



شبكة المعلومات الجامعية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ





شبكة المعلومات الجامعية



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكرو فيلم

جامعة عين شمس

التوثيق الالكتروني والميكرو فيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون أية تغيرات



يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %



شبكة المعلومات الجامعية



بعض الوثائق الأصلية تالفة



شبكة المعلومات الجامعية



بالرسالة صفحات
لم ترد بالأصل

Impact of Climate and Human Activities on the Water Chemistry and Coastal Resources of the Western Coast of Gulf of Aqaba.

THESIS

Submitted in Fulfillment for the Degree of
Ph.D. in Marine Science

BY

GALILA EBRAHIM MOHAMED HABASHE

B.Sc. in Chemistry

M.Sc. in Chemistry

*DEPARTMENT OF MARINE SCIENCE
FACULTY OF SCIENCE
SUEZ CANAL UNIVERSITY
ISMAILIA-EGYPT*

1998

B
1-07-

SUPERVISORS

-Professor SALAH GHARIB EL-ETREBY

S. El-Etreby

Head of Marine Science Department

Faculty of Science-Suez Canal University.

-Professor MOHAMED E. EL-RAEY

Department of Environmental Studies

Institute of Graduate Studies and Research

Alexandria University.

Raey

-Professor HUSSEIN YOUNES

(منوف)

*Late President-National Authority for Remote Sensing
and Space Sciences,*

Ministry of Scientific Research.

-Professor RAMSIS R. ABD ALLA

Ramsis

Head of Hydrobiology Department

Institute of Oceanography and Fisheries, Alexandria.

Approval Sheet

Name of Candidate : Galila Ebrahim Mohamed Habashy

Thesis Title:

" Impact of Climate and Human Activities on the Water Chemistry and Coastal Resources of the Western Coast of Gulf of Aqaba "

The Ph.D. thesis has been approved by:

Prof. Mohamed Adel Yehia

Chairman of National Authority
for Remote sensing and Space Sciences



Prof. Naiem Mahmod Dewedar

Oceanography Department
Faculty of Science - Alexandria University



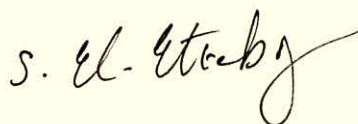
Prof. Mohamed E. El-Raey

Dean of Institute of Graduate studies and Research
Alexandria University



Prof. Salah G. El-Etreby

Head of Marine Science Dept.
Faculty of Science - Suez Canal University



DEDICATION

*TO MY
HUSBAND AND MY
DAUGHTERS*

ACKNOWLEDGMENT

I wish to express my deep gratitude to Prof. Salah G. El-Etreby; Head of Marine Science Department, Faculty of Science, Suez Canal University; for supervision, valuable suggestion and help through the carrying out of this work and revision of the manuscript.

I am deeply grateful to Prof. M. El-Raey, professor of Environmental studies; Dean of Institute of Graduate Studies and Research, University of Alexandria for his supervision of this thesis providing the facilities of the work of remote sensing, following up the research writing and the revision of the manuscript.

My deep thanks to Prof. Hussein Younes, Late-President of National Authority For Remote Sensing and Space Science, Academy of Science and technology; for providing the image of the study area and his support for this work.

I wish to extend my deep thanks to Prof. Ramsis Abd-Alla, Head of the Hydrobiological Lab., National Institute of Oceanography and Fisheries, Alexandria, for his great help throughout this work and the critical revision of the manuscript.

I am also grateful to Prof. Hussein Kamel; President of the National Institute of Oceanography and Fisheries; for his kind support and encouragement.

Special thanks are due to Pro. Hosny Omara, Prof. of Chemical Oceanography; Director of National Institute of Oceanography and Fisheries, Alexandria; for his continuous encouragement, support, advice and cooperation.

I would like to express my thanks to Pro. Morad Bacily; Head of marine environmental division, National Institute of Oceanography and Fisheries; for his encouragement and support.

I would like to express my deep thanks to the staff in Faculty of Environment, Portsmouth University, England, for their help in analyzing the data and image processing, specially Prof. M. Taylor, Prof. P. Collier, Dr. S. Murnion and Mr. P. Carter.

TABLE OF CONTENTS

	<u>Page</u>
I- INTRODUCTION	1
I-1 Background	1
I-1-1 Statement of the Environmental Problems	3
a. Oil Pollution	3
b. Phosphate Pollution	4
c. Tourism	5
d. Fishing	6
e. Miscellaneous Disturbances	6
I-1-2 Aim of Work	6
I-2 Literature Review	7
I-2-1 Previous Studies on the Red Sea and Southern Sinai.	7
I-2-2 Previous Studies on the Application of Remote Sensing.	13
 II- ENVIRONMENTAL CONDITIONS OF THE STUDY AREA	 19
II-1 Climate	19
II-1-1 Air Temperature	19
II-1-2 Wind	21
II-1-3 Humidity	23
II-1-4 Cloud Cover	23
II-1-5 Rainfall and Evaporation	24
II-1-6 Land and Sea Breezes	25
II-2 Oceanography	25
II-2-1 Water Temperature	25
II-2-2 Water Salinity	27
II-2-3 Currents	30
II-2-4 Tides	32
II-2-5 Sea Level Changes	32
II-3 Biological Conditions	34
II-3-1 Coral Reef Ecosystem	34
II-3-2 Fish and Turtles	36
II-3-3 Birds	40
II-3-4 Wild Life	41
 III- MATERIALS AND METHODS	 42
III-1 Data Availability and Acquisition	42
III-2 Field Work	44
III-3 Remote Sensing and Geographic Information System (GIS)	45
III-3-1 Landsat-TM System Characteristics	46
III-3-2 Photo Interpretation Techniques	48
III-3-3 Digital Image Processing	48
a- Preprocessing	48

b- Image Enhancement	50
c- Image Classification	57
III-3-4 Data Merging and GIS Integration	60
III-3-5 Merging of Image Data with Ancillary Data	61
III-4 Hardware and Software	61
III-5 Water Quality	62
III-5-1 Description of the Sites	62
III-5-2 Physical Parameters	65
III-5-3 Chemical Parameters	65
III-5-4 Determination of Chlorophyll-a	67
III-5-5 Statistical Analysis	67

IV- GROUND SURVEYS RESULTS, CHEMICAL ANALYSIS AND

DISCUSSION.	68
IV-1 Socioeconomic Parameters	68
IV-2 Climate Condition	74
IV-2.1 Air Temperature	74
IV-2.2 Relative Humidity	78
IV-2.3 Prevailing Wind	78
IV-3 Physico-Chemical and Biological Analysis	78
IV-3.1 Transparency	78
IV-3.2 Temperature	81
a- Horizontal Distribution	81
b- Vertical Distribution	81
IV-3.3 Salinity	88
a- Horizontal Distribution	88
b- Vertical Distribution	88
IV-3.4 Sigma-T and Water Column Stability	92
IV-3.5 pH	92
a- Horizontal Distribution	92
b- Vertical Distribution	93
IV-3.6 Oxygen	95
a- Horizontal Distribution	95
b- Vertical Distribution	95
IV-3.7 Nutrients	98
a- Inorganic Phosphate	98
b- Nitrate Distribution	98
c- Nitrite Distribution	101
IV-3.8 Chlorophyll-a	101
IV-4 Discussion	101

V- REMOTE SENSING RESULTS AND INTERPRETATION. 125

V-1 Remote Sensing	125
------------------------------	-----

V-1-1 Contrast Manipulation	133
a. Level Slicing	136
b. Shaded Relief	136
c. Gray-Level Thresholding	136
V-1-2 Multi-Image Manipulation	138
a. Decorrelation Stretching	141
b. Tasseled Cap Transformation	143
V-1-3 Image Classification	143
V-2 GIS	147
V-3 Digital Terrain Model (DTM)	147

VI- CONCLUSION AND RECOMMENDATION	155
--	------------

VII-SUMMARY.	162
-----------------------------	------------

REFERENCES.. . . .	167
---------------------------	------------

ARABIC SUMMARY

CHAPTER I

INTRODUCTION

I- INTRODUCTION

I-1. Background

It has been thought that the Gulf of Suez is formed in the Miocene with the first stage of the formation of the Red Sea and that only the marginal faults of the Gulf of Aqaba is formed at that time. The faults that actually bind the modern Gulf and that lie inside the marginal faults are considered to have been formed only 4 to 5 millions years ago, with the second stage of tectonism. The origin of sharms as canyons eroded during the lowered sea level during the Würm glaciation followed by Holocene flooding appears to be well established (Friedman, 1985).

The Red Sea resources contribute substantially to Egypt's economy, particularly in the areas of oil production, navigation (Suez Canal), tourism and fisheries. Figure(1) shows the Red Sea coastal areas and the location of the Gulf of Aqaba. The Red Sea is shared by Egypt, Sudan, Ethiopia, Republic of Yemen, Saudi Arabia, Jordan and Israel (Mancy, 1983). It is a semi-enclosed, narrow water body with no river inputs, which extends for approximately 1936 km from the city of Suez to Bab- El-Mandeb. The area of the Red Sea is about $437,970 \text{ km}^2$, and its mean depth is 491 m (U.S.Navey,1952). The Gulf of Suez is relatively shallow, with a maximum depth of about 64 m; outside its mouth the bottom slopes sharply to a depth of about 1255 m. In contrast, the Gulf of Aqaba attains a depth of about 1355 m and separated from the deep waters of the Red Sea by an entrance much of which is considerably less than 100 m deep (Mancy, 1983).

The western coast of the Gulf of Aqaba is an important and unique coastal environment. It is characterized by its coral reefs which offer great