

THE CONTENTS OF SOME INORGANIC MICRONUTRIENTS IN THE COAST OF PAPUA NEW GUINEA

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Introduction

A lot of studies on the cycles and the contents of micronutrients, especially of phosphorus, in different water spheres have appeared until now (e.g. PARSONS, T. *et al.*, 1973). But there are found few papers investigated on these nutrients in shore and offshore waters of Papua New Guinea. Succeeding to the previous paper (INOUE *et al.*, 1990), some inorganic nutrient contents which dominantly govern primary production were measured on the sea water samples collected in the vicinity of Port Moresby, Papua New Guinea in November and December of 1990.

The purposes of the present study were first to understand general features of shallow waters of coastal regions and second to accumulate fundamental data for the future development of aquaculture in the country. In another two places vertical changes of these nutrients were also measured to know the situations of these nutrients in deeper water which may eventually suggest suitable conditions for the habitat of *Nautilus* spp. that was frequently reported to live thereabouts.

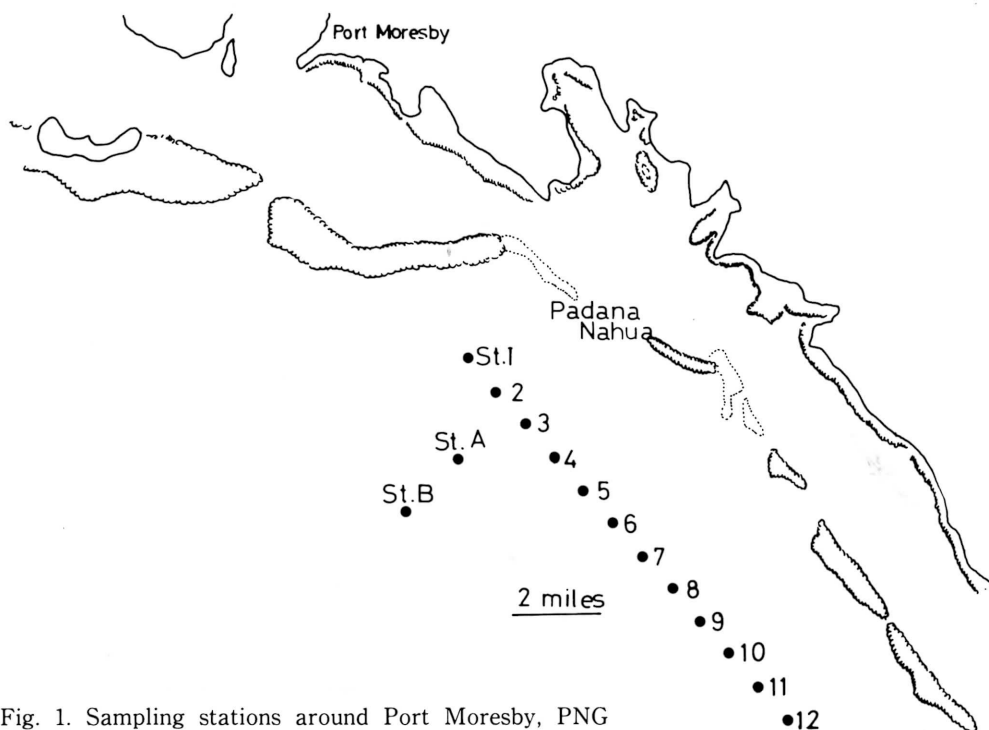


Fig. 1. Sampling stations around Port Moresby, PNG

Results and Discussion

The sea water samples were collected at twelve places along the barrier reef located at south east of Port Moresby. The sampling stations where shallow water samples collected are shown in Fig. 1. Sea water samples at 0 m were taken by a plastic bucket and the samples at the depth of 4.5 m by pumping up respectively. At another two places vertical changes of inorganic micronutrients were also measured. These collected samples were stored at -25°C after immediate filtration through millipore filters (pore size: 0.45μ) until used. Inorganic nutrients determined in this study were $\text{NO}_3\text{-N}$, $\text{NO}_2\text{-N}$, $\text{NH}_3\text{-N}$, Phosphate-P and Silicate-Si. The measurement was carried out mainly on board and partly in the laboratory after coming back to Japan by colorimetry using DREL-2000 (HACH) analyzer without any modifications indicated in the manual.

Table 1. Inorganic micronutrient contents at surface layers near POM

Station	Depth	$\text{NO}_3\text{-N}$	$\text{NO}_2\text{-N}$	$\text{NH}_3\text{-N}$	$\text{PO}_4\text{-P}$	Silicate-Si
1	0m	60	8	40	80	165
	4.5	80	6	20	80	416
2	0	60	9	30	80	134
	4.5	70	6	30	40	315
3	0	60	8	20	60	218
	4.5	70	8	40	50	177
4	0	70	8	20	40	141
	4.5	70	6	50	80	261
5	0	60	9	10	90	167
	4.5	50	10	30	30	187
6	0	60	—	40	100	98
	4.5	60	4	40	40	186
7	0	70	—	10	30	62
	4.5	40	1	60	90	366
8	0	60	2	40	120	88
	4.5	60	—	100	60	248
9	0	60	1	40	20	101
	4.5	80	—	20	80	290
10	0	70	5	40	60	95
	4.5	60	3	60	60	289
11	0	90	6	10	40	127
	4.5	90	—	60	30	498
12	0	60	4	50	40	148
	4.5	60	—	80	50	221

Contents are demonstrated by $\mu\text{g}/\text{l}$. — : not detected

The horizontal distribution of microinorganic nutrients at 12 stations is shown in Table 1. The ranges of individual nutrient contents were $40\sim 90\mu\text{g}/\text{l}$ for $\text{NO}_3\text{-N}$, 0 (not detected) ~ 10 for $\text{NO}_2\text{-N}$, $10\sim 100$ for $\text{NH}_3\text{-N}$, $20\sim 120$ for $\text{PO}_4\text{-P}$ and $62\sim 366$ for Silicate-Si respectively. Nitrate-N was found to distribute rather evenly and the difference between two layers at

each sampling station was not so notable. To the contrary Silicate-Si content of 4.5 m layer always surpassed that of 0 m at every sampling station. Phosphate-P existed more than $20\mu\text{g/l}$ throughout samples indicating that this nutrient was not so poor as to limit the primary production around the surveyed area. High ammonia-N contents were recognized at 4.5 m layer of two sampling stations (St.8 and St.12) whose reason was not elucidated in this study. Water temperature was between $27.3\sim 28.8^{\circ}\text{C}$, and salinity was between $34.54\sim 35.19\text{‰}$ throughout samples.

Table 2. Vertical changes of inorganic micronutrient contents

	Depth	$\text{NO}_3\text{-N}$	$\text{NO}_2\text{-N}$	$\text{NH}_3\text{-N}$	$\text{PO}_4\text{-P}$	Silicate-Si
St. A	0m	80	9	50	90	171
	10	80	8	30	100	136
	25	70	7	40	30	112
	50	70	8	10	60	58
	100	80	2	80	40	75
	150	110	5	60	40	73
	250	80	4	20	100	109
	500	80	6	50	90	337
	750	110	11	30	140	1028
St. B	0m	80	13	40	30	156
	10	70	4	50	120	144
	25	100	4	60	20	92
	50	90	6	40	50	75
	100	100	9	60	70	95
	150	90	4	40	140	129
	250	80	9	50	140	247
	500	100	13	50	130	783
	750	110	19	70	270	1632

Contents are demonstrated by $\mu\text{g/l}$.

The vertical distributions of nutrients at two stations are shown in Table 2. As seen in Fig.1 two stations were situated at about 2 miles distance each other and the nearer station to the shoreline, St.A, was about 6 miles away from long barrier reef developed southeasterly. Nitrate-N existed almost uniformly from surface to bottom layer and nitrite-N once decreased to middle layer and again increased to the bottom. The highest contents for these nutrients were 110 and $19\mu\text{g/l}$ at 750 m respectively. Vertical distributional patterns for phosphate-P and silicate-Si were well coincided. Both nutrients were found to be at lower concentrations at between 50 and 150 m at St.A and 25 and 100 m at St.B respectively suggesting massive consumption by phytoplankton activities in the near past. In the lagoon three additional water samples were taken and analysed for inorganic nutrients for comparison. No noticeable differences were found between the individual nutrient content in samples of inside the lagoon reef and these of outside the reef. The contents of every inorganic nutrient measured here were of rather lower level than those reported previously in tropic

areas (LEMASSON *et al.*, 1980 ; RICARD *et al.*, 1986). The contents found here, however, were not so low as the contents observed in the reef of Madang or Lae (INOUE *et al.*, 1990). The accumulation of more data is required before understanding the general features of coastal environments in Papua New Guinea.

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