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Cooperative Marine Technology Program
for the Middle East (Phase IV)

Second Annual Report - Executive Summary

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Cooperative Marine Technology Program for the Middle East
(Phase IV)

SECOND ANNUAL REPORT - EXECUTIVE SUMMARY

1 FOREWORD

This is the Second Annual Report of Phase IV of the Cooperative Marine Technology Program for the Middle East. Here we report on the research activities carried out in the following three projects:

- 1 *Trophodynamics of the Southeastern Mediterranean with Special Reference to Commercially Important Fishes*
- 2 *Investigations of Lake Ecosystems in Egypt and Israel with Implications for Fisheries and Water Quality Management*
- 3 *Seafood Safety and Fish Decontamination Technical Health Implications*

Also discussed are Management-related activities, workplans as well as future projects activities as the Program enters its third and final year.

As was the case in the First Annual Report, on account of the voluminous nature of some of the reports, the present Report is divided into two parts:

- Part I includes
- (1) Executive Summary
 - (2) Program Management
 - (3) Trophodynamics of the Southeastern Mediterranean
 - (4) Investigations of Lake Ecosystems in Egypt and Israel

Part II Seafood Safety and Fish Decontamination

An Executive Summary of the Second Annual Report is presented here together with the section on Program Management.

2 Trophodynamics of the Southeastern Mediterranean with Special Reference to Commercially Important Fishes

Israel

As the study entered its second year, efforts of the Israeli scientists were focused on carrying out multidisciplinary surveys of the Israeli fisheries zone, and on optimization of the design of future surveys. Since one of their goals is to elucidate the relationship between fish distribution and the environmental parameters, considerable effort was expended in improving the theoretical basis of the methods they are using to make these comparisons. They also were engaged in developing procedures for the rapid measurement of the environmental parameters. As an example, the recently acquired submersible fluorometer has enabled them to map the field of chlorophyll with high resolution and with less effort than with the conventional extraction methods.

Unfortunately, the repeated failure of the echosounder has caused severe problems with their proposed research plans. On two occasions, the instrument failed while at sea, and twice it was shipped to the manufacturer (BioSonics, in Seattle, Washington). Fortunately, however, the echosounder functioned properly during the August 1994 cruise, however it needs to be recalibrated.

During the period covered by this report, three multidisciplinary cruises were undertaken in December 1993, February/March, 1994 and August 1994. Acoustic surveys of pelagic fish stocks and concurrent sampling of the environmental parameters were carried out by the Israeli scientific team with the collaboration of Egyptian and U.S. scientists. The trawling surveys of the demersal fish stock were carried out on fishing vessels by experts from the Fisheries Department of the Ministry of Agriculture simultaneously with the acoustic surveys.

Egypt

As mentioned in last year's report, the delay in receiving the BioSonics acoustic system, together with the failure of the system once it was received

has played havoc with the original research plans. However, despite these setbacks, progress has been made in gathering data/information on the biology, distribution, and population dynamics of the commercially important fishes. In addition, two oceanographic cruises were mounted in September and October 1994. During these cruises, physical, chemical and biological parameters were studied, this was coupled with the successful deployment of the hydroacoustic system during the first cruise.

Plans are now underway to play 'catch-up' and to make up for the lost time. This will be accomplished by the mounting of several cruises during the remaining months left in the Project.

U.S.A.

The focus of research of the U.S. investigators was to provide information on the relationship between the pelagic fish stocks and their food base (i.e. phytoplankton). It is well-known that the study of size, distribution, abundance of phytoplankton is pivotal to any understanding of the structure and function of the marine food web.

To this end, U.S. investigators have collaborated with the Israeli scientists in the planning and undertaking of the three survey cruises made on board the R/V *Shikmona II*.

Unfortunately, the undue delay in scheduling the Egyptian cruise, which was aggravated by the malfunctioning of the echosounder, have prevented the U.S. investigators from participating on the September 1994 Egyptian cruise.

3 Investigations on Lake Ecosystems in Egypt and Israel With Implications for Fisheries and Water Quality Management

1 Lake Kinneret (Israel)

With a few exceptions, mostly caused by equipment problems, the various aspects of the Lake Kinneret project are proceeding satisfactorily and on time. The diel studies of fish and zooplankton vertical distribution have been completed. Several series of tank experiments were completed and data analyzed. Hydroacoustic work has continued despite the malfunction of the BioSonics hydroacoustic system mentioned in the Trophodynamic Project (see above). Fish population survey (Lake Kinneret sardine, or lavrun) with concurrent net sampling have been conducted. Further, a study of the distribution of lavrun in relation to the seiche has been carried out.

As a result of the research undertaken in Lake Kinneret, recommendation has been made to the Israeli Department of Fisheries to increase the annual stocking rate of *S. galilaeus* and to reduce the lavrun population. We believe that both recommendations will be implemented.

2 Lake Qarun (Egypt)

An intensive survey of lake Qarun was carried out during the last quarter of 1993. During this period three monthly trips were made. In each trip samples for physico-chemical and biological parameters of the lake water and sediments were collected at 24 stations in Lake Qarun and the two main drains i.e. El-Bats and El-Wadi. In addition, experimental fishing was carried out for monitoring fish population, catch composition and reproduction of endemic as well as transplanted fish (i.e. *Mugil* sp) were undertaken. Also during the period, coliform and fecal coliform counts as well as fish pathology (parasites, bacterial diseases) were investigated.

In the first quarter of 1994, the sampling program of the environmental parameters, together with the study of fish pathology and fishery parameters were also carried out. The effect of zooplankton grazing on phytoplankton populations was successfully studied. In this study, two *in situ* grazing experiments were conducted in July and August 1994.

4 Seafood Safety and Fish Decontamination Technical and Health Implication

The project's goals include the assessment of public health and safety practices used in the production, marketing and consumption of seafood in Egypt and Israel, the promotion of awareness of health risk of seafood contaminants, the development of guidelines for the improvement of seafood production and marketing. The institutions involved seek to examine the feasibility of various options to minimize risks of seafood-borne illness with emphasis on fish decontamination procedures.

To date, participants have succeeded in completing the planned investigations according to the project schedule, including training, developing a Data Bank for both chemical and microbial contaminants, and reviewing current literature regarding chemical and microbial contamination of seafood and the accompanying public health safety implications. Between October 1, 1993 and September 30, 1994, researchers in Egypt and Israel have completed several experiments to investigate fish decontamination and depuration rates, and to assess microbial and chemical contamination in fish from various sites in Egypt. The Second Annual Report provides a detailed account of their findings. The Report is divided into four parts.

Part I Microbial and Parasitic Contamination of Fish in Egypt

Examination of fish from the Aswan area showed a prevalence of fish parasitic infections with encysted metacercariae, the extent of the infection was low relative to values observed in northern Egypt. Diplostomatidae metacercariae were the most frequently observed species of metacercariae and were most prevalent in the head and trunk regions of the fish. Bacteriological examination revealed relatively low levels of bacteria and coliform, indicating that pollution with bacteria was minimal. Bacteria were isolated from the surface of the fish, and tests did not detect these bacteria in the muscles of live fish.

Part II Chemical Contamination of Fish in Egypt

Chemical examination focused on the uptake, accumulation and elimination of the insecticide fenitrothion, various metals, proteins, lipids and polycyclic aromatic hydrocarbons (PAHs). Researchers determined that the accumulation of fenitrothion was greater for larger fish. Depuration results of fish contaminated with the insecticide showed that concentrations declined gradually, with no significant difference between large and small fish at the end of the 15-day elimination period.

Project scientists measured levels of cadmium, lead, copper and zinc in various organs of fish collected from several sites in Egypt. In general, cadmium and lead levels were highest in the gills of fish, while copper and zinc levels were greatest in the liver. This reflects an organ and metal specific accumulation. Muscles showed the lowest values of all metals and are within the safe concentrations set forth by FAO. A detailed experiment on the uptake and elimination of cadmium illustrates the capacity of cadmium to bioaccumulate, especially in gill tissues. Uptake of cadmium was rapid, while elimination from the tissue proceeded at a rather slow rate. PAHs experiments showed site-specific differences in fish concentration levels. Total hydrocarbons were highest in fish samples collected from in the north, i.e. in the Port Said area. This is most likely due to the heavy shipping traffic. Total protein content of fish muscle showed no significant variation at the different sites.

Part III Fish Decontamination

Two studies were undertaken to determine the effectiveness of pathogen depuration from fish. The first study examined the effectiveness of changing the water in holding tanks to reduce the level of microorganisms on various fish tissue. Results of the study indicated that faster decontamination of fish is achieved by repeated changing of the water in the holding tanks. The second study determined the toxicity of hydrogen peroxide and silver ions (Ag^+) on fish and the die-off rate in which this mixture has on specific microorganisms (*E. coli*, MS2 phages, and polio 1). The preliminary results indicated that the combination of hydrogen peroxide (30 mg/l) together with Ag^+ ion (84 ppb) was found to be non-toxic to the fish, whereas the reduction

of *E coli* was 5 logs, 24 hours after the exposure. The die-off rate for MS2 phages and polio 1 was relatively very low and more experiments should be conducted to determine the effectiveness of this method.

Part IV Summary of Calculating Risk from Contaminants in Egyptian Fish

The fourth section of the Report provides a summary of risk assessment procedures, with specific examples related to contaminants present in the Egyptian fish. Risk analyses highlight mercury and cadmium as potential problems among the metals examined. This section distinguishes between risk calculations for carcinogen and non-carcinogens and provides examples of how to calculate exposure and risk estimates for DDT and mercury.

5 Program Management

As mentioned in the First Annual Report, the Cooperative Marine Technology Program for the Middle East is coordinated by a Steering Committee made up of Dr H K Badawi (Egyptian Coordinator), Dr Y Cohen (Israeli Coordinator), Dr R B Abel (Program Manager) and Dr S Z El-Sayed (Principal Investigator and Chief Scientist)

Dr S Z El-Sayed continued his role of assuming the overall responsibility for the scientific effort of the various components of the Program. He also bears the responsibility of compiling and editing the technical, semi-annual and annual reports.

The overall management is provided by Dr R B Abel, who is responsible for maintaining the close interaction and cooperation between the Program National Coordinators and the projects' Principal Investigators. He also shares in the responsibility of planning all the meetings held in Egypt, Israel and the U S.

Considerable progress was achieved, and numerous regional cooperative activities among the scientists and administrators of the three countries involved were made during the period covered by this report. Highlights of these activities are given below.

MEETINGS AND WORKSHOPS

- 1 On December 16-17, 1993 the Steering Committee met in Haifa (Israel). The topics of the discussion included the Second Annual Workshop, the Agridec evaluation, coordination among the Israeli and Egyptian investigators, logistics and finance problems, advance planning, and ship acquisition.
- 2 On December 18, 1993 the Steering Committee moved to Sharm El-Sheikh (Sinai, Egypt) to join the other Program scientists for the Second Annual Workshop. The Israeli and Egyptian Principal Investigators responsible for conduct of the Program's component projects (i.e., Seafood Safety, Trophodynamics of the S E Mediterranean, and Lakes Ecosystem

Management) summarized the progress made during the previous year, with particular reference to the goals prescribed in the Program document. Each presentation was followed by a discussion of the data and results presented. Also discussed at the Workshop were plans for research during Year 2.

- 3 On May 26, 1994 members of the Steering Committee met in Washington D C , with Mr Daniel Kurtzer, Acting Assistant of State to review the progress being made during Phase IV and to discuss the proposed Aqaba Project. The Steering Committee also met with Mr Kenneth Prussner, Dr John Daly and Mr Edward Lijewski again to review the status of the three projects under Phase IV, and to discuss future research projects.
- 4 Egyptian scientists made several trips to Israel to discuss with their Israeli counterparts the progress made in their projects and to exchange views on future research activities. They also participated on the three Israeli cruises in the Mediterranean Sea. Recently, Dr Ezzat Ibrahim (Principal Investigator, Lake Qarun Project) and his associate Dr Fahmy El-Gammal visited the Kinneret Laboratory to review the project results and to discuss research plans for next year.

LOGISTICS

Logistics has played an important role during this Phase.

- 1 Re/The echosounder - originally targeted for a Norwegian corporation, SIMRAD, Inc could not be purchased under the "Buy-American Act". Accordingly, purchase had to be effected through BioSonics, Inc (Seattle, WA), the only American manufacturing firm. Unfortunately, the performance of the instrument was dismaying, its recurrent failures have set back the Trophodynamics Project by at least a year! At one point, the manufacturer admitted to a fundamental design error.
- 2 Re/The research vessel - the Egyptians experienced severe problems in acquiring a vessel for the Trophodynamics Project field work. At present Dr R B Abel is exploring several leads that may prove as successful as the one achieved by his acquisition of the *Shikmona II* for the Israelis.

EQUIPMENT/INSTRUMENTS PROCUREMENTS

The Texas A&M Research Foundation's Purchasing Department continued to serve the needs of the Egyptian, Israeli and U S scientists by procuring equipments and instruments and shipping them to the Middle East

6 Acknowledgement

Grateful acknowledgement is expressed to the U S Agency for International Development for the financial support of the investigations reported herein

Statement On
Intellectual Property Rights

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COOPERATIVE MARINE TECHNOLOGY PROGRAM FOR THE MIDDLE EAST, PHASE IV

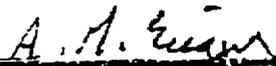
The undersigned Project Coordinators, representing the institutions from the United States of America, Arab Republic of Egypt and Israel participating in the Cooperative Marine Technology Program for the Middle East, Phase IV (hereafter referred to as "the Program"), do hereby agree

- o that property rights, copyrights and patent rights to products developed through the Program will conform to published guidelines of the Agency for International Development
- o that in the event of the development of a patentable product from the Program, the Texas A&M Research Foundation as the prime contractor to the Agency for International Development will notify the Agency of such developments
- o that in the event of the development of a patentable product from any sub-project of the Program, the Texas A&M Research Foundation and its subcontractors, the institutions participating in the sub-project, may have equity in the fruits of that sub-project
- o that the institutions participating in the Program may have patents and copyright policies that may necessitate review when and if applicable
- o that the applicable policies pertaining to property rights to products and to technologies developed through the Program will be reviewed by the Steering Committee, which is composed of members from the three participating countries. All such policies practised by this Program will conform to those of the Agency for International Development

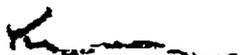
This document is effective as of 1 January, 1992 and will remain effective throughout the duration of the project, Phase IV



Dr Robert B Abel, Program Coordinator for the U S A



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