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DISTRIBUTION OF HYDROPHYTES IN LAKE BUROLLUS, EGYPT

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ABSTRACT

Lake Burollus is characterized by having an extensive growth of hydrophytes, particularly along its southern shores beside the outlets of land drains as well as in the eastern lake. The submerged plants were mainly represented by **Potamogeton pectinatus** L. while **Potamogeton crispus** L. and **Ceratophyllum demersum** L. were less frequent. **Najas armata** Lind. F. was of very limited distribution. The emergent hydrophytes included **Phragmites communis** (L.) Trin and **Typha australis** Schumt and Thow. These plants grow well at the lake margins and around the islets. The floating plants **Eichornia crassipes** (Mart.) Solms-laub., **Lemna gibba** L. and **Spirodela polyrrhiza** (L.) Schleid appeared also beside the outlets of the land drains where their growth is favoured by the flowing fresh water.

The growth cycle of **P. pectinatus** in the lake showed two growth periods during spring and in late summer with average standing crops of 4.2 and 4.8 Kg fresh wt./m^2, respectively.

The dense growth of submerged and floating plants in the lake harbours water fowls which utilize them as food. It is recommended to control the progressive extension of **Phragmites communis** in order to restrict its growth to limited areas.

INTRODUCTION

Lake Burollus is a shallow brackish water lake lying at the North of the Nile Delta along the Mediterranean coast of Egypt. Its total area is about 50,000 hectar and the average water depth is 115 cm. The Lake receives most of its water at its southern margins from five main drains collecting the drainage water of the surrounding cultivated land of Kafr El-Shaikh Province. Brimbal Canal connects the Lake with Rashid Estuary. Smaller amounts of water also flow into the north eastern shores through Burollus Drain (Fig. 1). The annual discharge of these drains into the Lake fluctuates from one year to the other, with an average of 2,500 million cubic meter per year. The surplus water entering the Lake flows into the Sea through the Lake-sea connection referred to as the Boughaz.

The average temperature of the Lake water fluctuates between 12.4°C in winter (December-January) and 30.0°C during the summer (July). The Lake water is slightly brackish, with chlorosity values ranging between 0.33 and 2.4 gm Cl/l. The water is usually more fresh along the southern shore, beside the outlets of land drains. The Lake water lies on the alkaline side, where the pH fluctuates between 7.6 and 8.3. The present paper deals with the distribution of hydrophytes in such a shallow brackish water lake.

MATERIAL AND METHODS

A general survey of the total hydrophytes growing in Lake Burollus was carried out during the years 1978-1979. Quantitative estimation of the standing crop of **Potamogeton pectinatus** L. was also estimated monthly from June, 1978 to November, 1979. This was made using a metallic cylinder (120 cm high and 63 cm diameter) open at both ends as designed by Aleem and Samaan (1969, I). The cylinder was immersed vertically into the water until it settled on the Lake bottom. A metallic fork was introduced into the cylinder to detach the plants from the bottom. The collected samples were then washed, allowed to drain for a few minutes, then weighed directly. Sampling was repeated several times at random within ten different sites of the growing hydrophytes. The average biomass of **Potamogeton** was then calculated in kilograms fresh weight per square meter.

RESULTS

Distribution of the different hydrophytes in the lake :

The hydrophytes in Lake Burollus were represented mainly by **Potamogeton pectinatus** L., which constituted over 85 % of the submerged plants. Its distribution was confined to the southern margins of the Lake as well as in the eastern sector and around the islets as shown in figure 1. Scattered patches of **Potamogeton cripus** L., appeared also along the southern side beside the land drains . **Ceratophyllum demersum** L. was recorded around the outlets of drains 8 and 9, while **Najas armata** Lind. F. was restricted in front of Drain 7. The chlorosity of water in these drains were mostly less than 1.0 gm Cl/l.

The emergent plants included **Phragmites communis** (L.) Trin. and **Typha australis** Schumt and Thow. These two plants grow mostly at the Lake margins and around the islets down to a depth of about 50 cm, similar to observation previously recorded by Aleem and Samaan (1969, II) in Lake Mariut. **Phragmites** grows also in extensive patches at some distance from the shore line.

The floating plants **Eichornia crassipes** (Mart.) Solms-Laub., **Lemna gibba** L. and **Spirodela polyrrhiza** (L.) Schleid. appeared mainly beside land drains, particularly around the outlets of Drains 8 , 9 and 11 as well as Brimbal Canal where their growth is favoured by the flowing fresh water.

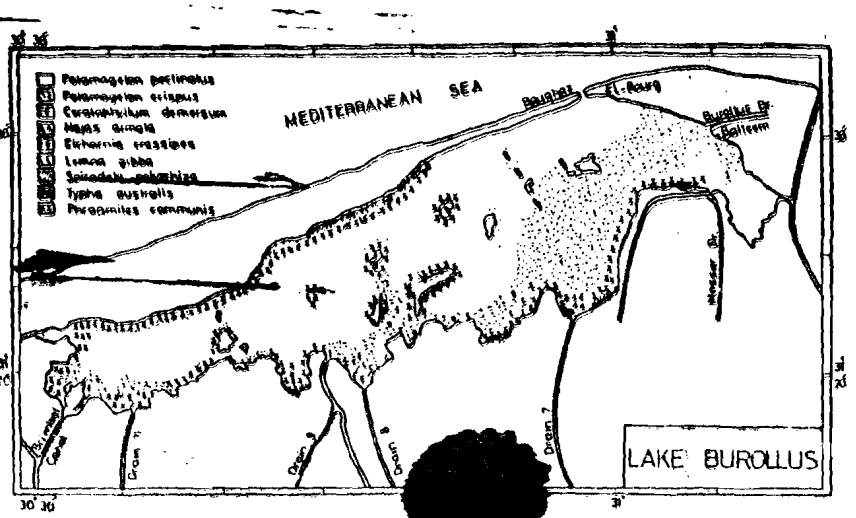

Fig
Distribution of hydrophytes in Lake Burollus.

Seasonal variations of the standing crop of Potamogeton pectinatus:

The growth cycle of P. pectinatus showed [redacted]h periods during the spring and by the end of the summer respectively. The average length of the fully grown plant in Lake Burollus reached about 130 cm., whereas the average depth of water was 100 cm This is in confirmation with the findings of Samaan (1974) that the length of the plant slightly exceeds the depth of water in which it grows.

As illustrated in figure 2 the plant growth started in March, 1979, showing a gradual increase in its biomass to reached an average maximum of 4.2 kg fresh wt/m^2 in May. A decline was noticed in the density of Potamogeton in early summer, succeeded by a second growth period in September with an average of 4.8 kg fresh wt./m^2. This latter peak was recorded in October of the preceeding year. A small increase was also observed in December, 1978 due to a dense growth of epiphytes on the plants.

The effect of the unfavourable season on the distribution of P. pectinatus varies from one year to the other. Thus, during certain years, a considerable portion of Potamogeton can survive the winter while in the others, most of the plants are ditached and drifted ashore. Such changes appear to be controlled mainly by water temperature and wind action. Zaki (1960) found that P. pectinatus in the Nouzha Hydrodrome was uprooted from areas exposed to wind velocity exceeding 16 knots. In the present investigation most of the plants died and sedimented on the Lake bottom during the winter and they appeared to be covered with a thick coat of bacteria and algae.

A parallel increase in the hydrogen ion concentration was observed during the growth periods of Potamogeton which reflects the photosynthetic activity of the plant.

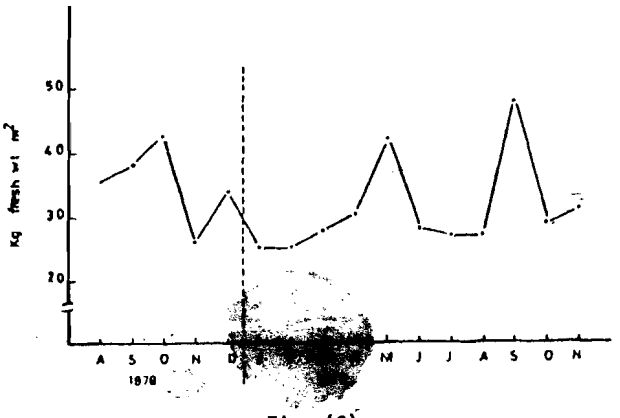

Fig. (2)
Monthly variations in the average biomass of **Potamogaton pectinatus** in kg. fresh wt./m^2.

DISCUSSION

Aquatic plants play an important role in the organic production of most inland water systems. They absorb their nutrient requirements from water as well as from the upper bottom sediments to build up organic matter of their own bodies. Through photosynthesis, oxygen is released, adding to the oxygenation of the Lake water. Moreover, certain macrophytes help to stabilize the Lake bottom and maintain clearer water (Welch, 1952). They are also used as food for many aquatic animals particularly insects (Berg, 1949). In the same time, they furnish a good shelter for eggs of some insects and molluscs which in turn, may be taken as food by other aquatic organisms including fish. Haslam (1976) reported that the different species of Ceratophyllum, Lemna and **Potamogeton** are eaten by birds. While **Phragmites communis** (underground parts) and **Typha** sp. (Pollen & underground parts) can be consumed by man. The submerged parts of the aquatic plants may also act as a good substratum for the growth of epipthytes.

Potamogeton pectinatus L. appeared as the most dominant submerged plant in Lake. It is tolerant to wide salinity variations, but with a tendency of better growth in slightly brackish water (Aleem & Samaan, 1969 II). This may explain its wide distribution in Lake Burollus. It is also a common aquatic plant in inland waters of Egypt, where it inhabits both still and running waters (Tackholm, 1941).

It was previously reported by Arber (1920) that this plant usually dies off in the autumn, leaving the rhizomes and winter turions to persist in mud till the next spring when new plants start to sprout. In Lake Burollus, a small portion of **P. pectinatus** was found to persist the winter season.

Potamogeton crispus L. is a stenohaline fresh water species. Its distribution in Lake Burollus was restricted around the outlets of land drains. Tackholm (1941) notified that **P. crispus** grows in abundance in the Nile and fresh water canals. Its distribution is also positively correlated with increasing concentrations of calcium, phosphate, and nitrate and it usually grows in association with **P. pectinatus** similar to the records of Haslam (1976).

Ceratophyllum demersum L. is a fresh water species which prefers [illegible] sheltered areas at the southern margins of the middle lake, around the [illegible]lets of Drains 8 and 9. The species is a familiar inhabitant of ponds and slow streams, usually grows in hard water lakes (Fassett, 1966 and Unni, 1972). **Najas armata** Lind. F. was noticed in small scattered patches at the southern margin of the eastern lake in front of Drain 7, where the salinity of water was relatively low. It is a fresh of slightly brackish water species (Tackholm, 1941).

Phragmites communis (L.) Trin grows well in both brackish and fresh water habitats. Haslam (1976) denoted that the plant is commonly dominant in shallow eutrophic and mesotrophic dykes and drains and grows best of fine soil. The growth of **Phragmites** proceeds by extending horizontal rhizomes from which develop erect stems which althogether tend to cover streched areas within few years. This is particularly true for the western and middle lake where many patches of the plant have been observed to show a gradual increase in their total areas. **Typha australis** Schumt and Thow. formed a landward belt at the southern shore, intermingled with **Phragmits.**

The floating plants recorded in the Lake, namely; **Eichornia crassipes** (Mart.) Solms-Laub., **Lemna gibba** L. and **Spirodela polyrrhiza** (L.) Schleid. are fresh water inhabitants. Haslam (1976) reported **L. gibba** as being often abundant on still and very slow waters. Tackholm & Drar (1950) mentioned that **L. gibba** and **S. polyrrhiza** prefer fresh and slightly alkaline waters and may grow rapidly at any time if conditions are suitable.

The growth cycle of **Potamogeton pectinatus** in the lake shows two growth periods occurring respectively during early spring (March-May) and in late summer (October-September). This agrees with previous records of its distribution in Lake Mariut (Aleem and Samaan, 1969 II) and in Lake Edku (Samaan, 1974). The first peak of **Potamogeton** amounted to 4.2 kg fresh wt/m^2, while the second one reached 4.8 kg fresh wt/m^2. These values appeared relatively low when compared to that of Lake Mariut and Lake Edku which averaged respectively 6.54 and 6.85 kg fresh wt/m^2. Spence (1964) mentioned that the nutrient content of water controls the growth of the different macrophytes. This confirms the finding of El-Sherif (1983)

that the concentrations of dissolved nitrates and phosphates in Lake Burollus were, in general, lower than those in other Egyptian Delta lakes, and subsequently it is expected to sustain lower growth rates of hydrophytes.

A reverse relationship was found between phytoplankton production and the growth of hydrophytes in the Lake. Thus, the dense growth of **P. pectinatus** in the eastern lake was met with lowest counts of phytoplankton (El-Sherif, 1983). Also phytoplankton production showed a peak during the winter when the growth of **Potamogeton** was at minimum. The same condition was observed by Aleem and Samaan (1969 II) in Lake Mariut, and by Vollenweider and Schmidt (1961) in the Nouzha Hydrodrome.

In conclusion,, Lake Burollus is characterized by having extensive growth submerged plants, particularly along its southern margins as well as at the eastern sector. This suggests the possibility of breeding water fowls in these areas where they can use such plants as their main food items. The water fowls may in turn add to the fertilization of the Lake water through their excrements. The dense growth of the emergent plant **Phragmites communis** in recent years appears to close up extensive areas of the Lake and subsequently creates unfavourable conditions for both activities of fishing boats as well as the growth of fish. Thus it is recommended that such growth should be constantly cleared up.

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