Preliminary study on phytoplankton-zooplankton relationship in Burollus Lagoon (Egypt)

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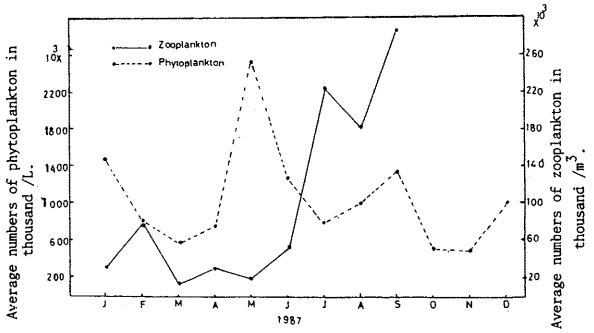
Lake Burollus is a shallow brackish water lagoon with an area of about 50,000 hectar, lying at the north of the Nile Delta, along the Mediterranean coast of Egypt. The present work deals with quantitative estimation of phytoplankton and zooplankton and their relationship as they represent the first and second trophic level in the food cycle respectively in the lagoon.

Estimation of the standing crop of phytoplankton was carried out monthly during year, 1987 from twelve stations representing the different habitats of the lagoon by using the sedimentation technique where the phytoplankton was calculated as their total number per litre. From the same stations the zooplankton samples were collected by filteration 250 L of water with standerd plankton net and calculated as their total number per cubic meter.

The phytoplankton community is mainly represented in Lake Burollus by members of Bacillariophyceae and Chlorophyceae which constituted about 49.11 % and 31.66 % by number of the total phytoplankton respectively. While Cyanophyceae appeared in small numbers (1.73 %). Other forms of Euglenophyceae and Desmokontae persisted also as rare forms but the appearance of one species of Flagellates with highest density at the eastern lake during May, raised the other forms to 17.5 % of the total phytoplankton. The average annual value of the total phytoplankton in the lake amounted to 1,039,641 U/L.

The zooplankton population in the lake was represented mainly by Cladocera, Rotifera and Copepoda, they constitued about 33.8 %, 26.5 % and 25.8 % by number of the total zooplankton respectively. Other groups of less frequency comprised Protozoa, Ostracoda, Malacostraca, free living nematodes and insects larvae were also recorded (13.9 %). The average annual of zooplankton in the lake reached 100,972 organisms/m^3.

The highest standing crop of both phytoplankton and zooplankton appeared in the western sector of the lagoon which reflects its eutrophic characters.



(Fig. 1) : Seasonal variations of the standing crop of phytoplankton in thousand per Litre and zooplankton population in thousand per cubic meter.

The variations of the phytoplankton - zooplankton standing crop are given in (Fig. 1). The highest numbers of phytoplankton were always accompanied with a low count in zooplankton; with exception of month of September. The species composition of the community plays an important role in the grazing process. As example the high count of Rotifera and Cladocera which are herbivorous was accompanied with low count of phytoplankton during July. On the contrary, during September the simultaneous increase of both phytoplankton and zooplankton can be attributed to the increased number of Cyclopoida which are mostly considered as carnivorous organisms. (Hartig, et al. 1982).

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Plankton of Lake Maryut Outlet (West from Alexandria)

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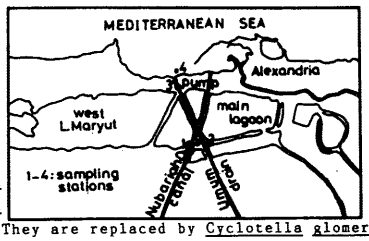
The eutrophic brackish water lagoon (Lake Maryut) is continuously pumped out to the sea through the outlet of Umum drain (Max pumping station, St. 3). The waters of the 2 canals crossing this lagoon (Umum drain and Nubariah canal) mix with the lagoon waters before reaching the sea.

In order to investigate the effect of mixing of lagoon waters with the drain and canal waters, samples have been regularly collected from two localities, immediately south of the lagoon (Unmixed drain st. 2 and canal st. 1) and from the outlet of the drain (st. 3) and adjacent inshore sea water (st. 4) (see map).

Comparison of the conditions in sts. 1-2 & 3 shows drastic changes caused by the mixing of agricultural drainage waters with the lagoon waters. The changes concern both the characteristics of the waters and the phyto and zooplankton associations. Mixing increases the S‰ only slightly (3.5-3.3 to 4.9 ‰). The pH shows little variation (7.8 to 7.7). The relative saturation in O_2 on the whole is low in the agricultural drainage waters (54.5 - 59.2 %). But mixing with the lagoon waters with their high load of organic matter further decreases the O_2 content to comparatively very low values (av. 36 %). The adjacent inshore sea waters show a recovery in the O_2 content (av. 68.1 %). The phosphate content rises to a very high value. In the agricultural drainage before mixing, it ranges from 0.25 to 3.2 $\mu M l^{-1}$. While at st. 3, the range was 2.2 to 6.8 $\mu M l^{-1}$. It is likely that, other nutrients become also enriched (see table).

The effects of eutrophication are reflected on the plankton biomass and composition. The composition is typically brackish, the number of species increases (from 26, st. 1, to 35 st. 3, for phytoplankton and from 35, st. 1, to 45, st. 3, for zooplankton). The phytoplankton increases from 19000 cell l^{-1} to 210000 and the zooplankton from 7000 to 90000 org.m^{-3}, Nitzschia spp., Biddulphia sp. and Bacillaria paradoxa are dominant at sts. 1&2. They are replaced by Cyclotella glomerata, Euglena spp. and Spirulina sp. Rotifers dominate the zooplankton at st. 3 (Brachionus calyciflorus, followed by B. angularis, B. urceolaris, B. plicatilis and Filinia longiseta). In the agricultural drainage waters, the dominance is shared between the same rotifer species and cladocera (Bosmina longirostris and Moina micrura) and copepoda (Mesocylops leuckarti).



The brackish plankton associations extend sea-ward to the middle of Max Bay. Beyond this area, a change is observed and Tintinnids are dominant.

Monthly average S ‰, pH, O_2 %, PO_4/P ($\mu M l^{-1}$) Phytoplankton (cells l^{-1}), Zooplankton (organisms m^{-3}.) and No. of phytoplankton and zooplankton species in the different localities (Average of 16 months).

	st. 1	st. 2	st. 3	st. 4
Av. S ‰	3.5	3.34	4.92	10.47
Av. pH	7.8	7.7	7.7	7.8
Av. Dissolved O_2 %	54.5	59.18	36	68.13
Av. PO_4/P $\mu M l^{-1}$	1.4	1.77	4.65	3.98
Av. phytoplankton cells l^{-1}	19000	1500	210000	222000
Av. zooplankton org. m^{-3}	7000	2400	90000	55000
No. of phytoplankton species	26	30	35	41
No. of zooplankton species	35	28	45	36