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# PRIMARY PRODUCTIVITY OF SEAWEEDS IN THE LAGOON OF MINICOY ATOLL OF LACCADIVE ARCHIPELAGO

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## Abstract

Net primary production (NPP) of 10 commonly available seaweeds varied from 2 to 10 g C/m3/day. The NPP of *Enteromorpha compressa* and *Hypnea valentiae* were the highest and that of *Caulerpa peltata* was the lowest. The mean of NPP of these 10 seaweeds when measured individually was 5.68 g C/m$^3$/d and that of allseaweeds incubated collectively registered 5.32 g C/m$^3$/d. Hence it is presumed that the probable rate of NPP of seaweed community contributing to Minicoy lagoon is approximately 5g/C/m$^3$/d. Except for C . peltata E.*compressa* and *Gelidiella acerosa.* The NPP of other species was higher at bottom than at the surface of the lagoon. The results obtained are discussed in the light of distribution of seaweed in Minicoy lagoon.

## Introduction

Most coral reefs are autotrophic and the net primary production (NPP) is derived from components such as symbiotic zooxanthellae, boring filamentous algae. sea grasses ,seaweeds etc. However ,the relative importance and contribution of each component to the overall productivity would vary greatly from one reef to the other, and this would be more pronounced and functional on the relative distribution of those ' producers. The rates of production of a typical reef ranges from 8 to 12g C/m$^2$/day (Kohn and Helfrich,1957) and the same for the reef of Minicoy atoll is reported to be 9.1.gC/m$^2$/d (Nair and Pillai, 1972). The NPP of reefs 1 largely depend on photosynthetic rated and standing crop of seaweeds and seagrsses. Variability in abundance of these are known even among Laccadive Archipelago, with a few islands sustaining seagrass beds. (Kaladharan and David Raj. 1989) in standing crop of seaweeds (Kaliaperumal *et al* (1989) and other macrophytes (Untawale and Jagtap, 1984). Hence the present study is quite important in assessing the role of seaweeds in the primary productivity of the lagoon. We report the relative carbon fixation rates of 10 species of commonly available seaweeds from the lagoon of Minicoy atoll (8°.15' N.and 73°03'E) of Laccadive Archipelago at the surface and at the bottom of lagoon..

## Materials and Methods.

10 g thallus each of ten seaweed species (Table 1) were collected from the lagoon and washed with filtered (0.45µ Whatmann) seawater. These 10 g. thalli were separately incubated species wise with filtered sea water in light and dark bottles of one litre capacity for three hours at surface (0.25m) and at the bottom of lagoon (3.25.m) by suspending the bottles at appropriate depth on a wooden pole during high tide period The oxygen production or consumption was determined using the standard Winkler's titration. The oxygen values were convereted to carbon equivalents using the factors 0.536/ PQ where PQ= 1.25.(Strickland 1960). Suitable controls were maintained to account for the NPP.of ambient water. Similarly one g. each of the seaweed species was incubated together in light and dark bottles (1 l) to find out their cumulative rate of NPP. The experiments were repeated 5 times from November 1990 to June 1991.

## Results and Discussion.

According to the estimate (Kaliaperumal *et al*, 1989) Minicoy lagoon sustains 1704 tonnes of seaweeds (wet wt ) annually, belonging to 38 genera and 52 species. Seaweed vegetation in the lagoon was

Table:1

Net production (gC/m$^3$/d) of 10 seaweeds from Minicoy lagoon

| Name | | Net Production |
|---|---|---|
| 1. *Caulerpa peltata* Lamour | | 2.05 ± 0.54 |
| 2. *Enteromorpha compressa* (L) Greville | | 10.15 ± 0.43 |
| 3. *Halimeda gracilis* Harv. ex. J. Ag. | | 2.88 ± 0.38 |
| 4. *Dictyota bartayresiana* Lamour | | 5.81 ± 0.62 |
| 5. *Sargassum* sp. | | 8.78 ± 1.55 |
| 6. *Turbinaria ornata*.J.ag. | | 2.40.± 0.35 |
| 7. *Acanthophora spicifera* (Vah.1) Boergs. | | 5.09 ± 0.64. |
| 8. *Gelidiella acerosa* (Forsk.) Feldmann | | 7.17 ± 0.51 |
| 9. *Hypnea valentiae* Mont. | | 9.84 ± 1.25 |
| 10. *Laurencia papillosa* (Forsk.) Grevile | | 2.53.± 0.36 |
| | Mean | 5. 68 |
| All the above 10 species | | 5.32 ± 1.88 |

Table:2 Percentage increase in production of seaweeds at the surface and at the bottom of the lagoon.

| Name | Net Production (%) | |
|---|---|---|
| | Surface | bottom |
| 1. *Caulerpa peltata* | 32 | - |
| 2. *Enteromorpha compressa* | 18 | - |
| 3. *Halimeda gracilis* | -- | 48 |
| 4. *Dictyota bertayresiana* | -- | 96 |
| 5. *Sargassum* sp. | -- | 10 |
| 6. *Turbinaria ornata* | no difference | |
| 7. *Acanthophora spicifera* | -- | 48. |
| 8. *Gelidiella acerosa* | 35 | -- |
| 9. *Hypnea valentiae* | -- | 38 |
| 10. *Laurencia papillosa* | -- | 47. |

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found extended upto 3-4 m depth The highest NPP was observed in the species of *Enteromorpha* and *Hypnea* followed by *Sargassum* sp. and *Gelidiella* sp. NPP of *Caulerpa* sp. registered the lowest rate (Table 1). From this observation, the ten species under investigation were divided into 3 groups on the basis of their NPP rates. Species of *Caulerpa, Halimeda, Turbinaria* and *Laurencia* were grouped as low producers as their production rates was within 2.0 to 2.8 gC/m$^3$/d. Species of *Acanthophora, Dictyota* and *Gelidiella* with production rates ranging from 5.0 to 7.0 gC/m$^3$/d were grouped as medium producers and species of *Sargassum*, *Hypnea* and *Enteromorpha* with high production rates (8.7 to 10.1 g C/m$^3$/d) were grouped as high producers. The results obtained by us were found to be well within the range reported for *Hypnea* sp., *Halimeda* sp and *Cladophora* sp. (Qasim and Bhattathiri, 1971).

In the present study the mean of NPP rates of the 10 seaweeds was 5.6 g C/m$^3$/d (Table -1). Similar result (5.3g C/m$^3$/d) was obtained when all these seaweeds in equal quantity were incubated collectively under similar conditions (Table-1.) Hence it is presumed that the daily rate of NPP by seaweeds possibly being contributed to the lagoon may be around 5 gC/m$^3$/d and the balance in the ovarall productivity of the lagoon is met by other producer components. It is obvious that some species of seaweeds sometimes can equal or exceed the productivity of seagrasses (Mann.1973) and the present rate on seaweeds of Minicoy lagoon is roughly equal to the NPP of seagrass, *Cymodocea serrulata* (Kaladharan and David Raj.1989) When these seaweeds were incubated for carbon fixation individually at surface as well as at the bottom of lagoon, akin to the distribution of seaweeds *in situ.* The NPP at surface and bottom showed sharp differences except for *Turbinaria ornata.* The results were presented in percentage increase over the other tratment in Table-2. It is well known that spectral characteristics of sub-surface light differ considerably from that of surface light (Jerlow, 1968). As seaweeds are found distributed in deeper areas of the lagoon,the light quantum reaching the bottom flora may be different and this may affect the production considerably although light reaches upto the bottom of lagoon on sunny days.

It is evident that seaweeds distributed in 3-4m depth can contribute primary production at a higher rate than those distributed in shallow areas excepting *Caulerpa, Gelidiella* and *Enteromorpha* spp. (Table.2.) The reported increase in the NPP rates at the bottom may be due to the temperature and light quanta ideal for optimum photosynthesis. The result is agreeable in the case of *Gelidiella* which occurs normally as a felt on rocks in the surf zone and its production was found 35% more in the surface than at the bottom. The NPP. of *Turbinaria* in the surface as well as at the bottom, remained unaltered and this is comparable to its distribution along the lagoon, reef slope, and in the reef flat which is exposed during low tide. According to Wetzel (1974) many of the benthic macrophytes are adapted to low light intensities and even brief exposure to surface light could seriously alter the sbsequent metabolic rates. Hence it is presumed from this study that with the tidal innundations the production rates of benthic seaweeds vary and consequently the productivity of the lagoon.

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