Increasing the Productivity of a Small Lake by Chemical Fertilizers

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Nozha hydrodrome is an artificial lake with an area of about 504 hectar (1200 acres). Formerly it was a part of the brackish water lake Maryut, new used as a fish farm.

In 1982 till 1987 a long term fertilization experiment was carried out to increase fish production using chemical fertilizers. At the beginning 5 kg of super-phosphate+5 kg of ammonium nitrate were added weekly per acre. The fertilizer was well mixed with water and spread as evenly as possibly using a motor boat. Fertilizers were not added during December and January also during July and August, as these months proved to be of minimum plankton production.

The amount of fertilizer was lowered according to the results of water analysis. Water was analysed for temperature, pH, oxygen content, ammonia, phosphate, nitrate, nitrite, carbonate alkalinity and chlorophyll<u>a</u>.

Water temperature varied between a minimum of 12.9°C in February 1983, and a maximum of 29.5°C in July 1986. Generally water temperature is favourable for plankton production. The pH was nearly always above 8.0.

Alkalinity is relevant to the suitability of water to fish culture, water with low alkalinity values are generally biologically less productive. The alkalinity of the hydrodrome water was between 21-43 mg $CaCO_3$/L.

No sign of oxygen deficiency was observed in the hydrodrome water during the experiment. With the progress of fertilization the oxygen content increased.

In 1982 the average oxygen value was 4.95 ml/l, in 1983 it was 5.98 ml/l in 1984 it was 6.77 ml/l and in 1985, it reached 7.01 ml/l.

Nitrogen compounds were not detected in high concentrations even after fertilization, this is due to the role played by denitrification and retention of ammonia by bottom deposits and its subsequent utilization by algae. This leads us to ask whether adding inorganic nitrogen fertilizers is economic.

Unlike nitrogen compounds, inorganic phosphorus was high in the hydrodrome water due to successive superphosphate addition. From October 1982 to March 1987, the phosphate content of the water never fell below 15 μg at/l.

Chlorophyll<u>a</u> is regarded as the essential component responsible for the amplitude of photosynthetic potential. Chlorophyll<u>a</u> content of the hydrodrome water was measured before fertilization and found to be 2.0 mg/m^3. After adding fertilizers it rose remarkably reaching up to 13.7 mg/m^3 in the period May-December 1982, in 1983 it rose up to 20.11 mg/m^3, in 1984 it reached a maximum of 29.11 mg/m^3 in 1985 it reached 18.7 mg/m^3. In May 1986, due to a sudden plankton bloom it rose up to 175.37 mg/m^3, then dropped sharply after one week to reach 63 mg/m^3.

The ultimate goal in any fertilization experiment is to increase fish production. The yield of fish from the hydrodrome before fertilization was 54 ton/year. As a result of fertilization the yearly increase in fish production is :

1982	1983	1984	1985	1986	1987	
13.4	48.7	150.6	148.8	65.0	151.0	ton

To sum up, the fertilization experiment of the Nozha hydrodrome gave a total gain in the fish yield of 577.5 ton, equivalent to a maximum increase reaching in some years up to 300%.

The Primary Production of the Larnaca Salt Lake - A Bioenergetic Approach

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INTRODUCTION

The purpose of this study was to measure the primary production of the Salt Lake of Larnaca. The productivity of the ecosystem and its overall function was determined.

<u>Site Description</u>: The Salt Lake of Larnaca is the biggest and lowest in a series of lakes situated to the southwest of Larnaca town. It covers an area of 5.01km^2 and its lowest part lies 2.16m below the sea level. Natural catchment area is about 5.7km^2.

The basin of the Lake is dry and covered by a salt crust during the summer months. Water in the Lake usually appears after the first rainfall and builts up at rates depending on the precipitation. The rainfall occurs mainly during the winter months and is considered as contributing most of the Lake's water.

The water collected in the Lake has no other way to escape except through evaporation.

The conditions which will prevail in the habitat of the Salt Lake in given a year are not predictable because they depend on - and they are imposed by - the meteorological conditions of the year; the environment of the Larnaca Salt Lake, in which biological activity will develop, is unpredictable. (Hadjistephanou, 1989).

MATERIALS AND METHODS

The primary production of the Salt Lake was determined by measuring the photosynthesis by the oxygen method.
Estimates were made on three selected dates, the beginning, the middle and the end of the period during which water is present in the Lake's basin.

The experimental procedure as it is described by Strickland and Parsons (1972) was strictly followed. The LB and DB samples were tight on poles which marked two stations, one on the central and deepest part of the Lake and another on the periphery.

The energy absorbed by the water was calculated from the meteorological data for the solar radiation of the area.

RESULTS AND DISCUSSION

The titration results were plugged into the equations given by Strickland and Parsons (1972) and the gross and net photosynthesis, as well as respiration were calculated in mgC/m^{3}h. These figures were converted in MJ per m^2 per day. The estimations are given on Table below.

<u>Table</u> : The Primary Production of the Salt Lake of Larnaca in MJ/m^2.d

Date	Station	Gross Photosynthesis	Respiration	Net Photosynthesis
29/12/1988	A (surf.)	0.0019	0.0045	0.000
	A (bott.)	0.0019	0.0045	0.000
	B	0.0047	0.0057	0.000
24/ 2/1987	A (surf.)	0.00088	0.00210	0.00000
	A (bott.)	0.00088	0.00160	0.00000
	B	0.00220	0.00106	0.00114
18/ 5/1987	A (surf.)	0.0384	0.0254	0.01297
	A (bott.)	0.0401	0.0275	0.01262
	B	0.0396	0.0227	0.01343

The results of the Table show that gross photosynthesis is detected during the whole wet period of the Lake and that photosynthetic activity is uniform in the water column.

At the beginning of the period of water accumulation gross photosynthesis was detected in the Lake, but the energy lost in respiration exceeds photosynthesis. On the contrary, net primary production is detected in the ecosystem towards the end of the wet period, in May. On February, around the middle of the wet period, the ecosystem is found to be in a transitional phase.

On the basis on Odum's (1963) classification, the ecosystem of the Larnaca Salt Lake is a heterotrophic ecosystem for a period from November till February i.e. from the beginning to the middle of the wet period of this seasonal lake. Nonetheless, the tendency is for ecosystems to proceed towards stability and thus to maintain themselves over both the short and long term. This tendency for the Larnaca Lake ecosystem is initiated from about the middle of the wet period onwards and the system appears with net primary production.

The function of the Larnaca Lake ecosystem as described above appears on an annual basis in temperate systems, where the spring-summer autotrophism is offset to varying degrees by fall-winter heterotrophism (Kormondy, 1976).

Although net primary production is detected during the second half of the wet period, the ecosystem of the Larnaca Lake is not very productive.

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