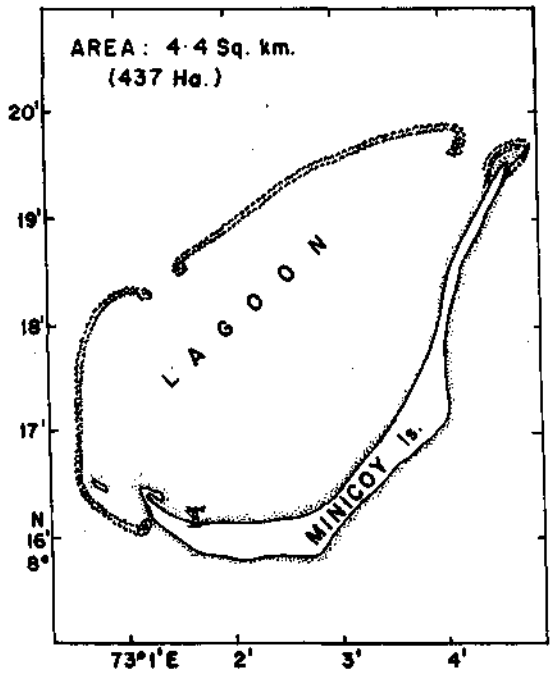

Fig. 12. Minicoy Island

mortality of live-baits durlng handling, transportation and storing in live-bait tanks is of utmost importance. Immediate attention should be given to carry out demonstration programmes so as to convince fishermen in the use of live baits other than the traditionally exploited sprats. Trials with artificial baits also have to be made. Manpower development through training as well as by appropriate socio-economic programmes need consideration. The interisland movement of fishermen/boat would result in further

expansion of the existing pole-and-line fishery. Some of the uninhabited islands where fishermen stay should have facilities for camping, repair and maintenance of the vessel, supply of fresh water and fuel. An organised marketing system will be beneficial to the fishermen. Product diversification to suit consumer preference will be ideal. Ways and means of utilisation of the tuna waste need consideration.

There are prospects for exploitation of a number of ornamental fishes and some of the ancillary resources in a limited way. But culture of some of these organisms in an organised manner in the lagoons of some of the islands will be worth trying. In view of the environmental damages caused by man, effective steps are underway to prevent further deterioration by legal measures and as well by creating greater awareness among the islanders. Steps to transplant and rejuvenate corals in areas of mass mortality of corals and construction of artificial reefs to attract a variety of reef fishes also have to be undertaken. A continuous monitoring of the resources and a close vigil on the resources response to the management measures is a sine-qua-non. Moreover, the overall approach and plans to ensure a fast and balanced growth of the economy of islands should visualise to bring to light the complexities of the various problems in the correct perspectives, so as to build up proper linkages between different components of the entire system.

The Lakshadweep Administration and the Directorate of fisheries of the Union Territory whole heartedly cooperated in the Survey without which it would not have been possible to complete the work. Our grateful thanks are due to Shri Jagdish Sagar IAS, then Administrator of the Union Territory of Lakshadweep. Our special thanks are due to Shri George Varghese, Director, Shri P. A. Raghavan, Asst. Director, Shri C. G. Koya, Fisheries Officer and their colleagues, Department of Fisheries, Lakshadweep for their kind cooperation, making available their departmental boats and other services for executing the survey programme as per the schedule.

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