

CHLOROPHYLL 'a' PARTICULATE ORGANIC CARBON AND SUSPENDED LOAD FROM THE MANGROVE AREAS OF COCHIN BACKWATERS

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Abstract: Chlorophyll 'a', Particulate Organic Carbon and suspended load were estimated for one year from two distinct mangrove areas of Cochin backwaters, viz. Puthuvyppeen and Nettoor. Environmental parameters like $T^{\circ}\text{C}$, $S\%$ and pH were also measured. Chlorophyll 'a', Particulate Organic Carbon and suspended load were high at Puthuvyppeen. The annual average for 6 stations ranged between 6.35 and 30.67 mg/m^3 , 4.05 and 21.27 mg/l and 48.78 and 146.24 mg/l respectively. Seasonal variation was well marked during monsoon. Mangrove region at Nettoor showed comparatively low values for all the above parameters. The annual average for chlorophyll 'a', Particulate Organic Carbon and suspended load for 4 stations varied from 2.41 to 3.18 mg/m^3 , 1.96 to 2.39 mg/l and 31.89 to 37.79 mg/l respectively. High pigment values coincided with high POC values in both regions. The values of present study are well comparable with values reported from the mangrove areas of South East coast. The POC, chlorophyll 'a' and suspended load of the mangrove areas of the study are high compared to other areas of Cochin backwaters.

1. Introduction

Mangroves are considered to be ecologically interesting environment. They are buffers between land and sea and prevent free flow of minerals from land to sea. Several hundreds of years ago, Kerala coastal plain was dominated by rich mangroves which occupied nearly 70,000 hectares. But now, only small patches of them sprawl out along this coast on account of population pressure, rapid industrialization and reclamation which wiped out vast expanse of mangroves in Kerala. Due to their economical, ecological, socio-cultural, aesthetic and scientific value, mangroves have assumed a world wide importance in recent years. Mangroves in Cochin area vary sparse and affected by pollution from adjacent oil complex, and effluents from industrial complex. So far no thorough ecobiological study has been made on this ecosystem. The present paper deals with the distribution of chlorophyll 'a', Particulate Organic Carbon and suspended load, which form a part of ecobiological study from two distinct ecosystems of Cochin backwaters. The mangrove area at Puthuvyppeen is shallow with thick vegetations such as *Avicennia sp.*, *Rhizophora sp.*, *Bruguiera sp.* and *Exoecaria sp.*, and is influenced by tides whereas the stations at Nettoor are located on the bank of Chitrapuzha river having less tidal influence.

2. Materials and methods

Water samples from the surface were collected monthly from six and four stations from the mangrove areas of Puthuvyppeen and Nettoor respectively, during 1993. Chlorophyll 'a' and POC were analysed following the methods of UNESCO (1966) and El Wakeel and Riley (1957) respectively. The suspended load was estimated by filtering a known volume of water through previously weighed Whatman GF/C filter paper dried to constant weight at 70°C and the differ-

ences in weight was taken as the amount of suspended load. Environmental parameters such as $T^{\circ}\text{C}$, $S\%$ and pH were also measured.

3. Results and Discussion

The temperature differences during the year was $4-7^{\circ}\text{C}$. The variation in salinity was very large, from almost freshwater to seawater conditions and the pH ranged from 6.80-7.91, during the year.

The seasonal and annual ranges and averages for chlorophyll 'a', POC and suspended load are given in Table I & II.

At Puthuvyppeen, the annual average for the 6 stations ranged from 6.35 to 30.67 mg/m^3 , maximum value being at station 4 and minimum at station 5. Seasonal variation was well pronounced during monsoon and average chlorophyll 'a', ranged between 4.87 and 37.65 mg/m^3 during this period, the peak value being 87.3 mg/m^3 in September at station 4 and the minimum being 0.37 mg/m^3 in June at station 1. Station 4 showed high chlorophyll 'a' content throughout the investigation period. At Nettoor, the annual average ranged from 2.41 to 3.18 mg/m^3 . Compared to Puthuvyppeen, the chlorophyll 'a', content is low in this area. Here the maximum value (5.86 mg/m^3) for chlorophyll 'a' was noticed in August at station 3 and minimum (0.06 mg/m^3) in January at station 1. Premonsoon⁴ showed higher values (3.01 to 3.36 mg/m^3) compared to other seasons.

Maximum value for POC (98.28 mg/l) was noticed at station 4 at Puthuvyppeen. The average value was high during monsoon. The annual average for POC varied from 4.05 to 21.27 mg/l and 1.96 to 2.39 mg/l at Puthuvyppeen and Nettoor respectively. At Puthuvyppeen, the highest value for POC was noticed in September and lowest in December. At Nettoor, the

Table 1. Seasonal and Annual ranges and averages for Chlorophyll 'a', POC and suspended load at Puthuvypeen.

	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	
Chl 'a' mg/m ³	Pre- monsoon	1.39-18.54 (7.43)	2.98-19.17 (13.66)	10.30-17.76 (14.10)	7.64-67.95 (25.19)	4.97-13.74 (8.02)	3.30-14.36 (9.75)
	Monsoon	0.37-32.85 (11.12)	1.25-25.06 (10.32)	1.57-36.35 (18.10)	1.68-87.34 (37.65)	1.94-8.35 (4.87)	1.20-14.44 (8.30)
	Post monsoon	0.05-4.96 (2.13)	1.86-8.94 (5.14)	4.45-16.53 (11.97)	4.96-4.37 (19.78)	4.24-9.28 (6.00)	5.00-10.57 (7.08)
	Annual	0.05-32.85 (7.44)	1.25-25.06 (9.77)	1.57-36.35 (15.22)	1.68-8.73 (30.67)	1.94-13.74 (6.35)	1.20-14.44 (8.49)
	PRE- monsoon	1.39-7.94 (4.87)	2.14-5.67 (4.37)	5.67-7.25 (6.45)	10.40-17.01 (12.81)	1.64-5.42 (3.95)	1.64-8.66 (5.28)
POC mg/l	Monsoon	1.89-13.86 (6.56)	6.17-15.44 (9.53)	4.41-22.68 (13.03)	3.40-98.28 (33.41)	2.65-7.88 (5.28)	0.38-11.34 (6.54)
	Post monsoon	1.39-5.83 (2.93)	0.63-4.88 (2.38)	1.95-5.51 (4.06)	3.40-28.04 (13.53)	2.14-2.84 (2.52)	1.58-5.42 (3.64)
	Annual	1.39-13.86 (4.97)	0.63-15.44 (5.84)	1.95-22.68 (8.37)	3.40-98.28 (21.27)	1.64-7.88 (4.05)	0.38-11.34 (5.29)
	PRE- monsoon	34.32-74.60 (59.15)	20.28-88.88 (57.37)	11.75-39.16 (20.93)	21.29-129.30 (74.49)	26.32-87.16 (51.32)	42.65-94.36 (64.66)
S.L. mg/l	Monsoon	9.10-84.10 (40.74)	5.50-83.60 (48.00)	9.20-136.20 (61.25)	22.50-776.00 (220.62)	30.00-86.10 (62.24)	11.10-98.70 (47.58)
	Post monsoon	34.40-120.75 (70.74)	30.70-92.95 (52.18)	25.88-109.25 (59.99)	43.40-266.90 (118.83)	16.76-77.04 (44.9)	39.45-95.80 (58.55)
	Annual	9.10-120.75 (55.66)	5.50-92.95 (52.06)	9.20-136.20 (48.78)	21.29-776.0 (146.24)	16.76-87.16 (53.73)	11.10-98.70 (56.00)

peak value for POC was noticed in October and lowest in November. Seasonal variation was not well marked here.

The suspended load showed the peak value during post-monsoon at Nettoor and the values ranged from 46.89 to 55.35 mg/l. No well marked seasonal variation was noticed at Puthuvypeen. The annual average ranged from 45.78 to 146.24 mg/l at Puthuvypeen, whereas it was between 31.89 and 37.79 mg/l at Nettoor.

The mangrove environment showed very much restricted light penetration and this would have favoured relatively higher production by nannoplankton (Ramadhas et al., 1976). Local rainfall, influence of tide, high nutrient content and falling of mangrove leaves may be attributed to high pigment content, POC and suspended load at Puthuvypeen. The pigment studies in the present survey yielded higher values

compared to the values reported by Sundararaj and Krishnamurthy (1973) and Ramadhas et al. (1976) for Pichavaram mangroves which ranged from 4.36 to 39.80 mg/m³ and 0 to 6.52 mg/m³ respectively. When the concentration of the pigments of the mangrove waters was compared with that of Cochin backwaters (DOD Report 1993) it was found to be three to four fold increase and this may be an indication of higher production in mangroves. The higher pigment content of the mangrove area in the present study may probably due to the detrital chlorophyll associated with stirred up sediments (Qasim and Reddy, 1967). Sundararaj and Krishnamurthy (1973) stated that though the number of phytoplankton species were low in mangrove, it would appear to be rich in chlorophyll 'a' bearing organisms and also in primary production. The autotrophic organisms which are smaller in size (1.1µ pore size) either endemic to that place or migrated via back-

Table 2. Seasonal and annual ranges and averages for chlorophyll 'a', POC and Suspended load at Nettoor.

		Station-1	Station-2	Station-3	Station-4
Chl 'a' mg/m ³	Pre- monsoon	1.14-7.89 (3.01)	2.63-4.56 (3.36)	2.38-4.45 (3.14)	2.63-3.93 (3.36)
	Monsoon	1.34-4.27 (2.89)	0.90-4.16 (2.40)	1.29-5.86 (2.67)	1.60-3.31 (2.32)
	Post monsoon	0.06-2.10 (1.57)	1.01-2.92 (2.05)	1.07-2.29 (1.57)	1.02-1.89 (1.59)
	Annual	0.06-7.89 (3.18)	0.90-4.56 (2.58)	1.07-5.86 (2.48)	1.02-3.93 (2.41)
POC mg/l	Pre- monsoon	1.13-4.57 (2.80)	1.83-5.80 (3.68)	1.20-3.53 (1.97)	1.45-4.54 (2.63)
	Monsoon	1.73-4.03 (2.62)	0.69-3.28 (2.20)	1.13-3.94 (2.48)	0.63-3.28 (1.89)
	Post monsoon	0.82-1.76 (1.32)	0.25-2.46 (1.37)	0.50-1.64 (0.84)	0.88-2.84 (2.16)
	Annual	0.82-4.57 (2.29)	0.25-5.80 (2.39)	0.50-3.94 (1.96)	0.63-4.54 (2.20)
S.L mg/l	Pre- monsoon	38.82-49.68 (44.55)	7.56-71.32 (42.99)	7.44-63.16 (40.09)	11.54-75.08 (48.79)
	Monsoon	2.80-39.92 (21.94)	6.35-30.30 (13.10)	4.30-23.32 (14.49)	2.70-26.40 (17.05)
	Post monsoon	23.40-103.88 (52.15)	29.62-89.60 (55.35)	29.52-79.40 (46.89)	19.16-93.80 (52.29)
	Annual	2.80-103.88 (37.79)	6.35-89.60 (36.76)	4.30-79.40 (31.89)	2.70-93.80 (37.15)

water to sea and or estuary, might be responsible for higher production in mangrove region.

The POC and the suspended load also showed higher values. Higher POC showed a good standing crop and thereby showing high life sustaining capability of these waters. The suspended load in the present study varied considerably with the state of tide and season, this may be originated from domestic sewage and mangrove vegetation. The POC was higher in the mangrove region when compared to other areas of Cochin backwaters. This may be attributed to the autochthonous contribution resulting from primary production and allochthonous contribution by transportation of materials from upstream sources.

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