

ON DIURNAL VARIATIONS OF ZOOPLANKTON IN A TIDAL ESTUARY

ABSTRACT

A study of zooplankton of the estuary of river Potengi in Natal, Brazil was carried out from April 1979 to March 1980 to find out the seasonal change in the composition of zooplankton in relation to physicochemical parameters of the estuary. In September, a more intensive sampling was done to elucidate the diurnal variation of zooplankton.

Copepods, appendicularians and cirriped nauplii formed the major component of the zooplankton in the study area during low tide, particularly during night. Zoeae of Brachyura also formed an important component and they were conspicuous during low tide, day and night. Maximum number of chaetognaths was collected during high tide.

THE HIGHLY productive nature of estuaries resulting from nutrient discharge of rivers has generated considerable interest in recent decades. Distribution of zooplankton shows complicated pattern within an estuary mainly depending upon the variations of salinity as elucidated by Barlow (1955), Jeffries (1962 a, 1962 b, 1962 c, 1964, 1967), Lance (1963) and Neale and Bayly (1974).

Zooplankton investigations in tidal estuaries of Brazil are limited to those of Tundisi (1970) and Paranaguá *et al.* (1979). Present study is the first attempt to investigate the diurnal variations in one of the estuaries in the northeast of Brazil.

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Material and Methods

A station close to the bar mouth of the river Potengi (Lat. 5°30'46"S, Long. 35°30' 12.5"W) was chosen for sampling, utilizing a floating platform of a restaurant. In September 1979, an intensive sampling was carried out at two-hour interval to cover a twenty four hour cycle. Data on physicochemical parameters near the surface and near the bottom (3 to 4 metres)

were collected at six hour interval, excepting salinity which was recorded twice, once during low tide and once during high tide. Five plankton samples were collected using a net of 48 cm diameter. A weight of 7.5 Kg was tied to the cod end of the net and vertical hauls were made from three metres to surface.

value being slightly lower than that near the bottom. Dissolved oxygen was higher near the surface, particularly during mid-day and late evening.

Zooplankton (Fig. 1): The principal components of zooplankton were Copepoda, nau-

TABLE 1. *Physico-chemical parameters (September 1979)*

Time of sampling		1300 hrs Low tide	1900 hrs High tide	0100 hrs Low tide	0700 hrs. High tide
Dissolved Oxygen (ml/l)	Surface	4.04	4.32	2.62	3.20
	Bottom	3.59	4.02	2.17	2.88
Temperature (°C)	Surface	27.9	27.0	27.0	27.0
	Bottom	27.2	26.9	27.0	26.7
Salinity (‰)	Surface	34.23	35.17	—	—
	Bottom	34.33	35.67	—	—
pH	Surface	8.35	8.5	8.3	8.5
	Bottom	8.35	8.5	8.3	8.5

TABLE 2. *Zooplankton components (Organisms/m³)*

Zooplankton	Time of sampling											
	1300	1500	1700	1900	2100	2300	0100	0300	0500	0700	0900	1100
<i>Major components</i>												
Copepoda	168	386	193	241	260	724	1319	1309	276	193	204	297
Cirripedia nauplii	103	171	11	—	4	166	112	1657	225	17	18	731
Brachyura zoeae	250	94	15	15	90	151	50	186	46	7	20	201
Lucifer	—	—	2	11	61	7	2	2	59	13	2	2
Chaetognatha	—	11	42	46	79	28	15	4	20	18	18	7
<i>Minor components</i>												
Medusae	2	2	3	P	2	3	3	3	P	3	2	3
Siphonophora	—	—	2	2	2	2	3	3	—	2	P	2
Polychaeta	5	P	P	P	P	2	P	12	2	2	—	P
Ophiopluteus larvae	P	—	2	P	2	—	P	2	7	5	2	2
Amphipoda	14	116	49	14	12	3	10	3	3	19	12	7
Caridea larvae	2	10	5	39	106	119	63	153	29	10	9	17
Fish larvae	P	P	—	3	2	3	3	2	2	—	P	2
Other zooplankters	7	12	9	19	39	65	55	141	17	11	21	50
Total	571	841	340	397	670	1588	2044	3656	693	304	312	1330

P represents number of organisms below one per cubic metre

Results

Physico-chemical parameters (Table 1): Temperature fluctuations were small, bottom temperature was lower than surface temperature. pH values near the surface and bottom varied only between low and high tides. Salinity was always higher during high tide, the surface

plii of Cirripedia, Appendicularia, zoeae of Brachyura, Chaetognatha (*Sagitta tenuis* Conant) and *Lucifer* spp. Larvae of Caridea and Amphipoda together with others (Table 2) were also encountered in the samples.

Largest number of zooplankton was collected at 0300 hours. Two smaller peaks occurred

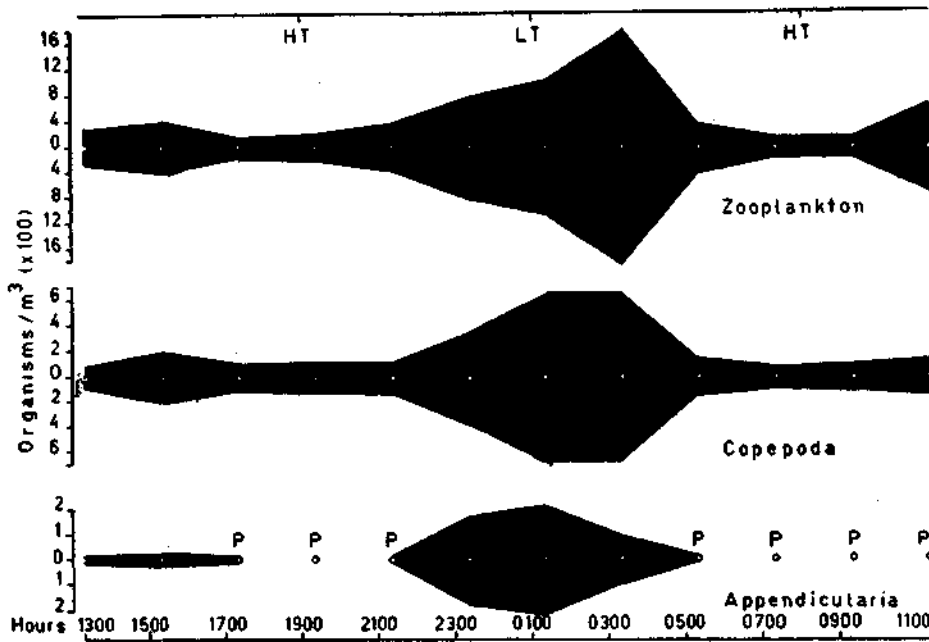


Fig. 1. Diurnal variations in abundance of zooplankton, Copepoda and Appendicularia. HT represents high tide, LT low tide and P number of organisms below one per cubic metre.

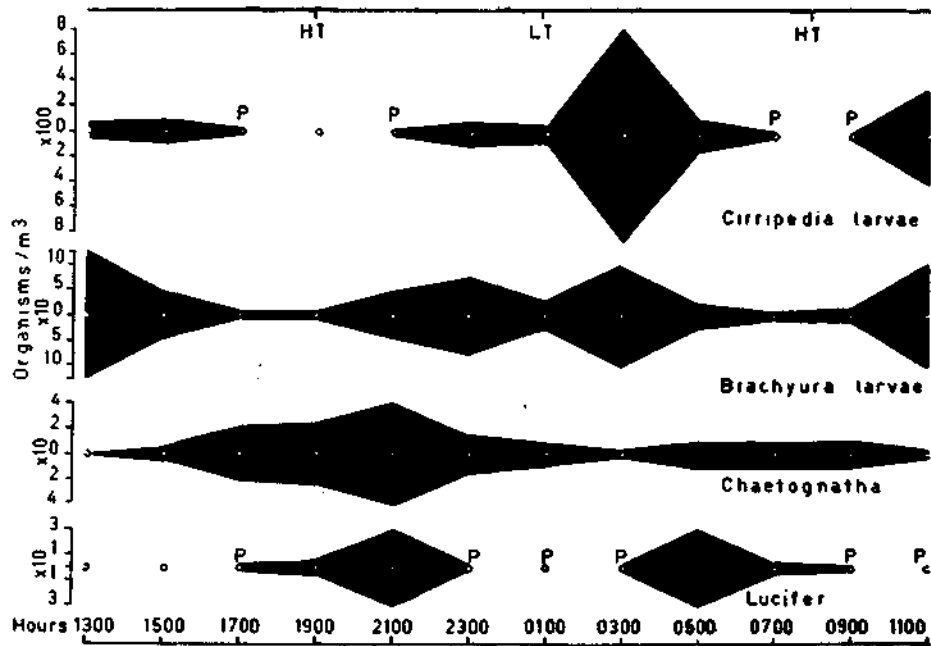


Fig. 2. Diurnal variations in abundance of Cirripedia larva, Brachyura zoeae, Chaetognatha and Lucifer. HT represents high tide, LT low tide and P number of organisms below one per cubic metre.

at 1300 hours and 1100 hours. Zooplankton, in general, was more abundant during low tide, more conspicuously so during midnight (2300 to 0300 hours).

The major concentration of Copepoda (Fig. 1) was observed during the period 2300 to 0300 hours. During the rest of the period there was a fairly even number of them in the samples. Appendicularia (Fig. 1) were notably abundant during the period 2300 to 0300 hours. Two major peaks of abundance of nauplii of Cirripedia (Fig. 2) were observed during the day, the largest peak at 0300 hours and a smaller peak at 1100 hours. Cirripede larvae were absent during the period 1700 to 2100 hours. Four peaks of abundance of zoeae of Brachyura (Fig. 2) were noticed during the day (1300, 2300, 0300 and 1100 hours). During the rest of the day the number of zoeae was low. No Chaetognatha (Fig. 2) was collected at 1300 hours, while their number increased steadily from 1500 to 2100 hours, followed by a decline in number till 0300 hours. Chaetognatha was represented in the samples from 0500 to 0900 hours. *Lucifer* (Fig. 2), though appeared in few numbers, was generally more common at 2100 hours and 0500 hours.

*Departamento de Oceanografia e Limnologia,
Universidade Federal do Rio Grande do Norte,
Natal RN - 59000, Brazil.*

Discussion

From above, it can be summarised that zooplankton was higher during low tide, particularly during the night; the dominant components being Copepoda, Appendicularia, nauplii of Cirripedia and zoeae of Brachyura. Chaetognatha, on the other hand, were abundant during high tide and more abundant during the night than day.

Among the physico-chemical parameters which are known to influence the abundance of zooplankton, tide and illumination are responsible for the diurnal variations in the abundance of zooplankton in a tidal estuary studied here. Illumination influenced most of the dominant groups represented in zooplankton except zoeae of Brachyura which were equally abundant during the day and night. All other groups (Copepoda, nauplii of Cirripedia, Appendicularia and Chaetognatha) were more abundant during the night. The influence of tide on the abundance of zoeae of Brachyura was pronounced showing a peak while the tide was low, on the other hand its influence on other groups (Copepoda, nauplii of Cirripedia and Appendicularia) was limited. In the case of Chaetognatha and *Lucifer* larger number was seen during high tide.

C. SANKARANKUTTY
G. F. DE MEDEIROS
N. DE Q. SANTOS

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