NOTES

ON ZOOPLANKTON OF THE COASTAL WATERS OF RIO GRANDE DO NORTE SAMPLED FROM OIL PRODUCING PLATFORM

Abstract

Lack of a comprehensive knowledge of zooplankton of the coastal waters of the northeast region of Brazil prompted the present study. Seasonal and diurnal collections were made from an oil producing platform located off Guamaré, Rio Grande do Norte, Brazil during the period of one year from March 1987 to February 1988. A preliminary analysis of the samples showed a discernible seasonal fluctuation and a clear pattern of diurnal changes in the composition of zooplankton.

The Coastal Waters of the northeast region of Brazil have not been subjected to any detailed oceanographic study. Our present knowledge on zooplankton of the Brazilian coastal waters is based on the studies of Vannucci and Hosoe (1952), Bjornberg and Forneris (1955, 1956 a, 1956 b), Hosoe (1956), Forneris (1957), Vannucci (1957), Almeida Prado (1961), Bjornberg (1963), Paranagua (1966) and Medeiros and Bjornberg (1978).

The logistic support offered by the Brazilian Oil Company (Petrobras) to conduct observations once a month on one of the offshore platforms gave the necessary impetus to carry out the present study. The financial support from the National Councill for the Development of Science and Technology (CNPq) also contributed to the success of the project. The authors are very much indebted to these organizations.

Material and methods

The platform chosen (Fig. 1, PUB 3) is located about 26 kms from the coastal village of Guamare in the State of Rio Grande do Norte, Brazil. This platform offers a stable place on top of the emergency ladder placed on the shoreward side of the platform which remains approximately ten metres above water level and from which all samplings were done. The depth of water column varied from 12 to 14 metres. Sampling was done at an interval of four weeks and on the day of sampling, collections were made at about 1000 hrs and 2200 hrs.

Collecting gears used were a Van Dorn water sampler for samples to determine physico-chemical parameters and a zooplankton net measuring 44 cm in diameter and a mesh size of 125μ.

Water samples for analysis of physico-chemical parameters were taken at two depths (5 m and 10 m). Until the fabrication of a Van Dorn sampler only subsurface samples of water were collected and analysed. Physico-chemical parameters were studied only once a day (at 1000 hrs) except dissolved oxygen which was studied at 1000 hrs and at 2200 hrs on the day of sampling.

Zooplankton samples were collected at 1000 hrs and at 2200 hrs and at every sampling three vertical hauls were made. To find out the vertical distribution of zooplankton three depth profiles were sampled; from March to September - 10 m to surface and 5 m to surface; in October and November - 10 m to surface and bottom to surface; from December to February - only from bottom to surface.

Zooplankton samples were analysed by conventional method. Data expressed are as organisms per cubic metre of water filtered. Average value from three samples for each depth profile was used in the estimation of density of population.

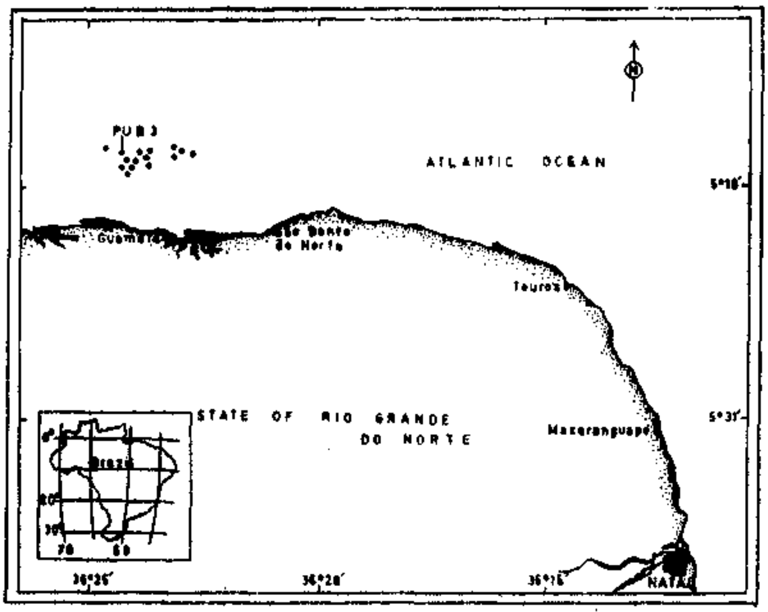

Fig. 1. The location of platform in the coastal waters of the State of Rio Grande do Norte, Brazil.

Results

Among the physico-chemical parameters, temperature, transparency and dissolved oxygen showed moderate seasonal variations as can be seen in Table 1. There was only marginal fluctuation in salinity and pH values recorded.

Zooplankton

Seasonal fluctuation in the number of organisms was clearly evident during the study (Fig. 2 a). The number of organisms was low from March to June (lowest value $11/m^3$ in April in the night). Two well defined peaks occurred in July and September, the latter larger ($1336/m^3$) during the day. There was another drop in number towards the end of September and again in October which was followed by another rise in number from November to February.

Throughout the year all night samples contained more organisms or rarely equal number (in May) of organisms except in September and February (Fig. 2 a).

Attempts were made to elucidate the vertical distribution pattern by sampling different depth profiles. Extrapoliting these data, it was observed that the upper 5 metres of water column contained most of the organisms, irrespective of the time of sampling (Fig. 2 b).

Copepoda

Since Copepoda is the dominant component in the zooplankton, the pattern of seasonal fluctuation was the same as that of zooplankton

TABLE 1. *Physico-chemical parameters*

	Hour	Depth (m)	18th Mar.	14th Apr.	12th May	9th June	7th July	4th Aug.	1st Sept.	29th Sept.	27th Oct.	24th Nov.	22nd Dec.	19th Jan.	23rd Feb.
			1987											1988	
Transparency (m) ..	1000		6.0	6.0	6.0	12.0	8.0	10.0	9.5	10.0	11.0	3.0	4.0	5.5	5.5
Temperature (°C) ..	1000	Subsurf.	30.0	29.5	29.0	29.0	—	—	—	—	—	—	—	—	—
		5	—	—	—	—	23.5	25.0	27.0	27.0	27.5	—	27.5	28.5	28.5
	1000	10	—	—	—	—	24.5	24.0	27.0	27.0	27.5	28.5	27.5	28.5	28.5
Hd ..	1000	Subsurf.	8.4	8.1	8.4	8.3	—	—	—	—	—	—	—	—	—
		5	—	—	—	—	8.6	8.0	9.3	9.2	9.1	8.5	8.2	9.0	8.3
	1000	10	—	—	—	—	8.4	7.9	9.0	9.2	9.5	8.4	8.8	9.0	8.4
Salinity (‰) ..	1000	Subsurf.	35.1	35.3	35.1	34.4	—	—	—	—	—	—	—	—	—
		5	—	—	—	—	35.0	34.9	38.0	37.0	36.5	36.0	36.0	35.4	37.4
	1000	10	—	—	—	—	35.0	34.9	38.0	37.0	37.0	36.0	36.5	35.0	37.1
Dissolved (O_2 ml/l) ..	1000	5	—	—	—	—	4.59	5.06	4.80	3.80	3.78	3.08	5.70	5.70	4.44
		10	—	—	—	—	4.34	4.10	4.82	3.62	3.98	2.72	4.50	5.40	4.48
		5	—	—	—	—	4.48	5.07	5.80	3.80	—	—	5.40	5.89	4.20
	2200	10	—	—	—	—	4.83	4.12	5.90	3.40	3.88	2.22	—	5.28	4.20

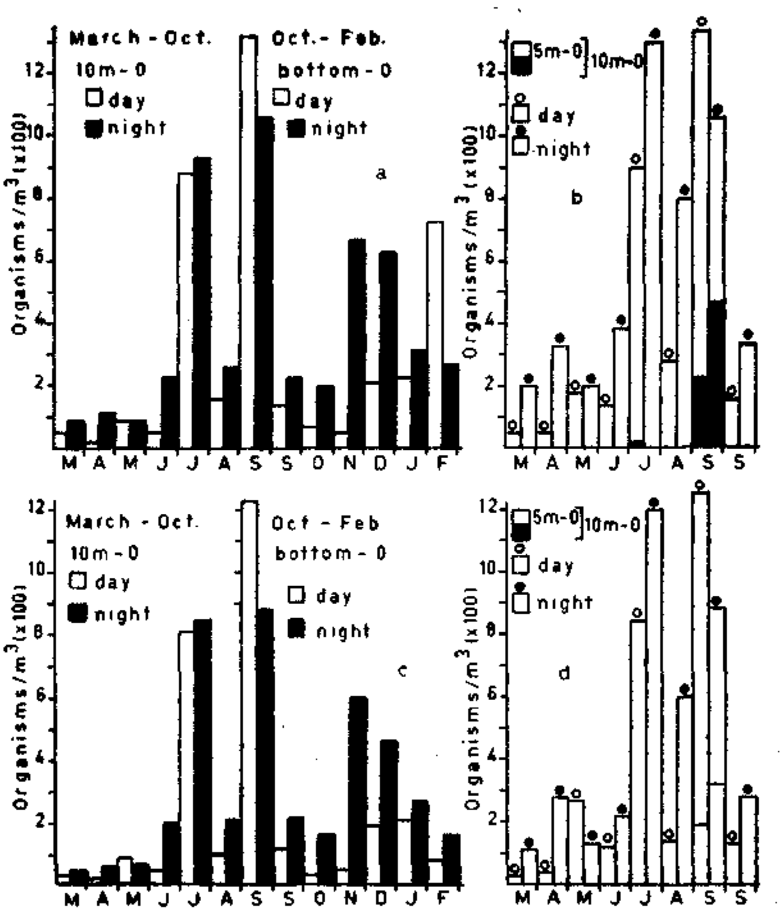

Fig. 2 a. Seasonal and diurnal fluctuations of zooplankton sampled from two depth profiles, b. Vertical distribution of zooplankton during the day and night, c. Seasonal and diurnal fluctuations of Copepoda sampled from two depth profiles and d. Vertical distribution of Copepoda during the day and night.

(Fig. 2 c). Lowest number of copepods occurred in April (10/m³) and largest number in early September (122/m³).

As a whole, night samples contained more copepods compared to those taken during the day, except in May and early September when the reverse was true (Fig. 2 c).

Fig. 2 d shows that most of the population of copepods remains in the upper 5 metre water column irrespective of the time of sampling.

Appendicularia

From Fig. 3 a it can be seen that three peaks occurred, first in April, second in the early part of September and third in December. Appendicularians, in general, were well represented during the period July—early part of September and again from November to Februrary. They almost disappeared in the day samples of March to June and again in late September and November.

They were normally more abundant in the

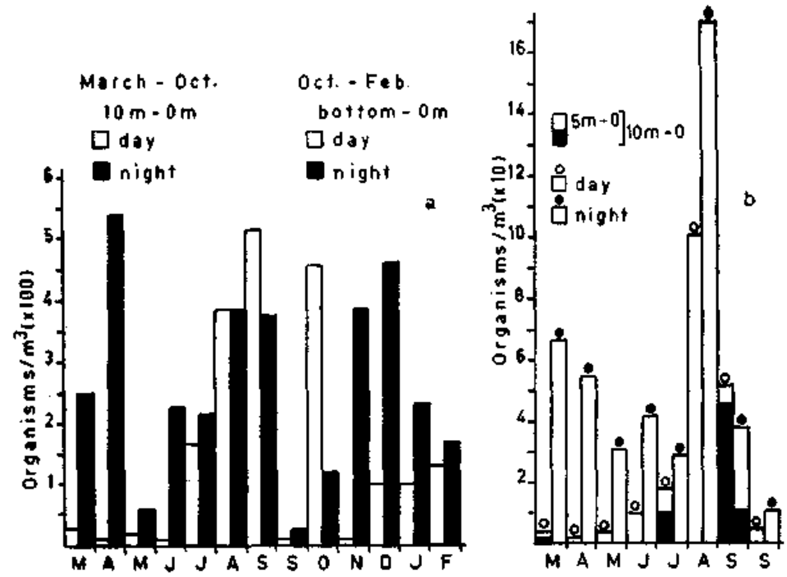

Fig. 3 a. Seasonal and diurnal fluctuations of Appendicularia sampled from two depth profiles and b. Vertical distribution of Appendicularia during the day and night.

night samples (Fig. 3 a), except in early September and October when they appeared in large number during the day.

It can be seen from Fig. 3 b that appendicularians were mostly confined to the upper layer except in September when there were few organisms in the upper layer.

Chaetognatha

The number of Chaetognatha was low except for a period between May and August when a distinct peak was observed in July (Fig. 4).

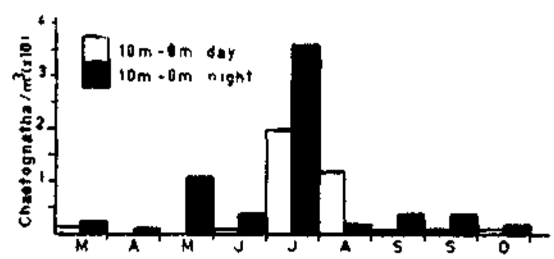

Fig. 4. Seasonal and diurnal fluctuation of Chaetognatha sampled from two depth profiles.

Invariably night samples had more Chaetognatha.

Discussion

In tropical waters seasonal fluctuation is not considered a significant feature compared to colder waters. Though this holds true in the case of oceanic region, seasonal fluctuation is rather well pronounced in tropical and subtropical estuaries (Reeve, 1964; Esnal *et al*.- 1985) and inshore waters (Wickstead, 1958) where the nutrient salts play a decisive role in the seasonal fluctuation.

The ecosystem studied which is situated in a tropical region within the continental shelf, does not present any profound seasonal changes in the physico-chemical parameters. As such, these parameters are not likely to influence much in the fluctuation in plankton production. The moderate fluctuation observed during this study is within the limits of tolerance of most of the tropical zooplankton. Therefore, the observed seasonal variation in zooplankton number is likely to be indirectly related to the fluctuation in the nutrient content which has a direct influence on phytoplankton production.

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REFERENCES

ALMEIDA PRADO, M. S. 1961. *Bol. Inst. Oceanogr. Sao Paulo*, **11** (2) : 31-56.

BJORNBERG, T. K. S. 1963. *Ibid.*, **8** (1) : 1-142.

——— AND L. FORNERIS 1955. *Contr. Avul. Inst. Oceanogr. Sao Paulo*, **1** : 1-68.

——— AND ——— 1956 a. *Bol. Inst. Oceanogr. Sao Paulo*, **5** (7) : 105-111.

——— AND ——— 1956 b. *Ibid.*, **7** : 113-116.

ESNAL, G. B., C. SANKARANKUTTY AND R. J. CASTRO 1985. *Physis (Buenos Aires), Secc.* A, **43** (105) : 65-71.

FORNERIS, L. 1957. *An. Acad. Bras. Cien.*, **29** : 273-284.

HOSOE, K. 1956. *Contr. Ayul. Inst. Oceanogr. Sao Paulo*, **3** : 1-9.

MEDEIROS, G. F. AND T. K. S. BJORNBERG 1978. *Ciencia e Cultura, Sao Paulo*, **30** (3) : 348-349.

PARANAGUA, M. N. 1966. *Trab. Inst. Oceanogr. Univ. Fed. Pe., Recife*, **5/6** (1) : 125-141.

REEVE, M. R. 1964. *Bull. Mar. Sci. Gulf & Carib.*, **14** : 103-121.

VANNUCCI, M. 1957. *Bol. Inst. Oceanogr. Sao Paulo*, **8** (1-2) : 23-109.

——— AND HOSOE 1952. *Ibid.*, **5** (3) : 1-30.

WICKSTEAD, J. H. 1958. *J. Cons. int. Explor. Mer.*, **23** : 340-353.