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Colonisation and Growth of the Sea Grasses, *Halodule uninervis* (Forskal) Ascherson and *Halophila ovalis* (R. Brown) Hooker f. in Marine Culture Ponds at Mandapam

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ABSTRACT

Observations carried out at Mandapam from 1983 to 1986 on the colonisation and growth of *Halodule uninervis* and *Halophila ovalis* are presented. Dislodged bits of the sea grasses were brought into three ponds of 60x30x1m from Palk Bay due to cyclonic and tidal conditions of the sea at the end of 1983. In pond I, *H. uninervis* alone had established and grown from about 90 plants/m^2 in January 1984 to 800/m^2 in October, reaching the peak abundance of 8,100/m^2 during February, 1986. In the other two ponds, both the species got established. *H. ovalis* was the principal species in the order of about 6:1 in pond II, while *H. uninervis* was dominant in pond III, in the order of about 3.4:1. The peak levels of abundance for *H. ovalis* and *H. uninervis* in the former pond were about 7,700/m^2 and 1,200/m^2 in March and January 1986 respectively,

INTRODUCTION

By virtue of their powerful roots and rhizomes, most species of sea grasses are known to bind sediments and stabilize sand and mud in inshore and nearshore areas. The great value of sea grasses to stabilize and protect coast lines from erosion has been reported earlier (Ginsberg and Lowenstem, 1958; Scoffin, 1970; Boone and Hoeppell, 1976). As pointed out by Phillips (1980), colonisation and transplantation of sea grasses has assumed importance in recent years in an attempt to create new seagrass pastures and meadows, but in India these aspects have not received much attention. Hence, the observations carried out on the colonisation and growth of two species of sea grasses, as a result of natural transplantation in three marine fish culture ponds on the Palk Bay side of Mandapam (Long. 79°48′ E and Lat. 9°14′ N) are of interest.

MATERIAL AND METHODS

During the last week of December 1983, tidal water had brought dislodged pieces of sea grasses into the Fish Farm of Central Marine Fisheries Research Institute. Subsequently, they got established in three ponds which are of 60 m length, 30 m width and an overall depth of 1.5 m with water depth of about 1m. For estimating the number of each sea grass species in a pond, the pond area was divided into 72 squares, each of 5m length and width (25 m^2). From them, ten squares were selected at random during each month. From each of these squares, one m^2 area, also selected at random, was utilised for counting the number of plants present therein. The relative abundance in the growth and propagation of the plants during different months is expressed as number of plant units per m^2 (Fig. 1). Dead and decaying sea grasses from the ponds were periodically removed. The hydrological parameters monitored monthly in the ponds were water temperature, salinity and dissolved oxygen, sampled in the morning. Water depth in the ponds was also monitored (Fig. 2).

RESULTS AND DISCUSSION

Observations on the colonisation and growth of the species *Halodule uninervis* and *Halophila ovalis* for a period of 28 months, from January 1984 to April, 1986 in the three ponds are presented in Fig. 1. In pond I, the estimated number of units of *H. uninervis* was about 90/m^2 in the month of January, 1984. This increased to 495 and 800/m^2 by September and October respectively. There was a sudden increase in the population during November, 1984, amounting to 2,400/m^2 and the population reached a peak of 8,100/m^2 during February, 1986. *H. uninervis* was present in pond II also along with *H. ovalis,* but much less in number. In pond III, *H. uninervis* was present in large quantities, more or less reaching the numerical abundance recorded in pond I. In pond II (Fig.1), *H. ovalis* reached peak levels of numerical abundance during January-March, 1986, amounting to about 7,500-7,700/m^2 from about 100 m^2 during January, 1984. In pond III, this species was first observed only during May, 1984, and was found to be present in negligible numbers, but later it reached a peak abundance of about 2,100/m^2 during March, 1986 (Fig. 1).

The mean monthly values of the three hydrological parameters prevailing in the three ponds from January, 1984 to April, 1986 are presented in Fig. 2. As seen from it, the surface water temperature showed a rising trend, increasing from about 20°C in January, 1984 to

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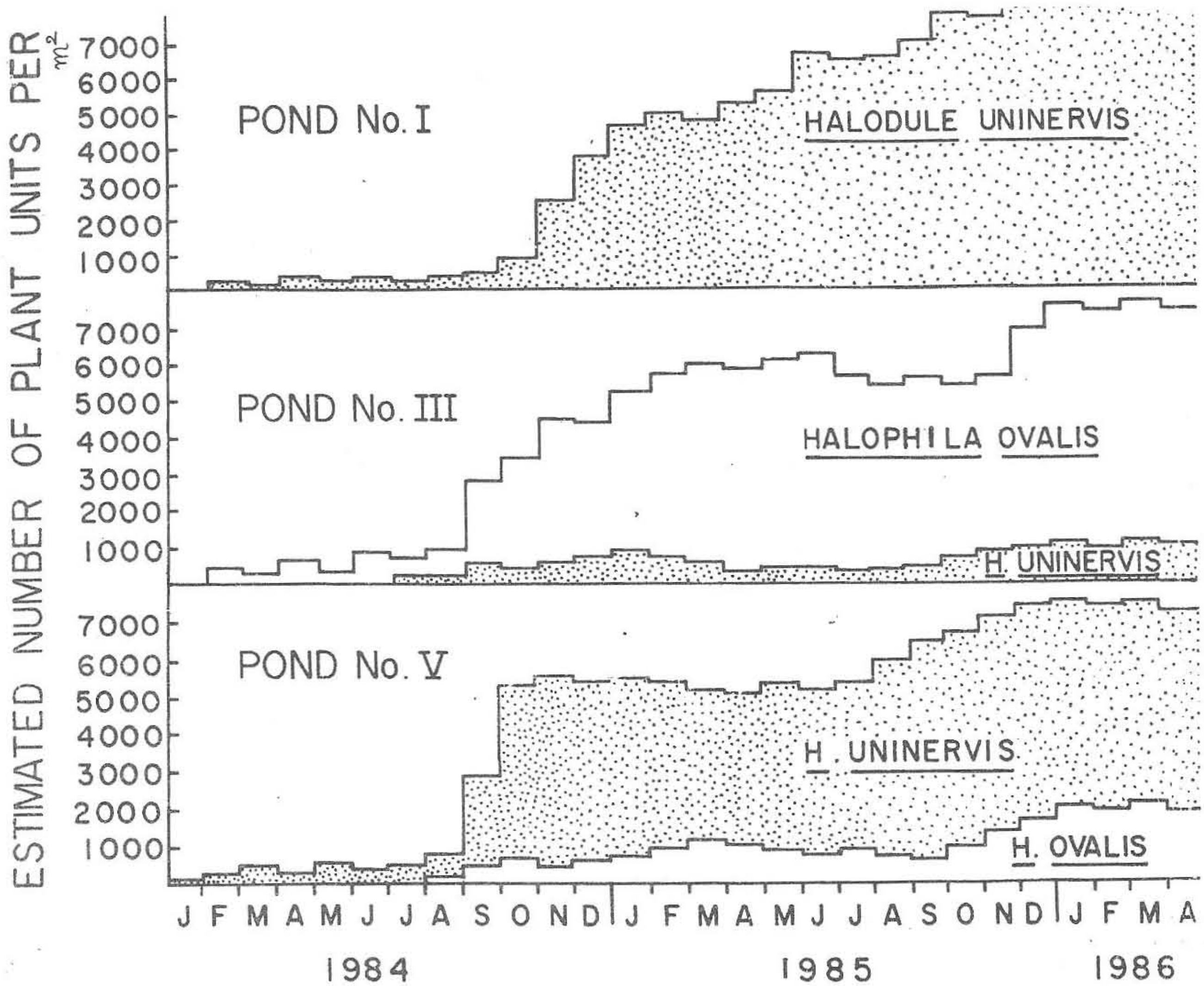
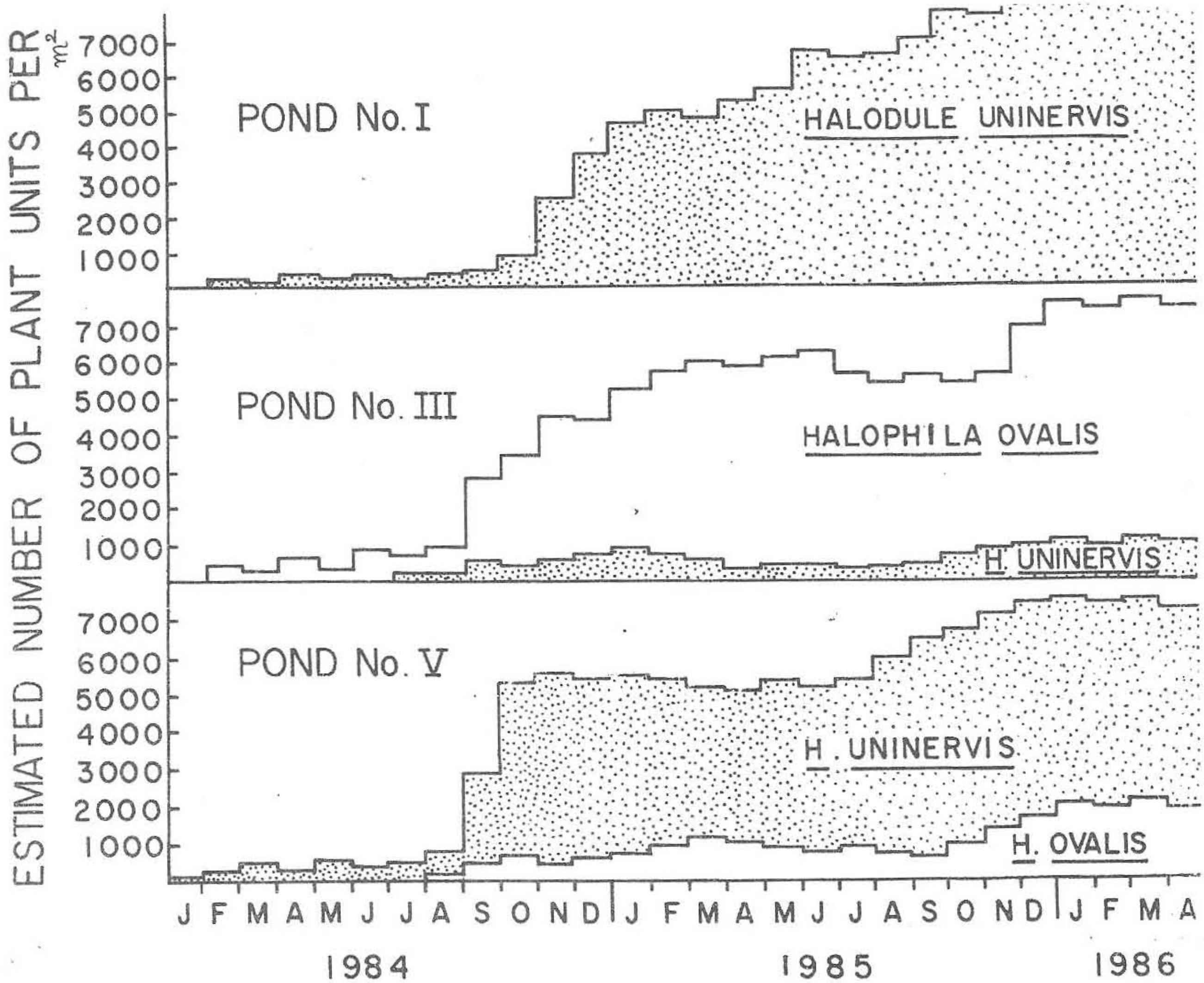


Fig. 1. Monthly estimated number of plant units in the three ponds in respect of *Halodule uninervis* and *Halophila ovalis* during 1984-1986

31° and 32°C during April-May, 1984. A minor secondary peak was recorded during September-November period, followed by lower values of 25°-26°C during December, 1984 - January, 1985. With regard to salinity, from values so low as 24‰ and 16‰ during January and February, 1984, there was an increase to 47‰ during April-June, period, followed by a decrease during September, 1984 - January, 1985 months. The values of salinity rose to 88.8‰ during August, 1985 caused by lack of seawater supply due to closure of the mouth of the supply canal and due to lack of rains. Inspite of the high salinity, the sea grasses survived. Coinciding with the decline in salinity subsequently, there was an increase in their population. Dissolved oxygen content in the ponds (Fig.2) usually ranged from 4.2 ml/l to 6.0 ml/l. However, on a few occasions high values of 6.4 and 7.0 ml/l were recorded. In general, an inverse relationship between salinity and dissolved oxygen was observed.

Factors like depth of water, temperature and salinity are vital for transplantation and growth of sea grasses. (Thayer *et al.*, 1982, Fonseca *et al.*, 1982). Growth of *Zostera marina* in New England area declines during winter and the plants are most active during spring and summer. On the other hand, in North Carolina, the opposite pattern of growth has been recorded. In the case of *Halodule wrightii,* Phillips (1980) observed that growth is good throughout the year in the Gulf of Mexico and Florida and opined that planting can be done at any time. From the present data recorded in the culture ponds at Mandapam, spurts in the growth of the two species is discernible during September-November, coinciding with the onset of North-East monsoon. *Halodule uninervis* and *Halophila ovalis* are euryhaline and have survived high salinity conditions (88.8‰) during August, 1985. Detailed investigations on the hydrobiological and ecophysiological conditions prevailing in the ponds as well as the changes



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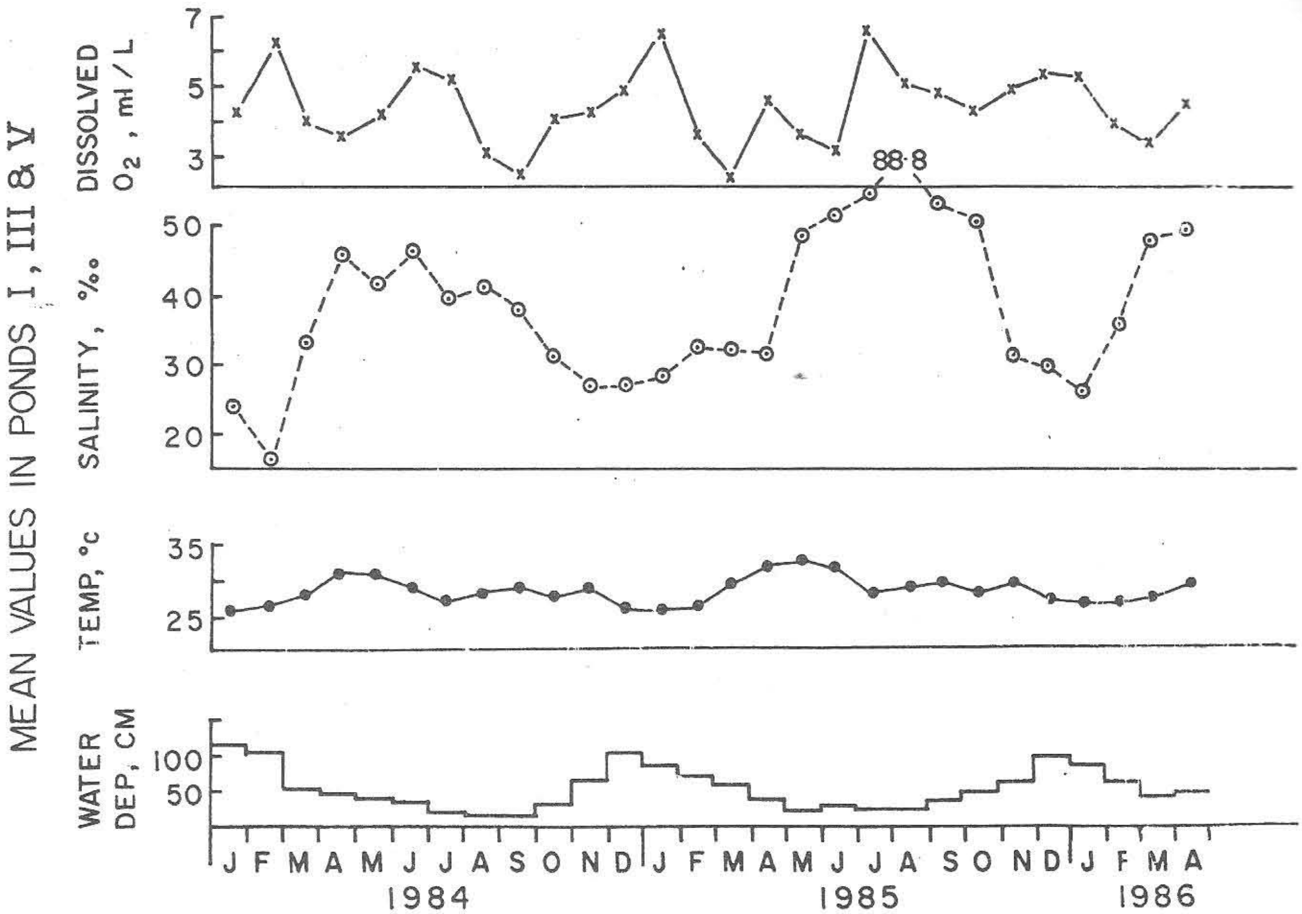

Fig. 2. Monthly mean values of water depth, water temperature, salinity and dissolved oxygen in ponds I, III and V during 1984-1986

in the substratal conditions need to be undertaken for more information on the ecology of these sea grasses in culture ponds. For transplantation and colonisation of sea grasses, various methods have been used in different countries, as reviewed by Phillips (1980). Among the "non-anchoring" methods, plants washed free of sediments is one. In the natural transplantation observed in the present study, the plant pieces were found without sediment and these have successfully established and grown. Since the culture ponds represent a closed system, the non-anchoring method has proved to be successful. But in an open system, the "anchoring" method of transplantation may be required. In the context of efforts being made at preserving the coastline from erosion as well as the management of coastal zones and improvement of fisheries, studies of the present type will go a long way.

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