

ENVIRONMENTAL DETERIORATION IN LAKSHADWEEP AND NEED FOR CONSERVATION OF LIVING RESOURCES

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INTRODUCTION

The Lakshadweep Archipelago is located on the Laccadive - Chagos ridge, believed to be the submarine extension of the Aravalli mountains. The various atolls rise from a depth ranging from 1500 to 4000 m. The Lakshadweep Archipelago consists of 12 atolls, 3 reefs and 5 submerged banks, all of coral formations. The total land area is about 32 sq km. The height of islands vary from 1 to 1.4 m from MSL. Except Amini all islands have a shallow lagoon. The windward side is with rubble shores while the lagoon leeward side is with a sandy shore. The reef flats are mostly fossilised with algal ridges and believed to have been shaped in the Holocene period. The climate is warm and humid. The Archipelago is exposed to both NE and SW monsoons and the average annual rain fall is about 1640 mm (Data based on Minicoy, the southern-most atoll). The atolls are located in the cyclonic belt and often severe storms are experienced. Ten of the atolls are inhabited and the area of inhabited islands altogether is about 26.2 sq km. A recent estimate by remote sensing (Shai, 1994) has shown that the extent of reef area in Lakshadweep is 140.1 sq km. The total population in lakshadweep according to the latest census is 51,681. The average density of population per sq km in Lakshadweep is about 1951. Androth with an area of 4.8 sq km has the largest population of 9149 and Bitra (0.1 sq km) has a resident population of 226 (Data from Manorama Year Book 1995, p. 680). Copra, Coir and Mass (dried tuna) are the mainstay of the economy, though a lot of foreign exchange is earned by sailors especially from Minicoy. Tourism is allowed on a limited scale in some of the islands, but there seems to be vast potential for ecotourism in several islands.

The typical atoll vegetation included, *Pandanus*, *Moringa*, *Ficus*, *Artocarpus*, *Terminalia*,

Calophyllum inophyllum and *Thespesia*. The ground vegetation is seasonal. *Casuarina* is introduced. Coconut plantation, fringes the sandy shores and the interior of the islands. In recent past many garden plants and vegetables are introduced into the atoll. Destruction to the natural vegetation consequent to agricultural activities was significant. Grazing pressure from the introduced cattle and goats is also causing destruction to vegetation. Mangroves are scarce, except at some pockets in Minicoy.

RESUME OF MARINE RESEARCH IN LAKSHADWEEP

Early investigations on the marine habitats and reefs of Lakshadweep were those of Alcock (1902) and Stanley Gardiner (1903-06). During the post-independence period, scientists of the C.M.F.R. Institute, Kochi and N.I.O., Goa carried out a series of impressive studies on the living resources of Lakshadweep as well as the human and natural impact on the ecosystems. Detailed accounts of these studies are provided by James, 1989 and James *et al.*, 1986 and Bakus, 1994.

On the agricultural sector, Central Plantation Crops Research Institute (ICAR) is doing a lot of research, especially on coconuts. These studies have addressed several problems on the environmental status of Lakshadweep in the recent past and a well founded data base is available. The present report is basically relying on earlier communications by Pillai (1985, 1986, 1990, 1995); James and Pillai (1989) and Pillai and Madan Mohan (1986).

THE CHANGING FACE OF LAKSHADWEEP

The pristine nature of the atoll face seems to have been altered to a great extent by human settlement, especially in the post-independence period. The surface soil was removed to make the land arable; subsurface sandstones were mined for con-

struction. Various construction activities coupled with developmental programmes have changed the physiographic features of almost all atolls in the Lakshadweep. Virtually nothing exists in the pristine condition. Introduction of exotic plants and large scale destruction to natural vegetation has changed the phytal sociology. The ecological disturbances and deficiencies of the Laksha-dweep were summarised by Wells (1988).

The marine ecosystems - largely the lagoon habitats and the shallow reef environs - in Lakshadweep have undergone drastic environmental deterioration due to many natural and anthropogenic parameters. To the environmentalists, it is difficult to convince others, for want of critical baseline studies in the pre-independence period. Except for Minicoy and perhaps, the Kiltan atoll, any base line studies and status reports of the habitats prior to the changes are lacking. One has to rely on present state-of-art to draw the conclusions, rather than to rely on deductions from comparison of the past and the present.

THE COASTAL ZONE

Construction activities along the near-shore areas such as jetties (a necessary evil) and sea erosion have caused an increase in the sediment load of the lagoon. Erosion is rampant at Minicoy, Chetlat and Amini. Filling up of the southern part of the lagoon in Minicoy is fast taking place as a result of sediment deposition. There is no major threat from any heavy metal pollution. However, organic pollution as a result of human defecation and dumping of human refuse is of a higher scale. No major factories are functioning in Laksha-dweep, so also no threat from thermal pollutants. Yet a major source of environmental damage is retting of coconut husk in some parts of the lagoon. Observations have shown that there is a paucity of intertidal and subtidal organisms at sites where retting of coconut husk was going on in Kiltan and Chetlat islands.

LAGOON

The marine biodiversity of most of islands is critically affected especially due to dredging. Dredging has both direct and indirect effect on fauna, especially the sedentary forms such as corals, polychaetes and sponges. The reef flats of some of the islands were blasted as in Minicoy to widen the channel to permit the larger mechanised vessels in

the last two decades. The lagoon is continuously dredged in several islands. This has resulted in mass mortality of corals in Kavaratti, Minicoy and Kiltan. A small fringing reef at the northern end of Minicoy with a luxuriant growth of corals (Nair and Pillai, 1972) is no more there. It is all buried under the sand dredged and deposited over it.

A detailed survey of the lagoon by a team of scientists from CMFRI in 1988 was made to quantitatively assess the percentage cover of living and dead corals in some of the morphozones of the various islands, by transect and quadrat methods.

Minicoy :

The percentage coverage of living corals in some parts of Minicoy lagoon is only 5 to 10. In several plots 70 to 80% of the corals were dead due to various reasons. The corals of the southern part of the atoll have suffered mass mortality due to excessive silting and all are buried. This large scale silting is attributed to blasting of the reef flat at the northern tip permitting greater influx of open ocean water into the lagoon. Since the southern reef flat is much raised the sediment is prevented from washing out and thus gets accumulated killing all the corals.

Kavaratti :

Dredging and other activities have effected large scale mortality of corals. The central part of the lagoon has some growth of ramose corals but fifty percent of the corals were dead.

Kalpeni :

The northern half of the atoll has relatively richer coverage and species diversity of corals than that of the southern half. Interference is minimum. The percentage coverage of dead corals in the sample plots varied from 20 to 25.

Amini :

The lagoon of Amini is very shallow with vast coverage of sea grass. The open windward reef flat has an extensive growth of *Acropora* thickets. The coral growth in the lagoon is sparse.

Kadmat :

The Kadmat island has a vast lagoon with rich growth of corals. However, dredged area had many dead shoals. The lagoon reef flat and outer reef have fairly rich live coral coverage.

Kiltan :

This island has suffered the worst environmen-

tal damage in Lakshadweep. Almost all corals in the lagoon were found dead in 1988 consequent to dredging and deepening the lagoon.

Chetlat Island :

This northern most atoll is the only one among the Lakshadweep islands that seems to have undergone least environmental damage as a result of human intervention. The lagoon shoals were supporting a rich and luxuriant growth of corals. The present situation needs assessment.

NATURAL FACTORS THAT AFFECT ENVIRONMENTAL CONSEQUENCES

Pests and predators in Lakshadweep were never reported to be major causes for environmental damage. Though *Acanthaster planci*, the crown of thorns was reported from some islands, their numbers were never in excess of natural stage to cause any mortality to corals. Recently a suspected case of White Band disease was reported from Kavaratti (Pillai, unpub.) causing mortality to ramose corals. The occurrence of this pathologic condition in other atolls is not hitherto investigated.

EXPLOITATION PRESSURE

The exploitation of various living resources from the lagoon and shallow reefs of Lakshadweep is of a higher order. Till date no reliable estimate of the resource availability is made to suggest any pattern of sustainable resource utilisation. The status of many economically important species are yet to be ascertained. Shell and finfishes are the major resources that are exploited. Shell collection especially from the reefs is of high order and many species of gastropods such as *Cypraea* spp. are certainly dwindling. The post-independence period has certainly made a fillip in pole and line tuna fishery due to the introduction of mechanised vessels. The capture of live baits from the lagoon of Minicoy and Kadmat has registered manifold increase to satisfy the higher demands. The traditional conservation methods practiced by the Minicoy people in the earlier days are not followed strictly.

CONSEQUENCES OF ENVIRONMENTAL DAMAGE

The atolls of Lakshadweep, as elsewhere, are of coral origin. Many of the marine living resources are reef associated. Destruction to reefs directly causes the shrinkage of living habitat to associated

organisms. Death of ramose corals in the lagoon certainly will affect the live bait population of small fishes such as Pomacentrids and Apogonids (Pillai and Madan Mohan, 1986). A typical example is the dwindling population of *Chromis caerulea* in the southern half of Minicoy due to mass mortality of corals (Pillai, 1990). As already pointed by James *et al.*, (1989) dead coral skeleton is vulnerable to bioeroding agents like sponges, molluscs and boring algae causing the breakdown of coral skeleton and their disintegration to coralline sand. This will result in faster filling of lagoon. Reefs subjected to human activities all over the world seems to have lost their capacity to regenerate in immediate future (Wells, 1986). As pointed out by Pillai (1975) reef formation in places where destruction was near total is a remote possibility for decades to come, though some coral growth may take place if the substratum is suitable for recolonisation.

CONSERVATION OF THE ATOLLS

The corals and coral associated living fauna and flora in the atolls form the major component of marine biodiversity. As already pointed out by Pillai (1985, 1990) the reef environs and the associated fauna in Lakshadweep is fast deteriorating due to both anthropogenic and natural causes. The reef resources form a major live supporting source for the islanders in many respects and it is imperative that these valuable resources should be utilised in a sustainable way and conservation strategies should be adopted on a priority basis. The user - conservationist conflict is likely to be a major hindrance in this regard. As far as possible development and conservation should go hand in hand. Dredging operations in the lagoon and blasting of the reefs for navigational purpose should be to the minimum, if not possible to dispense with altogether. Experience has shown that dredging once done has to be repeatedly done for the sediment supply from outer reefs is getting enhanced. Similarly blasting of the reefs enhances sea erosion as is seen in some sites. Exploitation of the resources needs careful monitoring. It is advisable to mark certain core zones in all islands as fully protected, without any human interference so that a breeding stock is kept maintained. In all matters of conservation the opinion of the tribal community may be sought and their full co-operation listed. Suggestions have been made

in the past (James and Pillai, 1989) on the declaration of marine parks in Lakshadweep. If the entire island cannot be declared as a protected area due to social and economic reasons, some sites in each island should be notified as reserves or parks. On

the land side application of fertilisers and pesticides for agricultural operations needs careful watching. At any event this paradise of ours needs immediate attention on the point of nature conservation.

REFERENCES

- ALCOCK, A., 1902: *A naturalist in Indian seas*. John Murray, London, 328 pp.
- BAKUS, J. GERALD, 1994: *Coral reef Ecosystems*. Oxford & IBH pub. New Delhi, 232 pp.
- GARDINER, J.S., 1903-1906: *The fauna and geography of Maldive and Laccadive Archipelagoes*. VOL I and II. Cambridge Univ. Press.
- JAMES, P.S.B.R., 1989: History of marine research in Laksha-dweep. *Bull. Cent. Mar. Fish. Res. Inst.*, 43: 9-25.
- JAMES, P.S.B.R. AND C.S.G. PILLAI, 1989: Suggestions for establishing a national Marine Park in Lakshadweep. *Ibid.*, 248-252.
- JAMES, P.S.B.R. *et al.* 1986: Marine fisheries research in Laksha-dweep. A historical resume. *Mar. Fish. Infor. Serv. T&E Ser.*, 68: 7-9.
- NAIR, P.V.R. AND C.S.G. PILLAI 1972: Primary productivity of some coral reefs in the Indian seas. *Proc. Symp. Corals and coral reefs*. India (Eds. C. Mukundan and C.S.G. Pillai) : 33-42.
- PILLAI, C.S.G., 1975: An assessment of the effects of environment and human interferences on the coral reefs of Palk Bay and G. Mannar along the Indian coast. *Seafood Export J.* 7(12) : 1-13.
- PILLAI, C.S.G., 1985: Ecological crisis in coastal and marine habitat. In : *India's environment - Crisis and Response*. Natraj pub., New Delhi : 120-130.
- PILLAI, C.S.G., 1990: The endangered marine and terrestrial habitats in Minicoy Atoll - Lakshadweep *Proc. Seminar Conserv. developing countries*. BNH (1983) : 267-279.
- PILLAI, C.S.G., 1986: Status of coral reefs in Lakshadweep. *Mar. Fish. Infor. Serv. T&E Ser.*, 68: 38-41.
- PILLAI, C.S.G. AND MADAN MOHAN, 1986: Ecological stress in Minicoy lagoon and its impact on tuna live-baits. *Ibid.*, 68: 33-37.
- PILLAI, C.S.G., 1995: Coral reefs of India - their conservation and management. In : *Marine Biodiversity their conservation and management*. (Eds. N.G. Menon and C.S.G. Pillai), CMFR Institute, Kochi : 16-31.
- SHAI, BALDEVI, 1994: Report to Ministry of Forest and Environment, Unpublished.
- WELLS, M. SUESAN, 1986: A future for coral reefs. *New Scientist* 1532 : 1-5.
- WELLS, M. SUESAN, 1988: *Coral reefs of the world*. Vol. 2. India, IUCN : 79-94.