

Chemical Composition of Marine Macrophytes & Their Surrounding Water & Sediments, from Minicoy, Lakshadweep

T G JAGTAP & A G UNTAWALE

National Institute of Oceanography, Dona Paula, Goa 403 004

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Among the marine algae studied, *Herposiphonia* spp showed highest concentration of nitrogen (6.55%). In seagrasses, *Cymodocea rotundata* was rich in nitrogen (6.19%) and organic carbon (30.8%). In general, seagrasses were rich in the major elements compared to marine algae. The coastal waters around Minicoy showed high concentrations of Na, K and Mg compared to Ca.

Marine plants are rich in proteins, carbohydrates and elements¹⁻⁵. The present paper gives a brief account of proteins, carbohydrates, organic carbon and major elements in the marine algae, seagrasses and in the surrounding surface seawater and sediments from Minicoy atoll.

All samples were collected from 5 stations along the Minicoy atoll (Fig. 1) during the 104 cruise of *R V Gaveshani* (Jan. 1982). Seawater samples were preserved with conc. HNO_3 while sediments and plants were handpicked. For the analysis of elements and major metabolites, the plants and sediments were processed as described earlier^{3,5}.

Plants and sediment samples (1 g each) were digested in HF (1.5 ml) and then in conc. HNO_3 (1 ml) in a quick succession. Element analysis was done using atomic absorption spectrophotometer (Hilger and Watts Atomspect H-1550). A known quantity of preserved seawater was filtered through GF/C filter paper and elements were analysed directly⁶⁻⁸ using atomic absorption spectrophotometer. In all cases duplicate subsamples were analysed and standards were treated same way using distilled water.

Plant and sediment samples were analysed for nitrogen and organic carbon^{9,10}. Nitrogen was converted to protein using the factor 6.25.

The alga *Herposiphonia* spp (Table 1) showed higher concentration of nitrogen and hence more of the protein. Protein content in marine algae was reported¹¹ to vary from 100 to 330 mg.g⁻¹ dry wt. The seagrass *Cymodocea rotundata* showed higher protein value compared to *Halophila ovalis*. However, protein contents in seagrasses may vary seasonally³. In the present study marine algae showed lower value of protein than seagrasses. The organic carbon in marine algae ranged from 4.2% in *Halimeda gracilis* to 27% in *Lyngbya majuscula* while in seagrasses it ranged from 18% in *Halophila ovalis* to 30% in *C. rotundata*. Sediments showed average of 2.35% N and 0.3%

organic carbon (Table 1). In the present investigation, sediments collected were 100% sand. Sediments with more percentage of sand were observed¹² to be low in organic carbon and nitrogen. The high concentration of N in the sediments may be attributed to the seagrasses which play an important role in contributing^{1,3} amino acids to the water and sediments. C:N ratio in the seagrasses ranged from 0.9 to 7.5 while in the lagoon sediments (sts L₁ to L₃, Fig. 1), it was very low and uniform (0.15) suggesting low organic matter.

Marine macrophytes from Minicoy atoll showed higher concentration of Na and Mg compared to Ca and K (Table 2). The highest concentration of Na (8759 $\mu\text{g.g}^{-1}$) was observed in the seagrass *Syringodium isoetifolium* while Mg was highest (2566 $\mu\text{g.g}^{-1}$) in marine algae *Ulva lactuca*. *Halimeda gracilis* (coralline algae) showed highest concentration of Ca (1223 $\mu\text{g.g}^{-1}$).

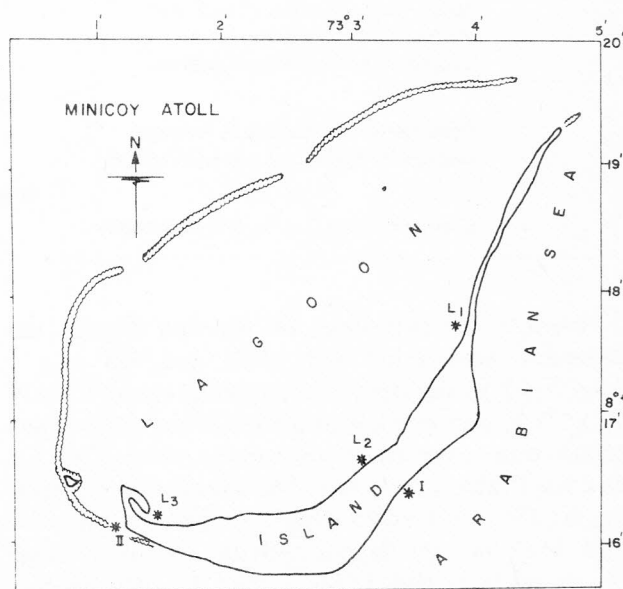


Fig. 1—Position of sampling locations

Table 1—Concentrations of Nitrogen, Protein and Organic Carbon in Macrophytes and Sediments
(Values are expressed on dry wt basis)

	Nitrogen %	Protein (% nitrogen $\times$ 6.25) mg.g ⁻¹	Organic carbon (%)	C:N
Seagrasses				
<i>Thalassia hemprichii</i> (Ehrenberg) Ascherson	6.10	381.0	24.6	4.03
<i>Cymodocea rotundata</i> (Ehrenberg et Hemprich)	6.19	386.8	30.6	4.89
<i>Halodule uninervis</i> (Forsskal) Ascherson	6.07	379.8	22.2	3.65
<i>Syringodium isoetifolium</i> Ascherson (Dandy)	3.30	206.5	24.9	7.53
<i>Halophila ovalis</i> (R. Brown)	2.80	175.0	18.0	6.43
Marine algae				
<i>Lyngbya majuscula</i> (Harv.)	6.05	378.0	27.9	4.61
<i>Ulva lactuca</i> (Linn.)	4.76	297.6	24.6	5.17
<i>Halimeda gracilis</i> (Harv.) ex J. Ag.	4.31	269.5	4.2	0.98
<i>Turbinaria decurrens</i> (Bory)	3.19	199.5	23.2	7.33
<i>Herposiphonia</i> spp.	6.55	409.5	—	—
<i>Galaxaura subverticillata</i> Kjellman	2.80	175.0	8.4	3.00
Sediments				
Lagoon stations (L ₁ , L ₂ & L ₃)	2.28	142.3	0.3	0.15

Table 2—Concentrations of Na, K, Ca and Mg
(Values are expressed in $\mu\text{g.g}^{-1}$ dry wt for sediment and plant samples and in ppm for water)

	Na	K	Ca	Mg
Seagrasses				
<i>Thalassia hemprichii</i> (Ehrenberg) Ascherson	6899	586.6	183.1	1147.1
<i>Cymodocea rotundata</i> (Ehrenberg et Hemprich)	7758	842.2	46.8	1412.6
<i>Halodule uninervis</i> (Forsskal) Ascherson	3759	501.7	407.1	1330.9
<i>Syringodium isoetifolium</i> (Ascherson) Dandy	8759	680.9	125.7	1279.9
<i>Halophila ovalis</i> (R. Brown)	5578	498.2	461.7	1732.6
Marine algae				
<i>Lyngbya majuscula</i> (Harv.)	2819	211.5	335.0	1164.1
<i>Ulva lactuca</i> Linn.	4382	465.9	116.9	2566.6
<i>Halimeda gracilis</i> (Harv.) ex J. Ag.	698	59.1	1223.3	633.8
<i>Turbinaria decurrens</i> (Bory)	1430	942.6	151.9	1041.6
<i>Galaxaura subverticillata</i> Kjellman	578	103.9	1144.3	1252.7
Water				
Open shore stations (I & II Average)	140186	203412	2727	28424
Lagoon stations (L ₁ , L ₂ & L ₃ Average)	16346	208392	1826	18318
Sediments				
Lagoon stations (L ₁ , L ₂ & L ₃ Average)	3685.3	9.6	579.2	988.3

Average concentrations of Na and Mg in the sediments were quite high (3685 and 988 $\mu\text{g.g}^{-1}$ respectively) compared to the concentration of Ca (579 $\mu\text{g.g}^{-1}$). K was very low in the sediments while it was high in water compared to the concentration of Na, Ca and Mg (Table 2) in water. The seawater along open shore (sts I and II) showed higher concentration of Ca and Mg than the lagoon waters. On an average seagrasses were rich in Na, K and Mg than marine algae while it was reverse in the case of Ca.

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