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# Mapping of Seagrass Meadows from the Lakshadweep Islands (India), Using Aerial Photographs

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## ABSTRACT

Seagrass meadows from the Lakshadweep islands were mapped with the help of black and white aerial photographs. A maximum of 40 ha seagrass cover was estimated in the lagoon of Minicoy, followed by Kavaratti (34 ha). The total seagrass cover from six major islands of Lakshadweep was estimated to be 112 ha with standing crop of ca 800 metric tonnes. The dominant seagrass species observed was *Thalassia hemprichii* while *Cyrtodocea rotundata*, *Halophila ovata*, *Syringodium isoetifolium* and *Halodule uninervis* were common to these islands.

## Introduction

Seagrass meadows form an important constituent of coastal ecosystem (den Hartog 1970; McRoy and McMillan 1977; Jacobs, 1982). Seagrass flora of India, comprising 12 species, mainly occur along the southeast coast of India and also in the Lakshadweep islands (Jagtap, in press), however, there is no reliable data on the extent of seagrass cover along the Indian coast.

Remote sensing techniques have been found to be precise and economical in the survey of marine flora, such as mangroves

(Sriplang 1982; Untawale *et al.*, 1982; Nayak *et al.*, 1986). However, very limited efforts have been made to study seagrass beds with the remote sensing data (Orth and Moore, 1983). In the present investigation, aerial photographs have been used for the mapping of seagrass beds in the Lakshadweep islands of India.

## Description of the Study Area

Lakshadweep group of islands is composed of 36 islands ca 220-440 km off the Kerala (west) coast of India, lying between 8°-10° 13' N latitudes and 71°-74° E longitudes. The coordinates of the

study area are given in Table 1. Most of the islands are coral atolls extending NNE-SSW, except the Androth island. These islands are approximately 5 m above the sea level and have steep slopes on the windward (east) side and lagoons on the leeward (west) side. Shelf deposits are of marine origin.

**Table 1.** Geographical position of the Lakshadweep islands

Island	Latitude (North)	Longitude (East)
Kadmat	11° 10' 52"	72° 45' 41"
	11° 15' 26"	72° 47' 29"
Minicoy	08° 15' 46"	73° 01' 11"
	08° 19' 46"	73° 04' 42"
Amini	11° 06' 45"	72° 43' 02"
	11° 08' 06"	72° 44' 04"
Kavaratti	10° 32' 26"	72° 37' 00"
	10° 34' 38"	72° 39' 04"
Kalpeni	10° 03' 19"	73° 37' 37"
	10° 09' 13"	73° 39' 56"
Agatti	10° 48' 48"	72° 09' 54"
	10° 52' 38"	72° 12' 24"

## Methodology

Black-and-white aerial photographs (Scale 1:25,000) of the Lakshadweep islands, taken during Feb. 1986, were used for the study. Seagrass meadows and associated geomorphological features were mapped as per the methodology described by Untawale *et al.* (1982). Photointerpreted results were confirmed by collecting ground truth data, during March-April, 1986-87. Seagrass cover was estimated by using Planix 5 (Made in Japan) having 0.1 cm<sup>2</sup> of minimum measurable area. The seagrass specimens were

collected by skin and SCUBA diving and preserved in 4% seawater formalin. Specimens were identified with the help of literature cited elsewhere (Untawale and Jagtap, 1989). For Lakshadweep region, the details of specimens have been published earlier (Jagtap, 1987).

## Results and Discussion

The islands studied were characterised by major coral reefs and sandy beaches towards the leeward side and coralline algal ridges towards the windward side. However, the Amini island has lagoon, coral reef and sandy beach, all around. Other islands except Kadmat are characterised by storm beaches towards the windward side (Siddiquie, 1980). The major seagrass beds were located in the shallow sheltered regions, along the shores of Kadmat, Minicoy, Amini, Kavaratti, Kalpeni and Agatti in the lagoon (Fig. 1). On the black and white aerial photographs, seagrass meadows appeared as smooth textured, dark gray, submerged (just below the low tide mark), broken stretches and patches. The coral-reef crest appeared as snow-white with uniform coarse texture while fore and reef slopes in the subtidal zone appeared as uniform coarse and smooth grey features, respectively.

The total seagrass cover in these islands was estimated to be 112 ha which is approximately 1.3% of the total lagoon area (Table 2). Maximum (40 ha) seagrass cover was seen in the lagoon of Minicoy and minimum (0.5 ha) at Agatti. The study substratum supporting seagrass meadows constituted of sediments originated mainly from corals, *Halimeda* (calcareous alga), pelecypods, gastropods and forminifera (Mascarenhas *et al.*,

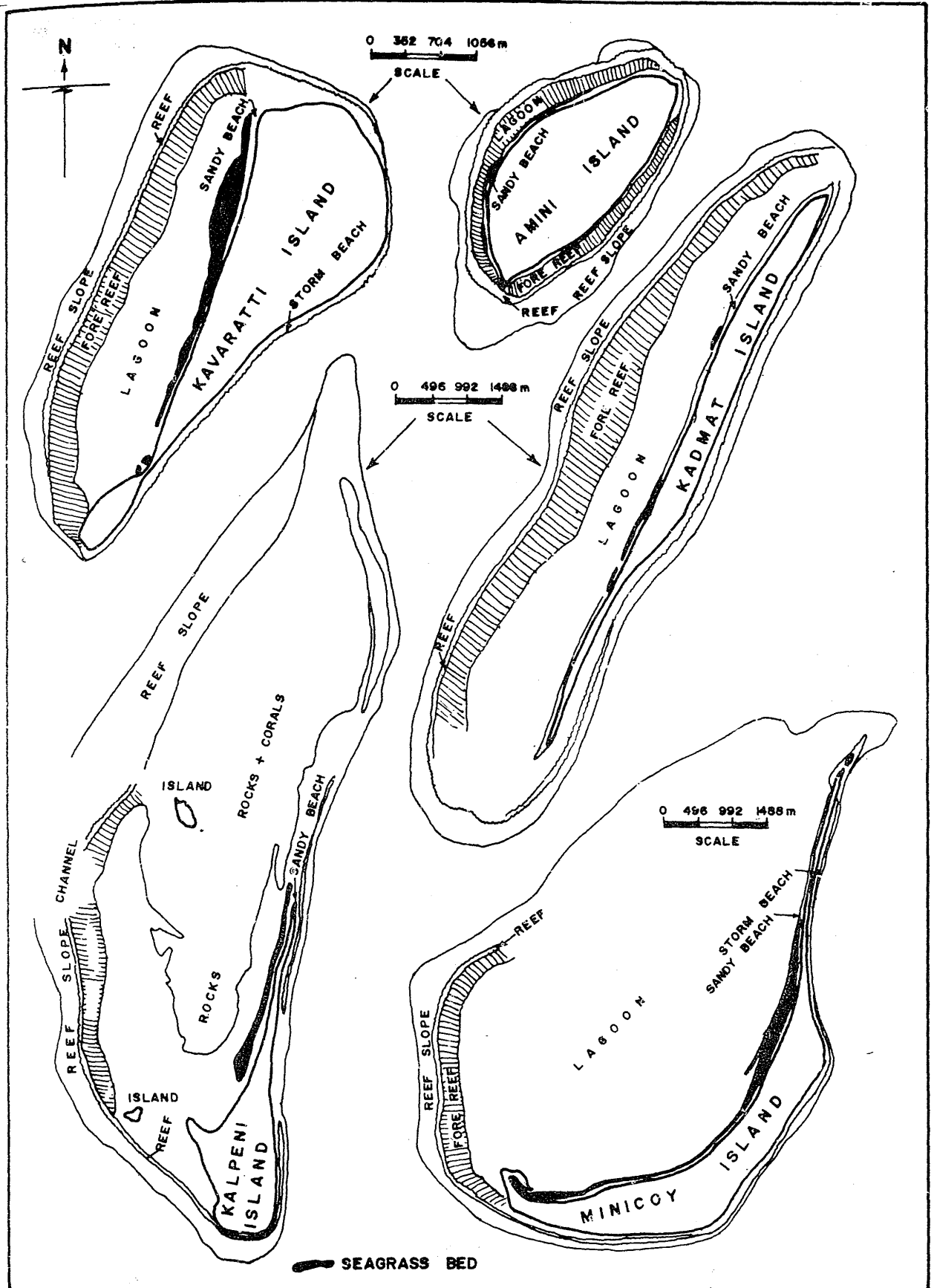


Fig. 1. Seagrass beds from Lakshadweep islands.

1980). Seagrass flora comprised of seven species of which *Thalassia hemprichii* was dominant and *Cymodocea rotundata*, *Halodule uninervis*, *Syringodium isoetifolium* and *Halophila ovata* were common to all the islands. However, *Enhalus acoroides* were restricted to small brackish water regions at Minicoy and *Cymodocea serrulata* rarely observed at Kavaratti (Table 2). The seagrasses occurred in the subtidal regions, from low tide mark upto 3 m depth. The present observations revealed that there was no significant change in the seagrass cover since 1966, may be due to limited sandy sheltered regions. Considering the average biomass of seagrasses to be 720 g/m<sup>2</sup> during 1984-

87, from major islands of Lakshadweep (Jagtap, 1987), the total standing crop of seagrasses in these islands was estimated to be ca 800 metric tonnes. However, short-term changes in local standing crop are possible as a consequence of a seasonality of recruitment, growth and mortality. These changes are unlikely to greatly influence the horizontal extent of the seagrass beds, as such an extension is limited by the lack of availability of a suitable substratum.

The seagrass meadows in the Lakshadweep islands could appear on the black-and-white aerial photographs as the visibility of water remains high (ca 20 m)

Table 2. Seagrass distribution from the Lakshadweep islands

Island	Lagoon area (ha)	Seagrass area (ha)	Nature of Seagrass bed	Species observed
Kadmat	1360	13.75	Broken stretches	1, 3, 4, 6, 7
Minicoy	2550	40.00	-----"-----	1, 3, 4, 5, 6, 7
Amini	81	05.00	-----"-----	3, 4, 6, 7
Kavaratti	431	33.75	A long stretch	1, 2, 3, 4, 6, 7
Kalpeni	2432	19.38	-----"-----	3, 4, 6, 7
Agatti	1798*	00.50	Patchy	3, 4, 6, 7
Total	8652	112.38		

\* Estimated from the Naval Hydrographic chart (Survey of India), 1977.

#### Legends for species

1. *Cymodocea rotundata* Ehrenberg et. Hemp ex Aschers.
2. *C. serrulata* (R. Brown) Aschers & Magnus.
3. *Halodule uninervis* Forssk. Aschers.
4. *Syringodium isoetifolium* (Aschers) Dandy.
5. *Enhalus acoroides* (L.) Royle.
6. *Thalassia hemprichii* (Ehrenberg) Aschers.
7. *Halophila ovata* Gaud.

during February. However, the submerged seagrass beds along the southeast coast of India, may be difficult to identify on black and white aerial photographs as seagrass meadows may not appear due to relatively poor visibility of the water.

### Conclusions

The black-and-white aerial photographs were found to be quite useful for the study of coral-reef environment and seagrass meadows. The total seagrass cover at six major islands of Lakshadweep was estimated to be 112 ha. The standing crop was estimated to be ca 800 metric tonnes and was largely contributed by *Thalassia hemprichii*.

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