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THE BENTHIC FAUNA OF LAKE BUROLLUS
1 - COMMUNITY COMPOSITION AND DISTRIBUTION OF THE TOTAL FAUNA

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ABSTRACT

Quantitative estimation of benthic macro fauna was carried out monthly in Lake Burollus during the period January, 1978 - December 1979. The community comprised eleven species and was dominated by **Chaetogaster limnaei, Corophium volutator, Gammarus lacustris, Mesanthura** sp. and **Corbicula consobrina.** The highest biomass of benthos appeared in the western sector of the Lake due to the increased weights of the bivalve **Corbicula consobrina** and it decreased gradually eastwards. Regarding the seasonal variations, the maximum persistence of benthos in the eastern and middle sectors was in spring of 1978, while this was shifted to the summer in the western Lake. The average annual values of the total bottom fauna amounted to 440 Organisms/m^2 with 13.7 gm fresh Wt/m^2 in 1978, decreased to 310 Organisms/m^2 and 6.1 gm fresh Wt/m^2 in 1979.

INTRODUCTION

Lake Burollus is a shallow slightly brackish water lake, situated at the north of the Nile Delta (Egypt), along the Mediterranean coast at longitudes 30° 30/ and 31° 10/ E and latitude 31° 35/ N. It extends for about 70 Km, with a varying width between 6 and 16 Km and a total area of about 50,000 hectars.

The Lake receives most of its water from five main drains as shown in Fig (1). It opens into the Rosetta Estuary at its western extremity through Brimbal Canal. It is also connected to the Mediterranean Sea at its north eastern side through a narrow opening referred to as Boughaz El-Borg. The amount of the drain water discharged annually into the Lake fluctuates from one year to the other and it averages about 2.5 billion cubic meters per year. The surplus water flows constantly into the Sea through Boughaz El-Borg. Sea water may also enter the Lake during winter gales which are usually predominated by strong north wind.

The nature of the bottom sediments differs within the different regions. Thus, the sediments at the eastern and western sectors of the Lake as well as the southern margins are usually silty clay mixed with shell fragments. In the middle Lake it is either clayey sand or sandy silty clay.

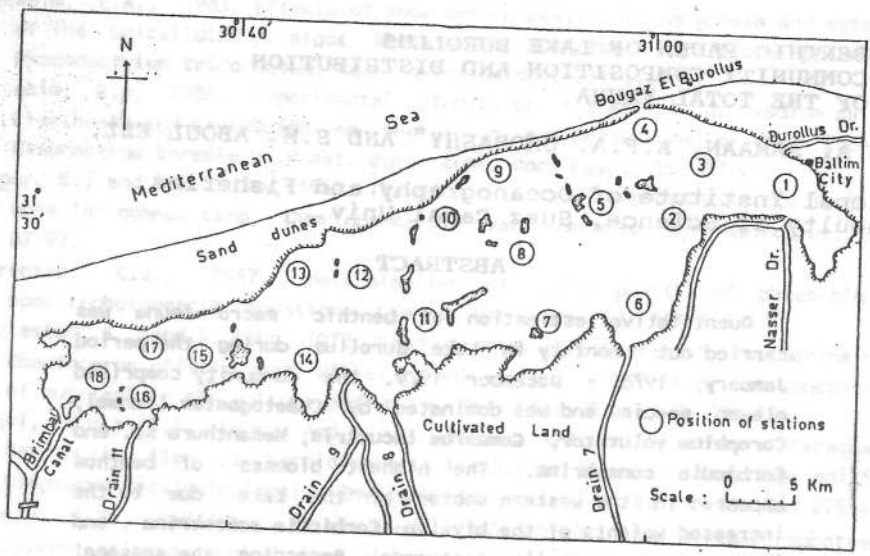

FIG. 1

Morphometry of Lake Burollus and position of stations.

Many islets are scattered in the Lake and these create semi-isolated basins named by fishermen as Berka or Houd. Due to the shallowness of the Lake the whole area is related to the literal zone where phanerogamic plants are widely distributed particularly at the eastern Lake as well as at the Lake margins (Samaan et al., 1988)

The composition of benthic fauna has long been considered as a good indicator of water quality because, unlike planktonic organisms, they form relatively stable communities in the sediments which integrate changes over long-time intervals, and reflect characteristics of both sediments and the upper water layer. However, the biologists have encountered many problems in obtaining base line information about the natural communities and comparing this accurately with altered associations because of the lack of good standardized sampling and sorting methods (Cook and Johnson, 1974). Investigations of benthos in the Egyptian Delta lakes are still few. These were mainly confined to that recorded in Nozha Hydrodrome (Elster and Jensen, 1960), Lake Mariut (Samaan and Aleem, 1972) Lake Edku (Samaan, 1977) and Lake Menzalah (Guerguess, 1979). The present study deals with quantitative estimation of bottom macro fauna in Lake Burollus.

MATERIAL AND METHODS

The bottom fauna was hauled by using a modified Ekman bottom sampler. Two dredges were taken at each station which represent an area equivalent to 0.06 m^2 of the upper layer of bottom sediments containing benthos. The samples were

then washed directly in the field through a small hand net of bolting silk with 23 mesh/cm^2 and preserved in polyethelene jars after adding 10% formalin solution. The samples were washed again thoroughly in the laboratory with the same hand net to get rid of any silt that may remain within them. Sorting was carried by taking small portions of the sample under estimation in a petri dish. The animals were separated into groups and each group was counted and weighed separately after being left for five minutes on a filter paper to get rid of any external moisture.

Eighteen stations were selected as representing the different parts of the Lake (Fig.1). These were further grouped into three main sectors namely; the eastern Lake (stations 1-6), the middle Lake (stations 7-12) and the western Lake (stations 13-18).

Sampling of benthic fauna was carried out monthly at the different stations during the period from January, 1978 to December, 1979.

RESULTS

1- The benthic community

The benthic macrofauna of Lake Burollus comprised eleven species belonging to nine orders within three phyla as shown in the following list:-

Phylum Annelid
Class Clitellata
Order Oligochaeta
Family Naididae
Chaetogaster limnaei K. Von Baer

Class Polychaeta
Order Erranta
Family Nereiidae
Nereis limnicola (Johnson)

Phylum Arthropoda
Class Crustacea
Order Mysidacea
Family Mysidae
Mysis relicta (Loven)

Order Isopoda
Family Anthuridae
Mesanthura Sp.

Order Amphipoda
Family Gammaridae
Gammarus lacustris (Fabricius)
Corophium volutator (Pallas)

Class Insecta
Order Diptera
Family (Chironomidae) Tendipedidae
Tendipes (chironomus) tentans (Meigen)

Phylum Mollusca
Class Pelecypoda
Order Heterodonta
Family Corbiculidae
Corbicula consobrina (Cailliaud)

Order Cerastoderma
Family Cardiidae
Cerastoderma (Cardium) edule (L.)

Order Mesogastropoda
Family Melaniidae
Melanoides tuberculata (Muller)
Neritina nilotica (Reeve)

Five species predominated the bottom community namely; the oligochaete Chaetogaster limnaei, the amphipods Corophium volutator and Gammarus lacustris, the isopod Mesanthura sp. and the bivalve Corbicula consobrina.

2- Distribution and seasonal variations

Generally speaking, the distribution of the total benthos in Lake Burollus was subjected to pronounced variations within the two successive years of investigation (Fig. 2). Thus, in 1978, the highest numbers were observed around the southern and northern margins of the middle sector due to the increased numbers of Corophium volutator and less so to Corbicula consobrina, Gammarus lacustris and Chaetogaster limnaei. Other increase was also noticed in the western Lake near the outlet of Drain 11 with a main component of Chaetogaster limnaei. The eastern Lake sustained the lowest standing stock except at the surroundings of Drain 7 and the Boughaz region which harboured considerable numbers of Gammarus lacustris.

During 1979, the picture was much different as the highest density of benthos appeared in the western Lake between Drains 9 and 11 particularly due to the increased numbers of Chaetogaster. On the other hand, the total numbers of benthos in the middle sector dropped to lower values and this was accompanied by decreased counts of Corophium . The eastern Lake remained poor, showing further reduction in the numbers of Gammarus. The average annual values of the total benthic fauna in the Lake amounted respectively 440 and 310 organisms/m^2 during 1978 and 1979..

Concerning the total biomass, the heaviest bottom specimens were usually the molluscs Corbicula consobrina. Thus, whenever these animals increased quantitatively, there was always an increase in the benthos biomass. This relation

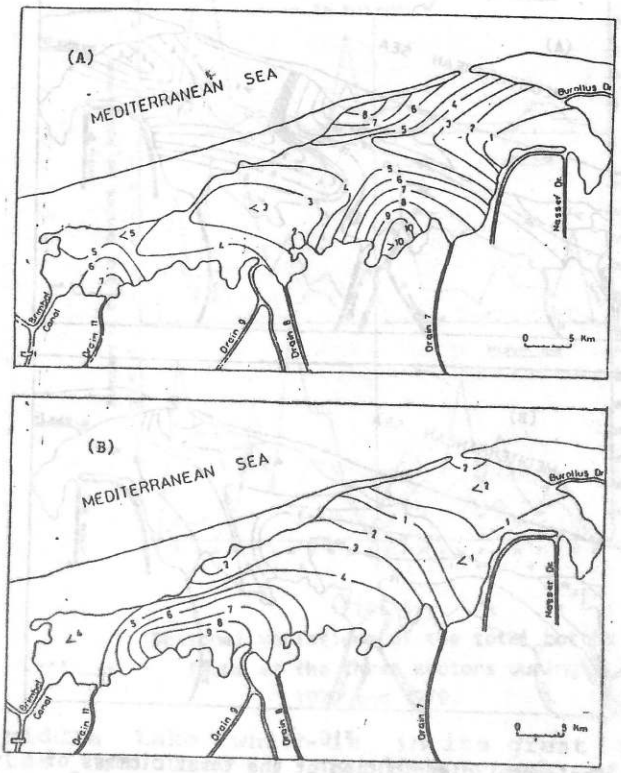

FIG. 2

Horizontal distribution of the total bottom faunin Lake Burollus (hundred organisms/m^2).

(A): Average of 1978. (B): Average of 1979.

was more clear in the western Lake which greatly exceeded the other two sectors in its total benthos biomass. The average annual biomass of benthos in the Lake amounted 13.7 gm fresh wt/m^2 during 1978 decreased to 6.1 gm fresh wt/m^2 in 1979. Such decrease is mainly attributed to the drop in the fresh weights of C. consobrina although their numbers increased slightly in the last mentioned year,(Fig.3).

Regarding the seasonal variations, the bottom fauna in the eastern sector showed a major peak of abundance during March-April 1978 and was dominated by Gammarus and to a less extent by Nereis and a smaller one in November, also due to Gammarus (Fig. 4). Its density remained low throughout 1979.

The middle sector harboured the highest counts of benthos in April and May, 1978, with the predominance of Corophium. Two other smaller peaks were recorded there in February and November, 1979 as produced respectively by Corophium and Corbicula.

In the western sector, the maximum persistence of benthos appeared between August and October, 1978 and consisted mostly of Chaetogaster and in may, 1979 which comprised both Chaetogaster and Mesanthura.

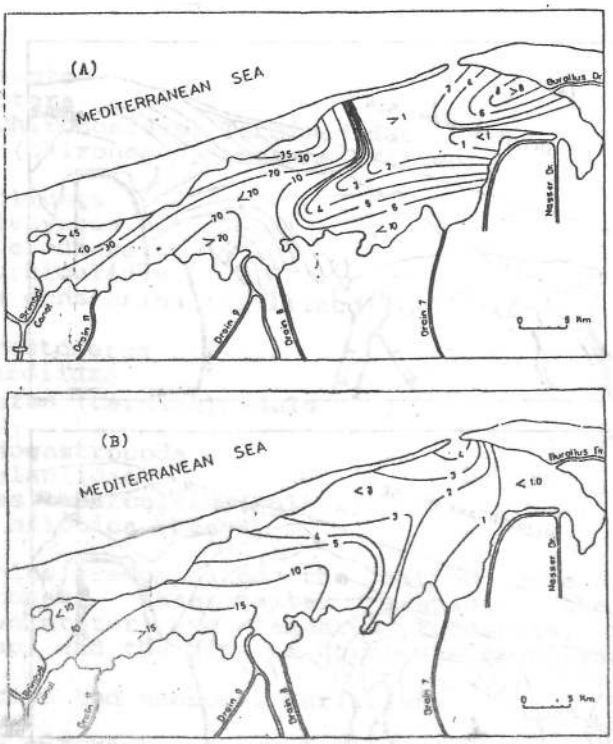

FIG. 3
Horizontal distribution of the total biomass of bottom fauna in Lake Burollus (gm fresh wt/m^2).
(A): Average of 1978. (B): Average of 1979.

DISCUSSION

The distribution of benthic fauna in the three sectors of Lake Burollus was subjected to pronounced seasonal as well as annual variations. The eastern sector which is mostly covered with the hydrophyte Potamogeton pectinatus sustained the lowest standing stock of benthos. This agrees with the observations previously recorded by Samaan and Aleem (1972) in Lake Mariut and Samaan (1977) in Lake Edku, where the plant belt harboured a poor standing stock of bottom fauna. The main bottom dwellers in this sector were Nereis limnicola, Gammarus lacustris and Tendipes (Chironomus) larvae. The two former species are considered as euryhaline forms and showed their maximum persistence around the Boughaz region (lake-sea connection). Chironomus larvae were mostly confined to the Potamogetom plant belt and are considered as good indicator of oxygen reduction at the bottom. The average annual counts of benthos in the eastern sector reached 237 organisms/m^2 with a biomass of 3.4 gm fresh wt/m^2 during 1978. These values dropped to 112 organisms/m^2 and 1.6 gm fresh wt/m^2 in 1979.

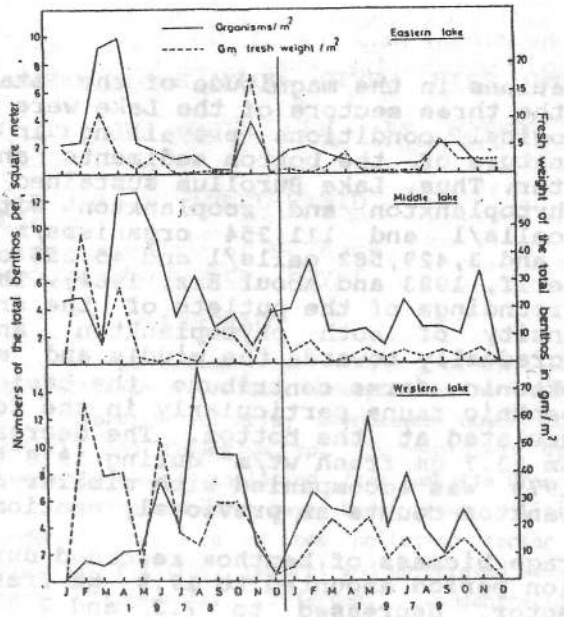

FIG. 4
Seasonal variations of the total bottom fauna at the three sectors during 1979 and 1979.

The middle Lake which is in its great part devoid of hydrophytes harboured a standing stock of benthos that consisted mainly of Chaetogaster limnaei, Corophium volutator, Corbicula consobrina and Mesanthura sp.

Corbicula formed the major bulk of benthos biomass there, while Chaetogaster was numerically the most abundant bottom dweller. Corophium appeared mainly in areas devoid of hydrophytes. Other species of infrequent distribution in the middle sector comprised Nereis limnicola, Melanoides tuberculata and Mysis relicta.

The standing crop of benthos in the middle Lake averaged 548 organisms/m^2 with 11.2 gm fresh wt/m^2 during 1978. It decreased to 321 organisms/^{2} but its average biomass increased slightly to 13.3 gm fresh wt/m^2 in 1979.

The western sector contributed the highest biomass, mostly due to Corbicula consobrina. On the other hand, the highest counts recorded there , were attributed to Chaetogaster limnaei followed respectively by Corbicula consobrina and Mesanthura sp., while Corophium volutator, Gammarus lacustris and Mysis relicta were rarely observed. The total counts of benthos in this sector amounted to 479 organisms/m^2 with 26.5 gm fresh wt/^{2} during 1978 and 498 organisms/m^2 weighed 13.3 gm fresh wt/m^2 in 1979.

The variations in the magnitude of the standing stock of benthos in the three sectors of the Lake were mostly related to the ecological conditions prevailing in these sectors, beside the nature of the bottom sediments and fertility of the Lake water. Thus, Lake Burollus sustained high densities of both phytoplankton and zooplankton with average of 2,745,364 cells/l and 111,354 organisms/m^3 respectively during 1978 and 3,429,582 cells/l and 45,255 organisms/m^3 in 1979 (El-Sherif, 1983 and Aboul Ezz, 1984). The western Lake and the surroundings of the outlets of the drains harboured highest density of both phytoplankton and zooplankton decreasing gradually towards the middle and eastern sector. These planktonic forms contribute the basic tool of food items for benthic fauna particularly in the form of organic debris accumulated at the bottom. The decreased biomass of benthos from 13.7 gm fresh wt/m^2 during 1978 to 6.1 gm fresh wt/m^2 in 1979 was accompanied with similar decline in the total zooplankton counts as previously mentioned.

The average biomass of benthos recorded during the whole investigation period amounted to 19.9 gm fresh wt/m^2 in the western sector, decreased to 7.3 and 2.5 gm fresh wt/m^2 respectively in the middle and eastern sectors. The annual biomass for the whole Lake averaged 9.9 gm fresh wt/m^2. This value is comparable to that previously recorded for benthic fauna in Lake Edku which reached 10.4 gm fresh wt/m^2 (Samaan, 1977) but slightly higher than that of the Nozha Hydrodrome which averaged 6.3 gm fresh wt/m^2 (Elster and Jensen, 1960). However, it was lower than the records of bottom fauna in the highly productive Lake Mariut which sustained an average annual of 76.6 gm fresh wt/m^2 (Samaan and Aleem, 1972).

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