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SOME REMARKS ON THE DISTRIBUTION OF NUTRIENTS ALONG THE TRANSECT NHA TRANG - LUZON

(Vietnamese-Philippines cooperative investigation, JOMSRE II, May 2000)

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ABSTRACT A nutricline (as termed by Cullen, 1982) exists along the transect Nha Trang - Luzon during May - June 2000 investigation. Variation ranges of nitrate and silicate were comparable with data of JOMSRE-SCS investigation during April - May 1996 whereas the maximum value of phosphate was higher. Vertical distribution of nutrients was irregularly in euphotic layer, the highest concentrations were found in stations 3 and 12. In deeper layer nutrient concentrations increased with depth. Phosphate was concentrated in the western part of the transect; high concentrations of this element and silicate in euphotic layer may due to the effect of upwelling phenomena.

N/P molar ratios were lower in euphotic layer, it caused by nutrient consumption of algae.

Better knowledge on chemical, physical characteristics and hydrodynamic regime in the region will contribute to the development of economic activities in the region.

VAI NHAN XET VE SÖ PHAN BO CUA MUOI DINH DÖÔNG DOC THEO MAT CAT NHA TRANG - LUZON

(Chöông trình hôp tac nghien cöu Viet Nam – Philippine, JOMSRE II, thang 5/2000)

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TOM TAT Mot nutricline ton tai ô mat cat Nha Trang - Luzon trong thôi gian thöc hien chuyen khao sat thang 5-6 nam 2000. Pham vi bien ñong cua nitrate and silicate co the so sanh ñöôc vôi ket qua cua chuyen khao sat JOMSRE-SCS Thang 4-5 nam 1996 trong luc gia trò cöc ñai cua phosphate cao hôn. Sö phan bo cua muoi dinh döông trong tang öu quang khai bat thöông, cac ham löông cao nhat ñöôc gap tai cac tram 3 va 12. Ô lôp nöôc sau ham löông muoi dinh döông tang theo ño sau. Muoi phosphate tap trung cao ô phan phía tay mat cat; cac ham löông cao cua yeu to nay va cua silicate trong tang öu quang co the do anh höông cua hoat ñong nöôc troi.

Tæ so phan tö N/P trong tang öu quang thap, nguyen nhan la sö tieu thu muoi dinh döông cua tao.

Cac hieu biet tot hôn ve cac ñac ñiem vat ly, hoa hoc cung nhö ve che ño thuy ñong löc se gop phan vao viec phat trien cac hoat ñong kinh te trong khu vöc.

I. INTRODUCTION

In order to obtain more data on the oceanography and biology of the marine area between Nha Trang and Luzon a Vietnamese - Philippines cooperative investigation had been carried out in May-June 2000. 188 water samples had been collected, measured and analyzed for pH, DO, alkalinity, chlorophyll and nutrients (by Hoang Trung Du and Nguyen Phi Phat). The following part of the papers presents some remarks on the distribution of nutrients (nitrate, phosphate and silicate) on the basis of data from these samples.

The authors wish to acknowledge the help of Mr. Nguyen Phi Phat in analyzing of the samples.

II. MATERIALS AND METHODS

The investigation had been carried out at 16 stations located in the deep sea (depth more than 2000m, see Fig. 1). In each station, water samples had been collected at 3m, 20m, 40m, 60m, 70m, 80m, 100m, 150m, 200m, 300m, 400m and 500m levels using 12-bottles CTD - Rosette. Nutrients were analyzed aboard using spectro-photometric methods (after APHA, 1995).

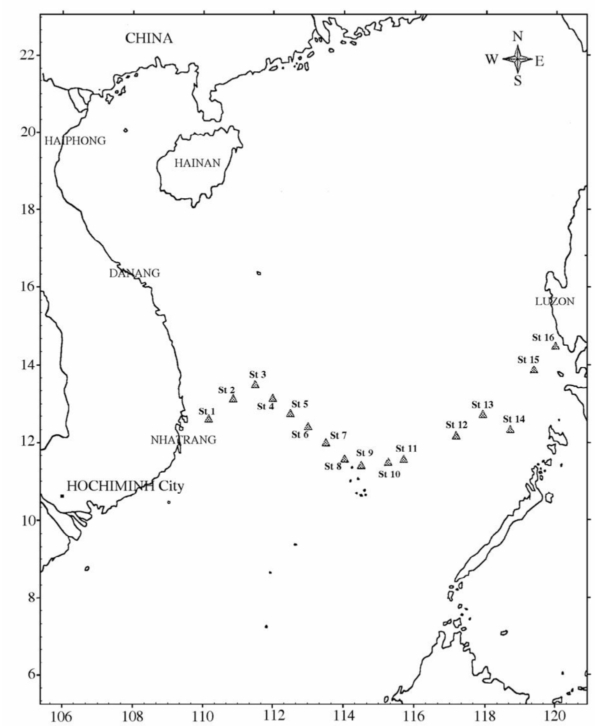


Fig. 1: Location of sampling stations

III. RESULTS AND DISCUSSIONS

1. Vertical distribution of nutrients

Generally, the vertical distribution pattern of nutrients was similar in all stations of the Nha Trang - Luzon transect. The concentrations of nitrate, phosphate and silicate increased with the depth. However, there were some irregularities in the upper layer where minimum values of nutrients (0.0 µg/l for nitrate, 0.2 µg/l for phosphate and 20 µg/l for silicate) were recorded (Figure 2). Maximum values were found at 500m depth (414.2 µg/l for nitrate; 114.2 µg/l for phosphate and 1778 µg/l for silicate). Corresponding mean values were 134.8 µg/l, 30.0 µg/l and 375 µg/l respectively. Variation ranges of nutrients were comparable with the data from JOMSRE-SCS investigation, April - May 1996 (G.S. Jacinto et al., 1997) except for the case of phosphate; maximum value of phosphate in the investigation was higher (Tab. 1).

Vertical distribution pattern demonstrated two water layers: (1) the upper layer where nutrient concentrations were lower and irregularly distributed; (2) the deep layer where concentrations of all nutrients were higher and regularly increased with depth. It is difficult to determine exactly the boundary of the two layers (nutricline, according to Cullen, 1982, in: Jacinto et al., 1997). However, vertical distribution of nutrients (presented in Figure 2) indicates that this boundary exists at the depth ranged from 60 to 100m, mainly from 70-80m. The upper layer can be called as euphotic layer. Concentrations of nutrients in this layer are determined by two factors: (1) the consumption of marine algae and (2) the supply from the mineralisation prevailing in the deeper part of water column.

Table 1: Comparison of the data from April-May 1996 and May-June 2000 investigations

Value	Nitrate (µM)		Phosphate (µM)		Silicate (µM)	
	a	b	a	b	a	b
Max	33.85	29.59	2.80	3.68	96.03	63.50
Min	non-detectable	non-detectable	non-detectable	0.01	0.43	0.71

a. data of JOMSRE-SCS cruise (Aprill-May 1996), water samples had been collected from surface to the depth of 800m; after G.S. Jacinto et al., 1997 b. data of this cruise, water samples had been collected from near surface to the depth of 500m

2. Spatial distribution

Thickness of the upper layer ("euphotic layer") varied along the transect. In other words, topography of the nutricline was irregularly. It rised in western and eastern ends of the transect. Mean concentrations of nutrients in "euphotic layer" also varied. These variations (together with the depth of nutricline) are depicted in fig. 3. This figure indicates that highest mean values of nitrate and silicate are found at stations 2 and 13 whereas highest mean values of phosphate are recorded at stations 3 and 6.

Highest concentration of silicate was also found at station 2 in deeper part of water column (Fig. 4). The fig 4 also shows that variation of nitrate at 200 and 500m levels along the transect was smaller in comparison with the variations of phosphate and silicate.

Based on the data from figs 3 and 4, it's possible to say that phosphate was concentrated in the western part of the transect. This part was also rich in nitrate in euphotic layer. This may due to the effect of upwelling phenomena. The neritic sea located in the southwestern part, this part is rich in phosphate during southwest monsoon under the effects of upwelling (Pham Van Thom, 1996).

Available data suggests that nitrate was the limiting nutrient along the transect during May - June 2000 investigation. The euphotic layer of marine areas nearby stations 2 and 13 was rich in nutrients; on the other hand, N/P molar ratios in these areas were highest (Table 2). Vertically, N/P ratios in euphotic layer were lower than in deeper layer (Table 3). The cause may be the nutrient consumption of algae (using more nitrate than phosphate).

Table 2: Mean values of N/P in euphotic layer along the transect

Station	Mean value of N/P	Station	Mean value of N/P
1	4.20	9	3.19
2	**7.99**	10	4.10
3	2.01	11	3.89
4	4.25	12	3.43
5	4.71	13	**8.26**
6	1.31	14	3.58
7	0.51	15	1.92
8	3.57	16	4.33

Table 3: Variation ranges and mean values of N/P molar ratios in various layers

Euphotic layer				Deep layer			
Max	Min	Mean	n	Max	Min	Mean	n
35.43	0.00	**3.88**	91	19.71	5.87	**11.54**	90

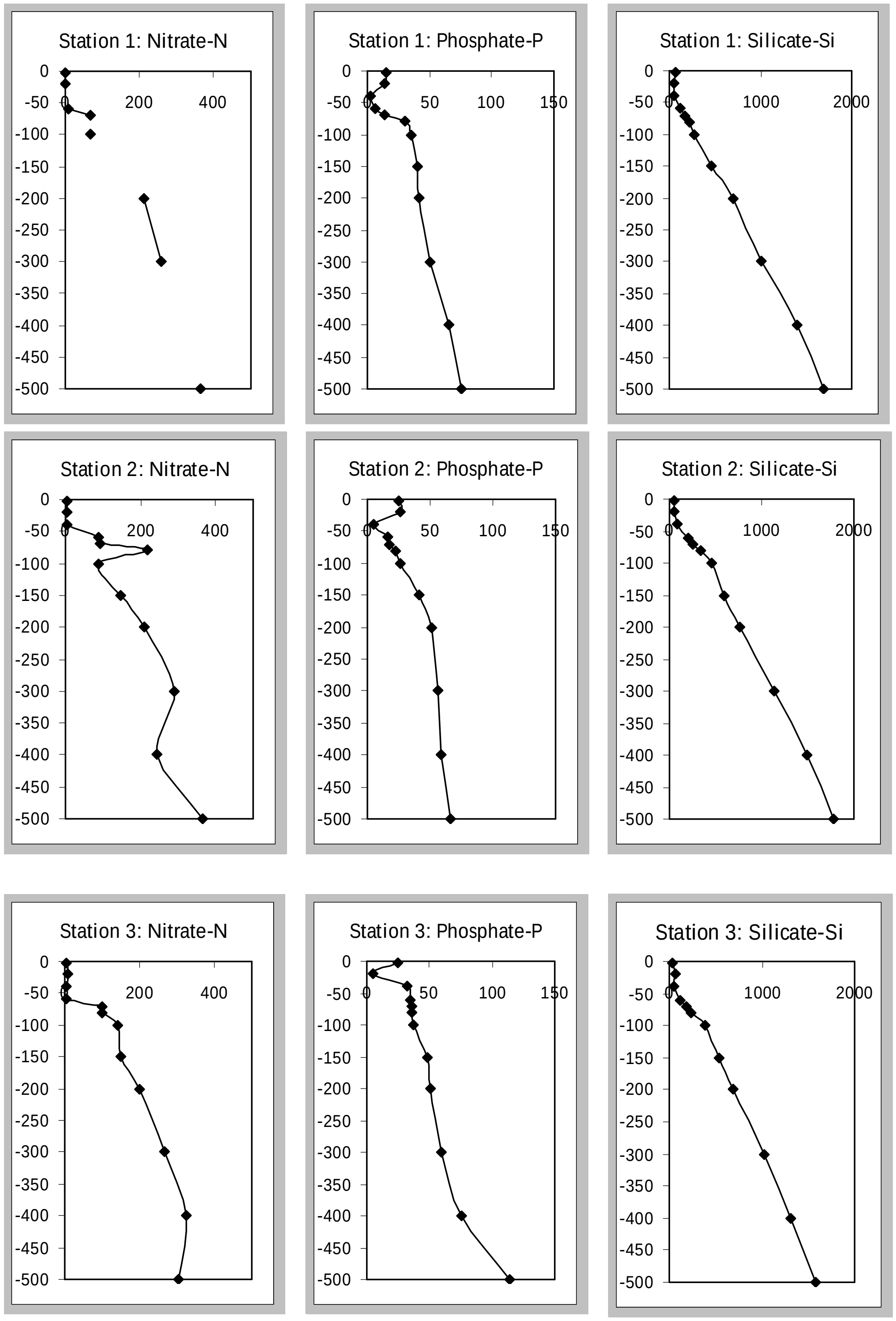


Fig. 2: Vertical distribution of nutrients (unit: µg/l)

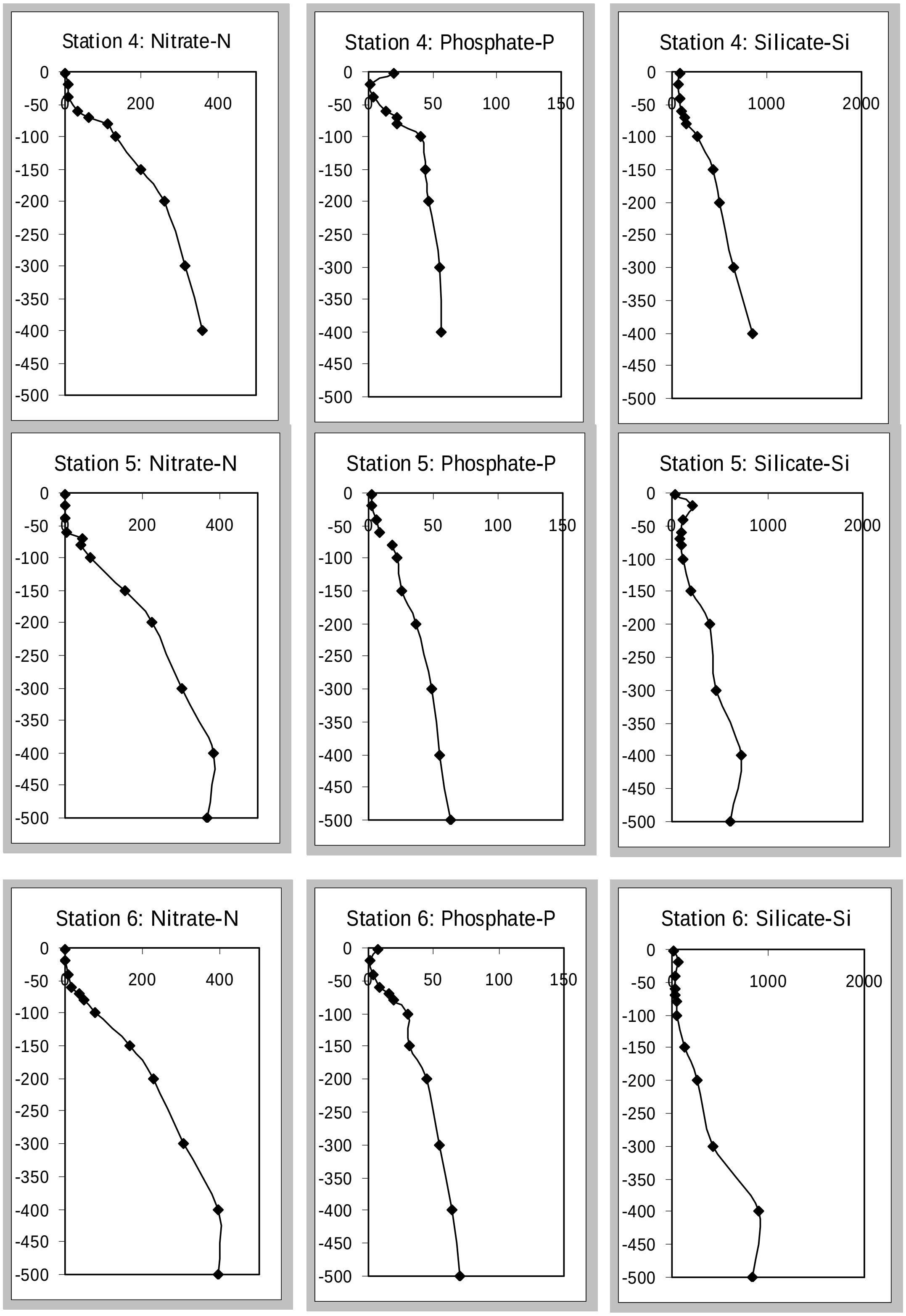
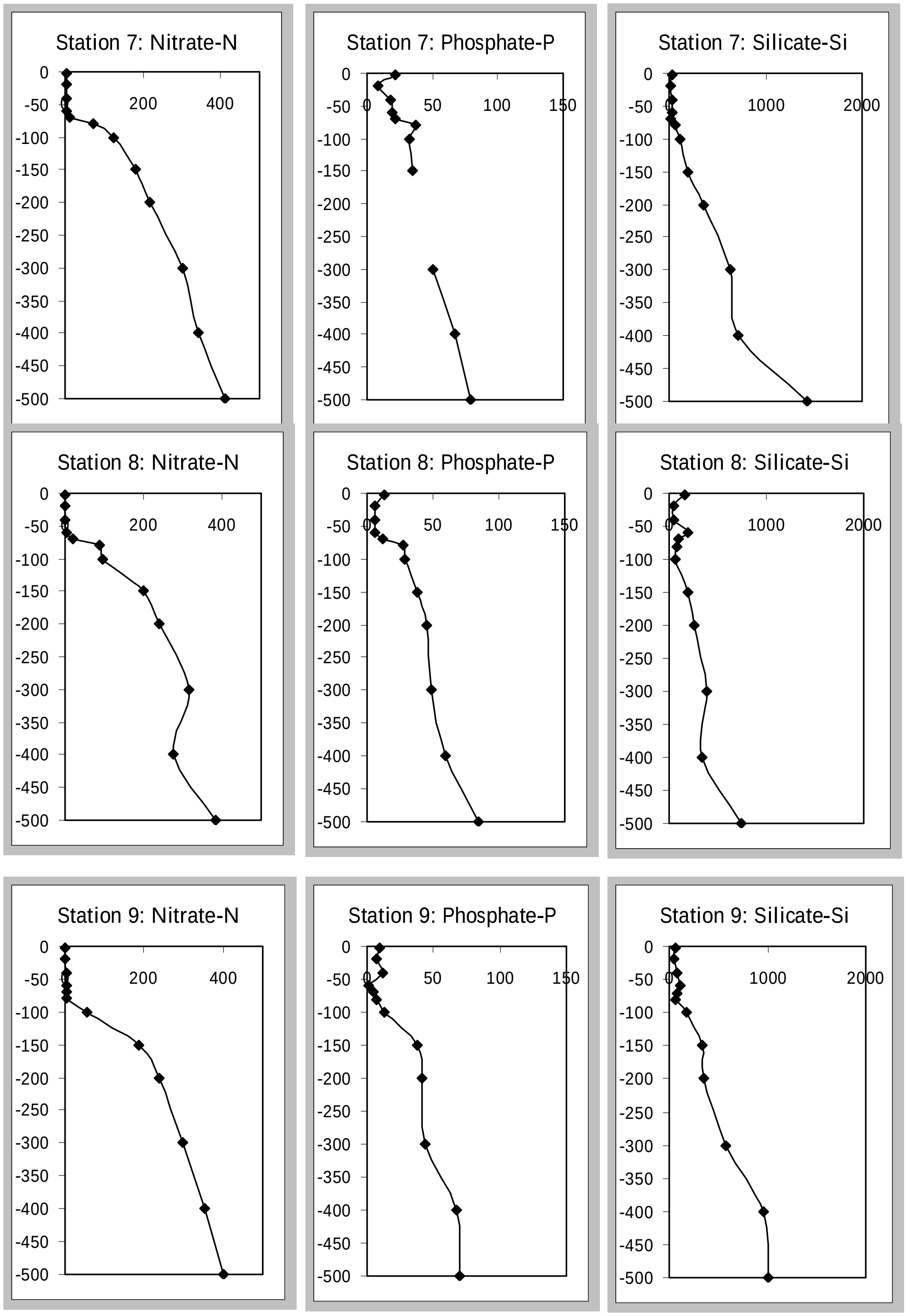


Fig. 2: (Continued)



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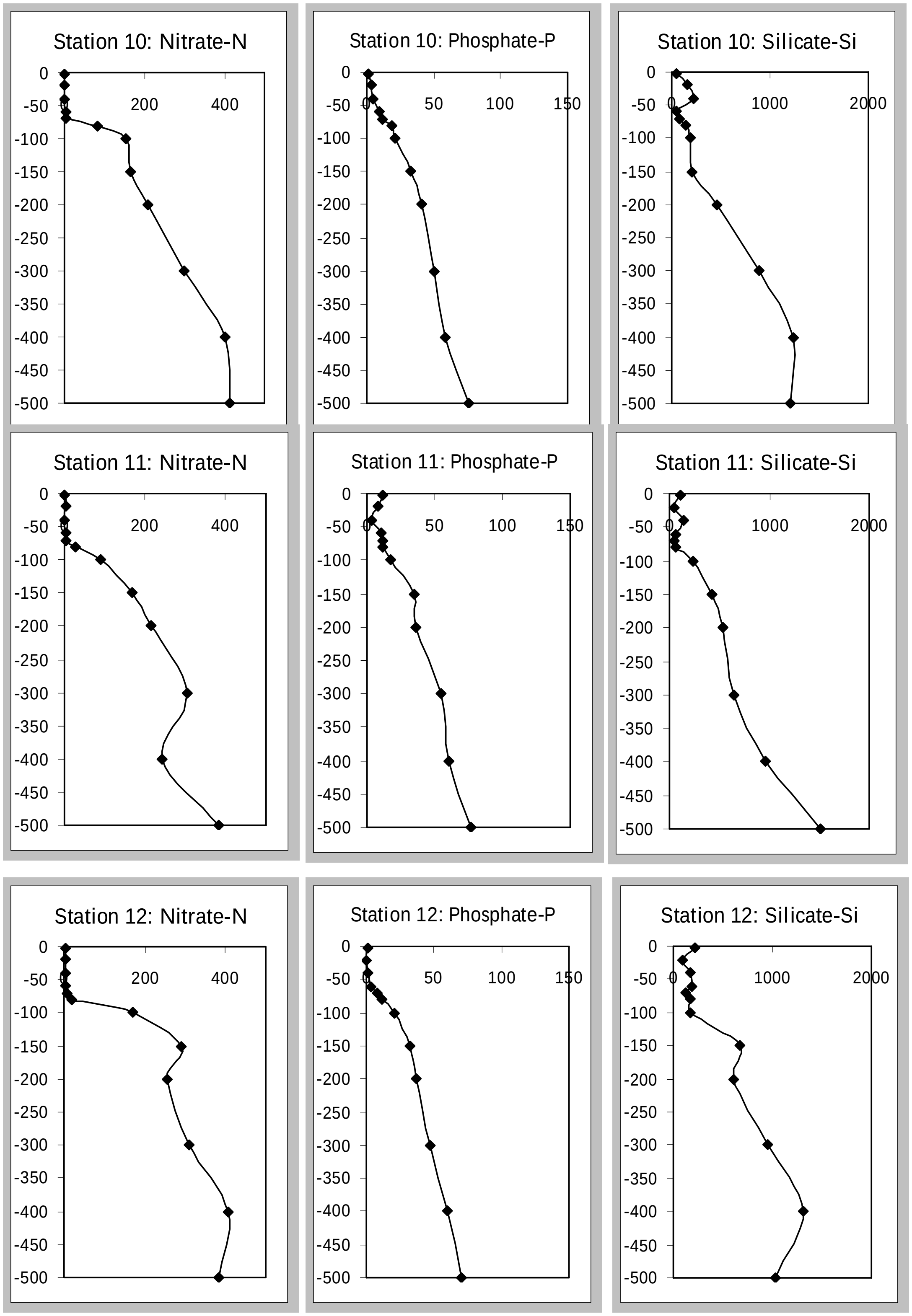

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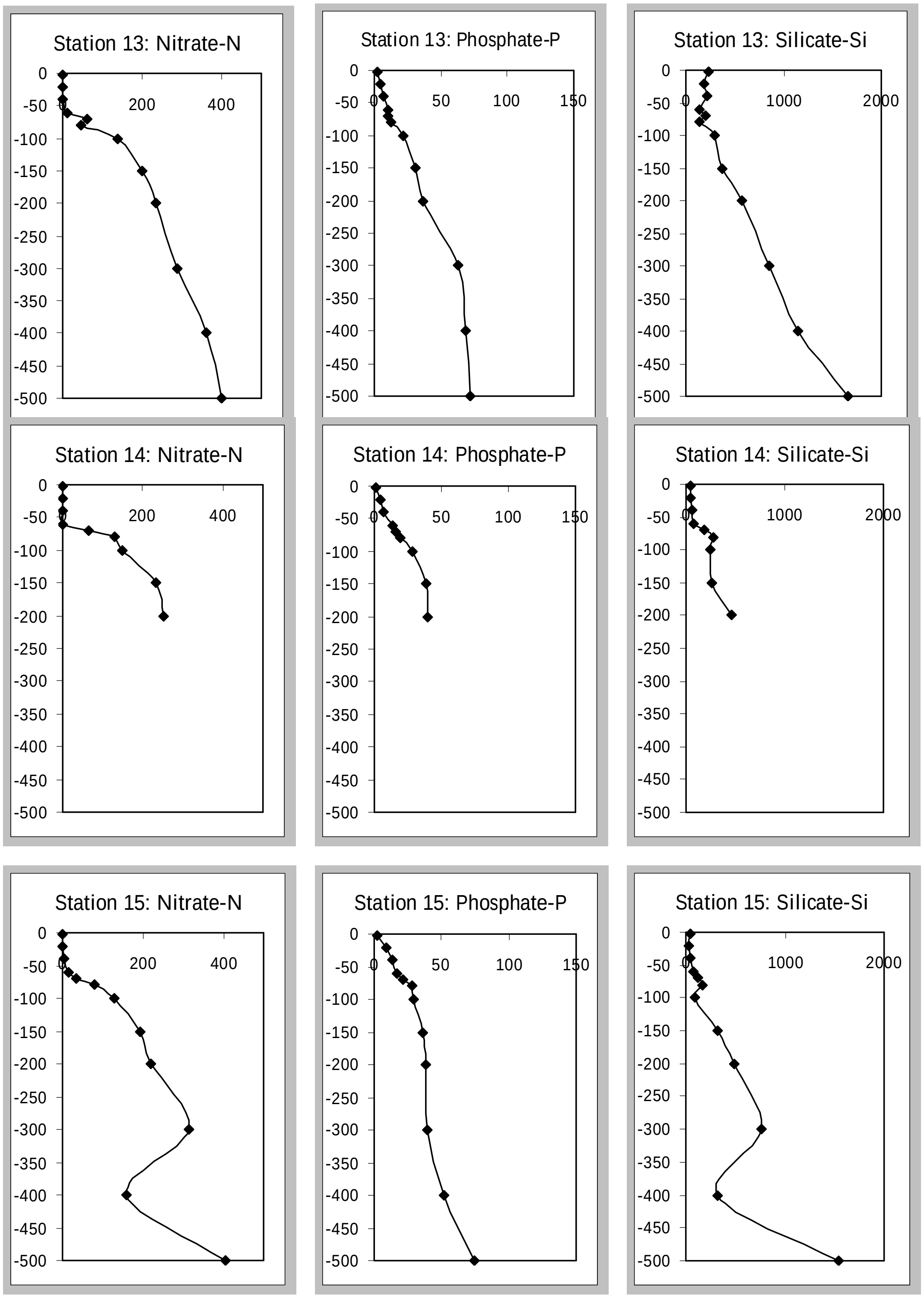

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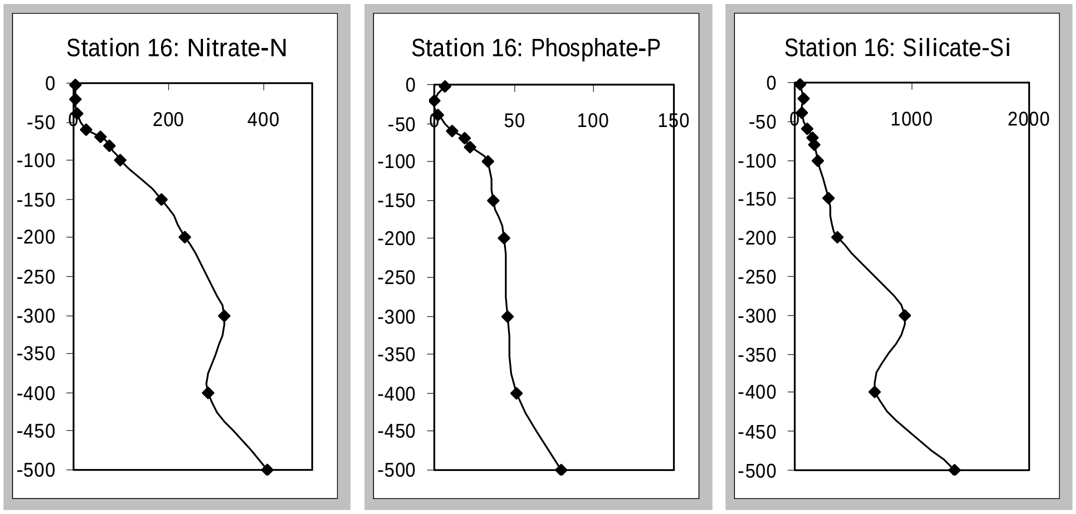

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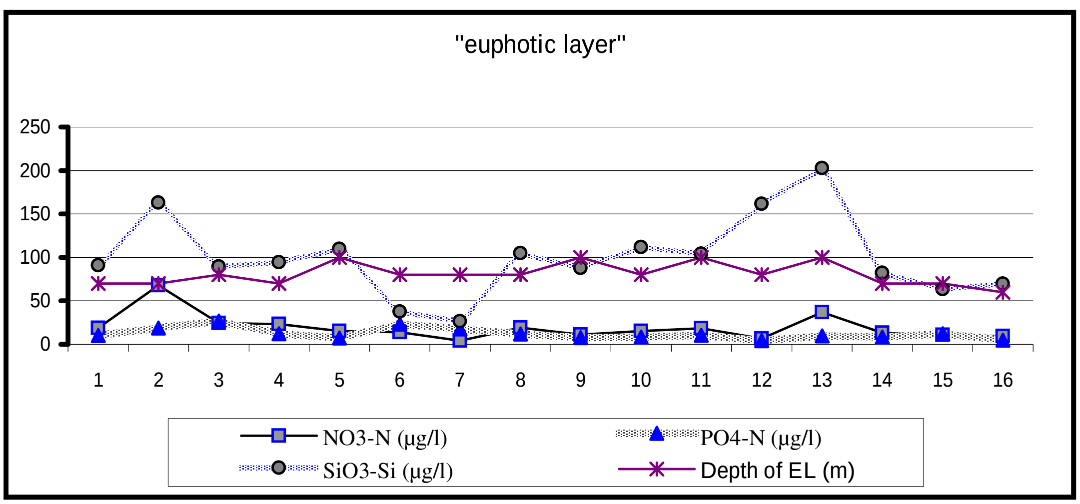

Fig. 3: Spatial variation of mean values of nutrients in euphotic layer

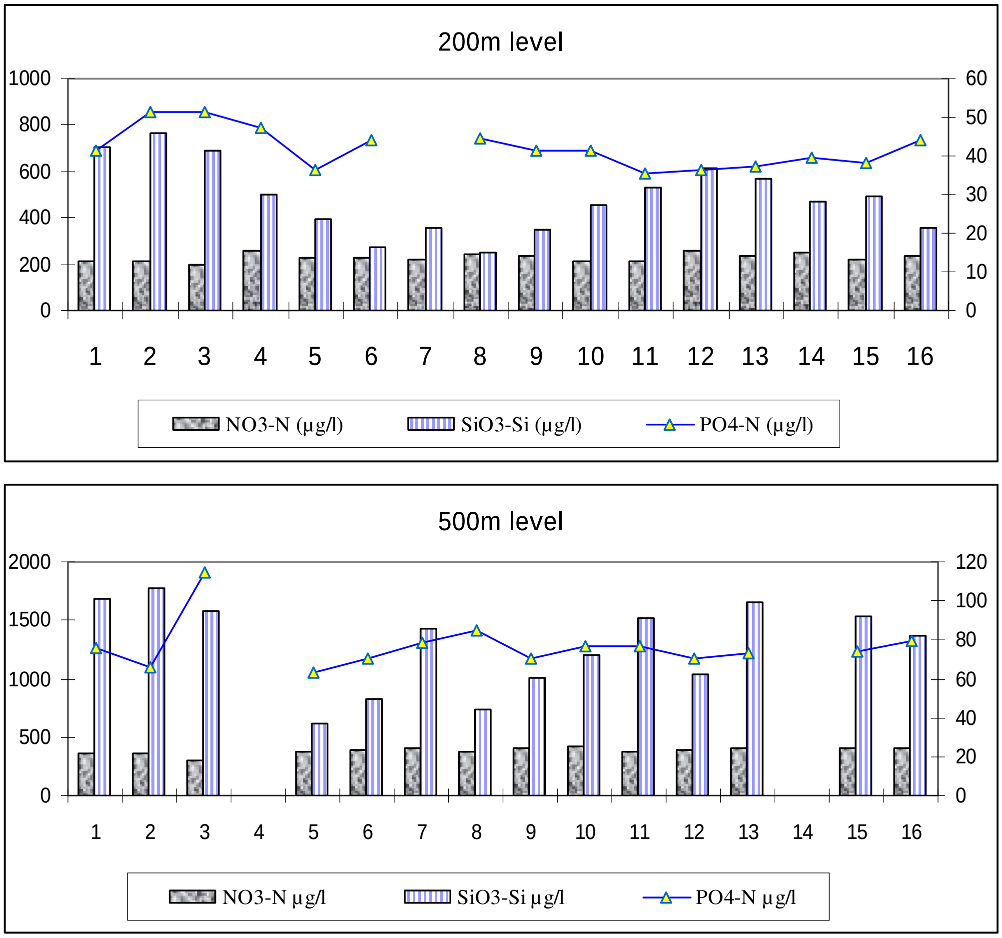

Fig. 4: Spatial varation of nutrients concentration at 200m and 500m depths

IV. CONCLUSION

It can be said that the mineralisation of organic detritus which is accompanied by supplying nutrients from deep layer has an important role in determining nutritive level of euphotic layer (through upwelling phenomena), especially for the neritic sea. Better knowledge on the chemical, physical characteristics of water column as well as the hydrodynamic regime in the area will contribute to develop fisheries and other economic activities. It is necessary to perform more comprehensive cooperative studies in this area.

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