

**STUDIES ON THE POPULATION DYNAMICS
OF ANIMAL ORGANISMS AND EFFECT OF
POLLUTANTS UPON SOME OF THEM IN LAKE
WADI ELRAYAN (ELFAYOUM, EGYPT)**

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A THESIS
Submitted for the Award of
The Degree of
DOCTOR OF PHILOSOPHY



At
The Faculty of Science
Ain Shams University

43-58

1984

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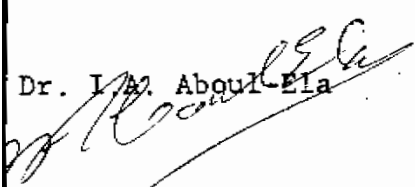
A THESIS

Submitted in Partial Fulfilment for the Award of the Degree of

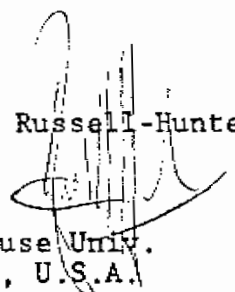
DOCTOR OF PHILOSOPHY OF SCIENCE

Zoology Department
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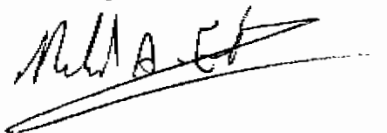

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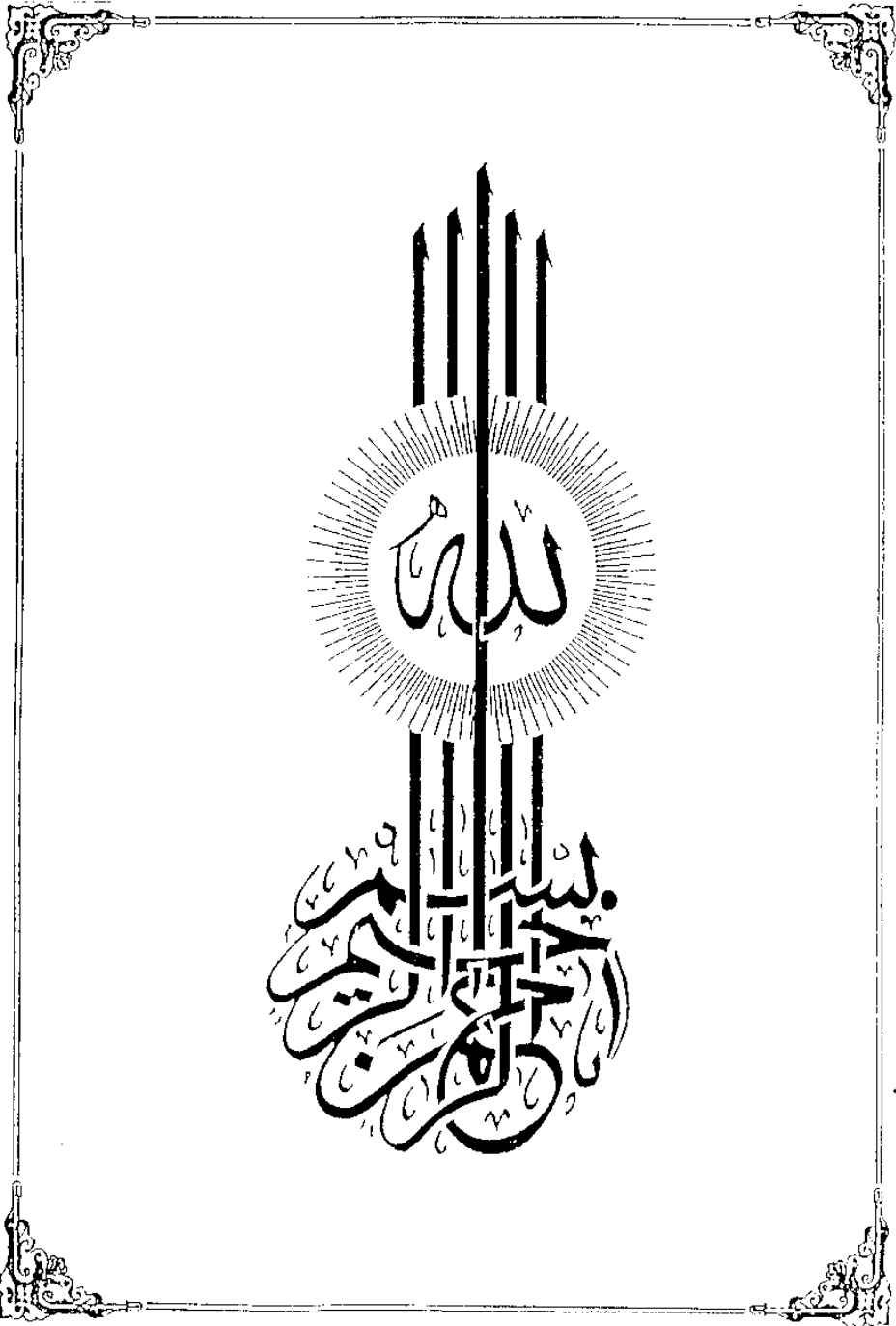
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- 5- Biology of polluted water.
- 6- Design and analysis of experiments (statistics).
- 7- Multivariate statistical Methods
- 8- Advanced ecology.

5

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	
I. INTRODUCTION	1
II. MATERIAL AND METHODS	5
A. <u>Environmental and Biological Investigations</u>	
1. Selected station for material collection	5
2. Physical and meteorological	5
3. Chemical	7
4. Biological	9
a) Phytoplankton	9
b) Chlorophyll-A	9
c) Primary Production	10
d) Zooplankton	11
e) Benthic Fauna	12
f) Biological Parameter	12
B. <u>Effect of Pesticides on Animal Organisms</u>	
1- Pesticides	14
2- Acute Toxicity Experiments	16
3- Chronic Toxicity Experiments	18
i. Experiments upon <u>Helisoma trivolvis</u>	
a. Influence of Pesticides on the Growth	19
b. Influence of Pesticides on egg production	20

	Page
c) Effects of Pesticides on embryonic survival and Hatching of <u>H.trivolvis</u> eggs..	130
d) Effects of Pesticides on oxygen uptake rate	133
ii) Experiments upon <u>Biomphalaria alexandrina</u>	
a) Influence of Pesticides on Growth	139
b) Effects of Pesticides on embryonic survival and hatching of eggs.....	142
IV. DISCUSSION AND CONCLUSIONS	145
V. SUMMARY	164
VI. APPENDIX OF PHOTOGRAPHIC PLATES	168
VII. LITERATURE CITED	173
VIII. Arabic Summary	180

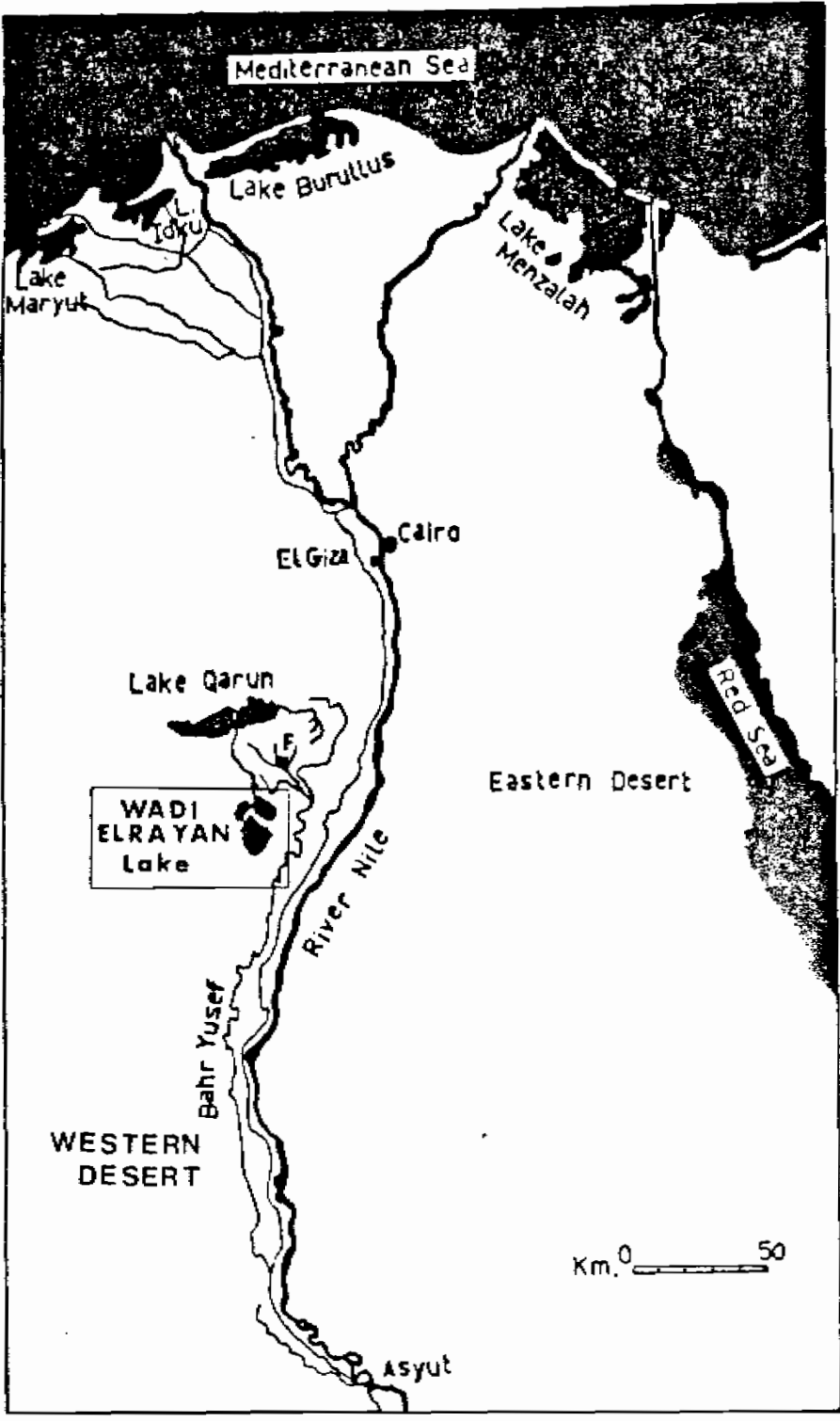
I- INTRODUCTION

I. INTRODUCTION

The new Lake, WADI ELRAYAN (Map 1) is a natural reservoir, which lies to the southern west of El-Payoum Governorate, in the Western Desert. It consists of three graded sections. Totally and finally it will contain a volume of about two milliard cubic meters of water at minus 18 meters from sea level. The first section (EL-MASAKHEET) covers an area of about 52.8 Km^2 at 10 meters below sea level and has a mean depth of 25 meters with minimum 3 meters and maximum 50 meters. When this section was filled with water from ELWADI drain, it overflowed into the second section (EL-QUOSAIMAT or EL-BOKIRATE) which has an area of about 26.5 Km^2 at 18 meters below sea level. This section has a mean depth of about 15 meters and when it was full, it has started to overflow into the third and final section (EL-RAYAN), which has an area of about 110 Km^2 and a maximum depth of about 50 meters at 18 meters below sea level.

In the last two decades, WADI ELRAYAN area received attention from the Egyptian authorities for the following reasons:

1. To hold the water level of Lake Qarun at lower than 44.30 meters below sea level and increase the cultivated



Map (1). Map of Northern part of Egypt to show position of Lake Wadi Elrayan

area of El-Fayoum by 59,000 Feddan or 24,780 hectors (from 328,000 to 387,000 Feddan or from 137,760 to 162,540 hectors).

- 2- To develop productive areas in the Egyptian desert by creating water areas, generating hydroelectric power, cultivating crop plants, building new villages and finding new tourist areas in the Egyptian desert.
- 3- To conserve the reclaimed land areas and to make the best use of the limited resources of water to meet the growing demand for food.

The first section of WADI ELRAYAN Lake had received the first lot of drainage water, through a tunnel from ELWADI drain in April 26, 1973. Fresh water fish, planktonic organisms and different salt contents had been transported through the drainage water to the Lake. Complete cycles of different water fauna and flora were gone through in the area for the first time.

This study is part of the first complete ecological and biological investigation of Lake WADI ELRAYAN and its main objective is to ensure that the physical and biological resources of the Lake are used in an optimum

manner and that the environment will be protected over the long-term.

On the other hand, Lake WADI ELRAYAN receives its water supply from the drainage of agricultural lands which are loaded with wastes, salts, nutrients and pesticides that may contaminate the aquatic environment and thus exerting a hazardous effect on the fishery and living organisms. Therefore, studies are urgently needed to determine the effects of these pollutants on fish and organisms in the food-web of fishes.

Generally, three major types of pollution are known: organic, mostly from drainage nutrients; artificial as from industrial wastes and pesticides; and natural mineral pollution. The most commonly used pesticides in Fayoum area are: Bayluscide used for the eradication of Bilharzia snails, Lannate and Dimethoate insecticides used for controlling agricultural pests. So, the present study also deals with the acute and chronic toxicity of these three pesticides to some typical aquatic organisms of Lake WADI ELRAYAN.

II- MATERIAL AND METHODS

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A- ENVIRONMENTAL AND BIOLOGICAL INVESTIGATIONS

1- Selected Stations for Material Collection

The environmental and the biological studies had been carried out on the first section (EL-MASAKHEET) and the second one (EL-QUOSAIMAT) of WADI ELRAYAN Lake between June, 1979 and June, 1980.

Samples for plankton and chemical analysis were taken at eight stations at approximately monthly intervals. Five stations (1 - 5) in the first section, and three (6 - 8) in the second one, representing the different parts of the sections (Fig.1). Primary production experiments were performed at three stations, two in the first section (I and II) and one in the second section (III). Benthic samples were taken on the two sections of the Lake along six transects, four transects (A-D) at EL-MASAKHEET section and two (E and F) at EL-QUOSAIMAT section, as detailed in Fig.1.

2- Physical and Meteorological

Wind direction and speed, air and water temperatures as well as precipitation and relative humidity were computed from the data obtained from the meteorological

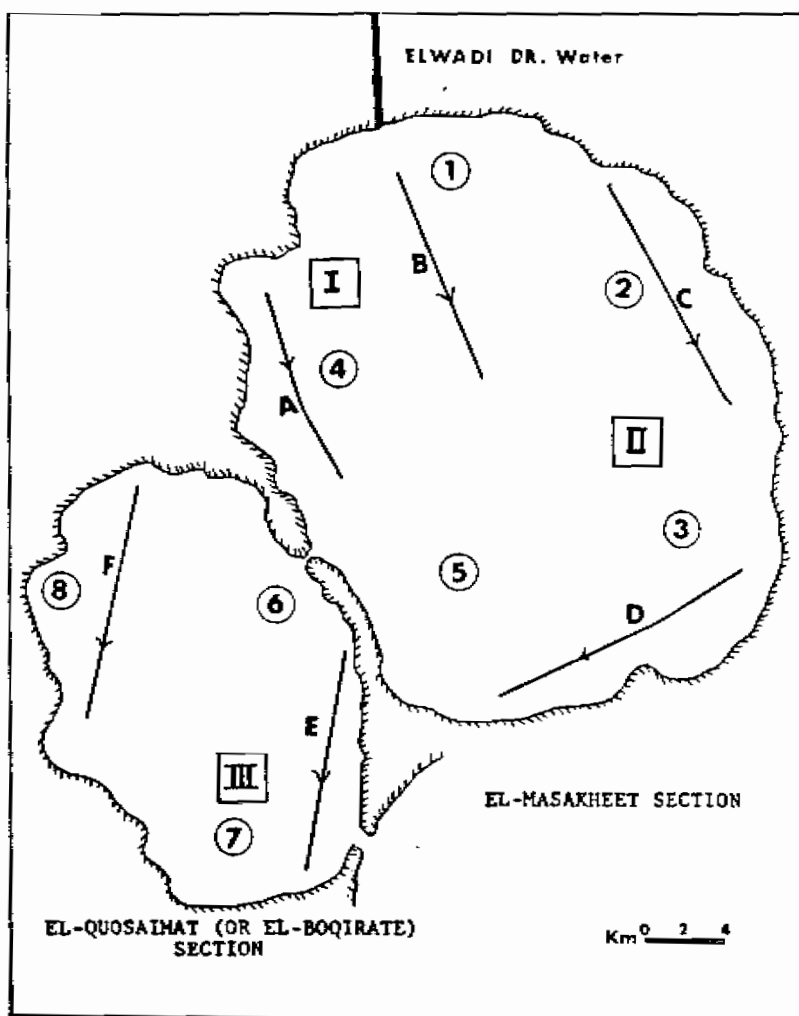


Fig. (1). The first and the second sections of Lake Wadi Elrayan

- Primary production stations
- A—E Location of Benthic sampling transects
- Plankton and water sampling stations

station at Lake Qarun and considered as covering and affecting the whole area of WADI ELRAYAN Lake.

3- Chemical

Water samples for chemical analysis were collected approximately once per month at each station (Fig.1). Samples were taken just below the water surface and then kept in polythylene bottles of one litre capacity and preserved according to the standard methods. The samples were analysed in the chemical laboratory of the Atomic Energy Establishment in Cairo. Table (1) shows the parameters analyzed in each of the routine samples. In addition to these, dissolved oxygen, conductivity, temperature, alkalinity, salinity and pH were analyzed at the time of collecting samples.

The methods of chemical analysis used for other parameters were as follows:

- Sulphate - Turbidimetric method
- Phosphate - Stannous Chloride method
- Nitrate - Colourimetric method
- Nitrite - Colourimetric method
- Ammonia - Phenate method
- Silica - Colourimetric Molybdosilicate method