

## Hydrocarbons in Benthic Marine Algae of the Vestfold Hills, Antarctica

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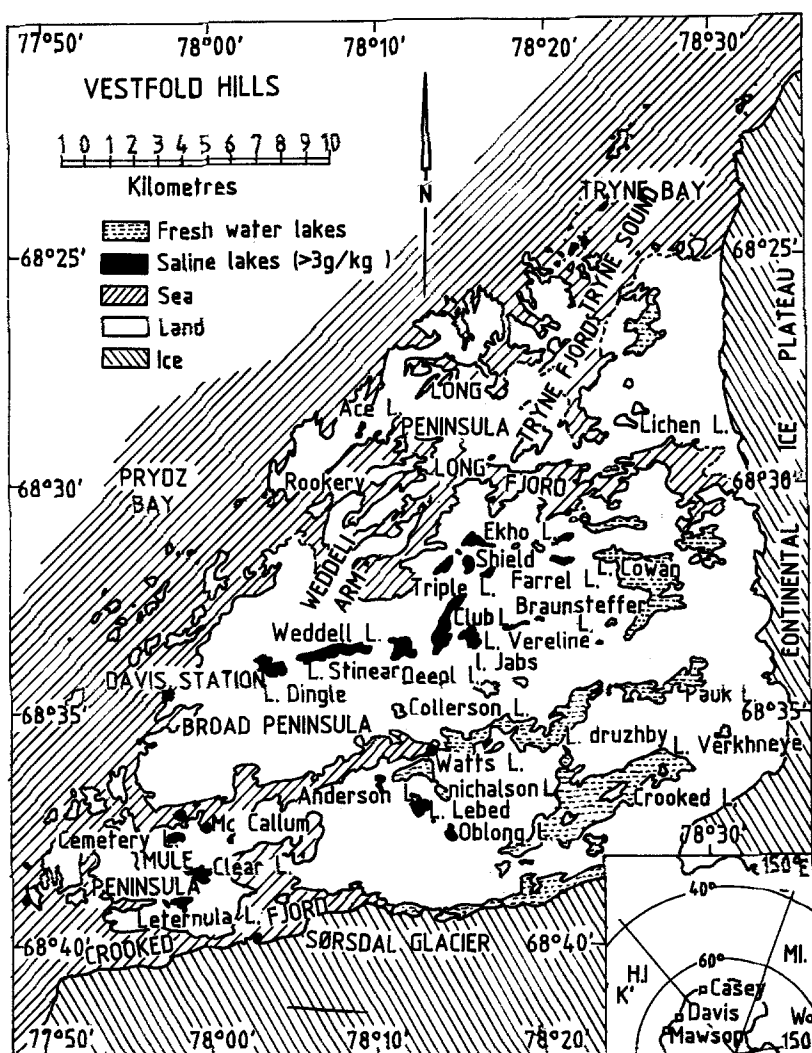
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-Recently, Antarctic continent has been the center for diverse research activities. This has resulted in a large number of research and supply vessels visiting Antarctica, which may lead to the contamination of Antarctic environment due to unintentional release of petroleum products. It is, therefore, essential to monitor the concentration of various pollutants in water, sediment, flora and fauna of this region which may also serve as a baseline data for future comparison. With this in view, total hydrocarbon concentration in some marine benthic algae collected from the Vestfold Hills, Antarctica was studied.

### MATERIALS AND METHODS

Nine benthic marine algae, three from Chlorophyta - Urospora penicilliformis (Roth) Areschoug., Enteromorpha bulbosa (Subr) Montagne and Cladophora simplex (Kuetzing) ., two from Phaeophyta - Himantothallus grandifolius (A. & E.S. Gepp) Zinova and Desmarestia menziesii (J. Ag.) and four from Rhodophyta - Palmaria decipiens (Reinsche) Ricker comb. ined., Porphyra endiviifolium (A. & E.S. Gepp) Camberlain, Phyllophora antarctica (A. & E.S. Gepp) and Iridaea cordata (Turner Bory) were used for estimation. The samples were collected with a grab, operated (0-2 m<sup>3</sup>-area) through a drilled hole in 2 m thick sea ice of the Vestfold Hills, Antarctica (Fig. 1). Algal samples were sorted, labelled and brought to the laboratory where they were cleaned of epiphytes, washed with tap water, dried at 60°C in a hot air oven and powdered in a macrohammer mill. A known amount of algal powder in triplicate was digested using 0.5 N KOH in 95% methanol. Non saponifiable lipids, including hydrocarbon, were partitioned into hexane. The resulting extracts were dried over anhydrous sodium sulphate which was cleaned previously with chloroform. Blanks and standards were treated in the same way. Fluorescence emission of the

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extracts obtained as above was measured at 370 nm with excitation at 310. Total hydrocarbon (THC) concentrations were calculated using Bombay High crude oil as an arbitrary standard.

Total organic carbon (TOC) and lipids were analysed in triplicate following the methods of Wakeel and Riley (1957) and Bligh and Dyer (1959) respectively.

## RESULTS AND DISCUSSION

The concentrations of THC, TOC and lipids along with standard deviations are given in Table 1. Among Rhodophyta species maximum concentration of THC

Table 1. Total hydrocarbon in Antarctic benthic marine algae

Macrophyte Species	TOC mg g <sup>-1</sup>	Lipids		Total hydrocarbon (THC)		
		mg g <sup>-1</sup>	% of TOC	mg g <sup>-1</sup>	% of TOC	% of lipids
Chlorophyta						
1. <u>Urospora</u> <u>penicilliformis</u>	324.0 $\pm$ 1.587	10.1 $\pm$ 0.189	3.11	0.052 $\pm$ 0.001	0.016	0.514
2. <u>Enteromorpha</u> <u>bulbosa</u>	240.0 $\pm$ 1.800	37.1 $\pm$ 0.170	15.46	0.038 $\pm$ 0.001	0.016	0.102
3. <u>Cladophora</u> <u>subsimplex</u>	156.0 $\pm$ 2.078	29.5 $\pm$ 0.410	18.58	0.025*	0.016	0.084
Phaeophyta						
1. <u>Himantothallus</u> <u>grandifolius</u>	304.2 $\pm$ 0.693	29.6 $\pm$ 0.497	9.73	0.057 $\pm$ 0.002	0.012	0.125
2. <u>Desmarestia</u> <u>menziesii</u>	342.0 $\pm$ 1.200	22.0 $\pm$ 0.156	6.43	0.106 $\pm$ 0.002	0.031	0.481
Rhodophyta						
1. <u>Palmaria</u> <u>decipiens</u>	325.8 $\pm$ 0.346	22.9 $\pm$ 0.239	7.03	0.043 $\pm$ 0.005	0.013	0.187
2. <u>Porphyra</u> <u>endivifolium</u>	342.0 $\pm$ 0.980	38.5 $\pm$ 0.156	11.32	0.064 $\pm$ 0.005	0.018	0.166
3. <u>Phyllophora</u> <u>antarctica</u>	280.2 $\pm$ 0.910	12.9 $\pm$ 0.605	4.60	0.032 $\pm$ 0.006	0.011	0.248
4. <u>Iridaea</u> <u>cordata</u>	282.0 $\pm$ 0.600	11.0 $\pm$ 0.291	3.90	0.024 $\pm$ 0.005	0.008	0.218

\* Single analysis

(0.064 mg g<sup>-1</sup>) was observed in P. endiviifolium, whereas, in I. cordata it was found to be minimum (0.024 mg g<sup>-1</sup>). TOC and lipids followed similar trends of distribution in red algae (Table 1). Both the species of Phaeophyta did not show significant variations in TOC and lipids concentration, however, a large variation in THC concentration was observed. Chlorophyta members also showed variations in TOC, lipids and THC concentration (Table 1).

In general THC concentration in all the marine algal species varied from 0.24-0.106 mg g<sup>-1</sup>. Matsumoto et al. (1979) analysed aliphatic hydrocarbons in benthic algae collected from three localities of McMurdo Sound, Antarctica and observed large variations (11-140 µg g<sup>-1</sup>). The results of the present investigation also showed similar trends of THC distribution. Such variations in THC concentration could be due to difference in age, short-life span and geographic distribution of algae (Youngblood et al. 1971). Alternatively, the rate of THC accumulation may vary from genus to genus (Clark and Blumer. 1967).

Desmaristia mezieisii showed highest concentration (0.106 mg g<sup>-1</sup>) of THC which could be used to monitor hydrocarbon pollution. However, such conclusions need to be confirmed after repeated observations. Based on the spectrofluorometric data it is rather difficult to identify the source of the hydrocarbons in benthic algae of this region. Further data, using GC and GC/MS analysis are needed in order to trace the origin of hydrocarbons in these algae. Nevertheless, the data presented here on THC can serve as a base line for future work.

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