MID-TERM EVALUATION OF THE COOPERATIVE MARINE TECHNOLOGY PROGRAM FOR THE MIDDLE EAST

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TABLE OF CONTENTS

		Page Number
LIST OF ACRONYMS		i
I.	SUMMARY	1
	SUMMARY OF RECOMMENDATIONS	1
II.	PROJECT BACKGROUND	4
III.	EVALUATION METHODOLOGY	6
IV.	EXTERNAL FACTORS	9
V.	KEY PROJECT ASSUMPTIONS	10
VI.	PROGRESS SINCE LAST EVALUATION	12
VII.	INPUTS	13
VIII.	OUTPUTS	15
IX.	PURPOSE	25
X.	GOAL 28	
XI.	BENEFICIARIES	29
XII.	UNPLANNED EFFECTS	29
XIII.	LESSONS LEARNED	30
XIV.	SPECIAL COMMENTS OR REMARKS	31

APPENDICIES

1.	Unified Logical Framework	33
2.	Phase II Sub-Project Log Frames of May 1984	42
3.	Financial Status	59
4.	Al Ahaly Newspaper Article	62
5.	Key Individuals Interviewed	63
7.	List of Documents Consulted	66
8.	Itinerary for the Evaluation Team	68
9.	Scope of Work for the Evaluation Team	71

LIST OF ACRONYMS

COOPERATIVE MARINE TECHNOLOGY PROGRAM
PHASE II EVALUATION

AID/W	United States Agency for International Development, Washington, D.C., Bureau.
ARO	Agricultural Research Organization, Fish and Aquaculture Research Station, Dor, Israel.
ASRT	Academy of Scientific Research and Technology (Cairo,, Egypt.
CAS	Cassette Acquisition System (submerged pressure sensor array and cassette tape recorder for collecting ocean wave energy data).
CCS	Center for Coastal Studies, Scripps Institution of Oceanography.
CMTP	Cooperative Marine Technology Program for the Middle East.
ICP	Institute of Coastal Protection, Alexandria, Egypt.
IOF	Institute for Oceanography and Fisheries Research (Cairo), Egypt.
IOLR	Israel Oceanographic and Limnological Research, Haifa, Israel.
MI	Ministry of Irrigation, Cairo, Egypt.
NCM	National Center for Mariculture, Elat, Israel.
NJMSC	New Jersey Marine Sciences Consortium, Fort Hancock, New Jersey.
PI	Principal Investigator.
R/V	Research Vessel.
STA	Science and Technical Affairs Office, U.S. Embassy, Cairo, Egypt.
USAID	United States Agency for International Development.

I. SUMMARY

Following the end of hostilities between Egypt and Israel the United States began sponsoring projects to increase regional cooperation through research on common problems. The Cooperative Marine Technology Program for the Middle East was the first such project. It was authorized in August 1980 as a trilateral collaborative effort in marine and freshwater aquatic research.

A Phase I evaluation, conducted in March 1983, concluded that the project was generally successful technologically and was fostering regional cooperation as well as could be expected, given the existing political climate. In September 1983 Phase II of the project was authorized to continue support for three more years.

This report, the Mid-Term Evaluation of Phase II has found the situation to be much the same as when evaluated in Phase I: science is generally outstanding and efforts towards normalization are doing as well as can be expected.

Three main problems were encountered by the evaluators:

1. Reluctance of Egyptians to travel to Israel.

2. Slow administrative procedures handicapping fund disbursement.

3. The absence of a unified logical framework.

Recommendations And Suggestions

Recommendations and suggestions are presented to overcome these difficulties as well as less critical problems.

SUMMARY OF RECOMMENDATIONS

Evaluation Team Composition

Future evaluation teams for trilateral projects should have representation from each country, even if it means limiting the number of American evaluators. We feel that both the constraints that limit technical cooperation and the bureaucratic bottlenecks that slow the Cooperative Marine Technology Program's progress would have been more fully clarified, perhaps leading to constructive solutions, had our teams contained fulltime Israeli and Egyptian representation. (It would also have resulted in another Egyptian travelling to Israel and simplified logistics in both countries.)

Scheduling for Evaluations

We recommend, that future evaluations be scheduled to coincide with one of the Cooperative Marine Technology Annual Conferences so that the atmosphere and level of trilateral interaction can be understood. The first evaluation, we feel, suffered by not seeing the Program from this perspective of cooperation.

More Direct Disbursement of Sub-Project Funds

Funds for the Coastal Management sub-project should be transferred directly from NJMSC to the Principal Investigator's account. Since this activity is now an Authority of the Water Research Center in the Ministry of Irrigation, there is little rationale for disbursement through the IOF. If possible, Monosex Tilapia funds should also be given a more direct route to the sub-project.

Continued Participation of American Scientists

Minimal participation of American scientists should be continued for all sub-projects in the Program.

Sub-project Transfer From IOF to MOA

Investigate the possibility for transferring monosex Tilapia research from the IOF, ASRT, Ministry of Education to the General Authority of Fish Resources, Ministry of Agriculture (MOA). The MOA has a core of personnel trained in fish breeding and has relatively well equipped laboratory facilities at the Abassa Hatchery. The collaborative policy of the MOA would make it more likely that the EOPS could be fully achieved.

Proviso For Future Funding

Future funding for cooperative fish culture research should be favorably considered with the following proviso: Egyptian scientists, possibly accompanied by graduate students, initially complete a 3-6 month sabbatical at the Israeli National Center for Mariculture at Elat under a program of work-study in nutrition and maricultural techniques that is mutually agreed upon in advance.

Oversight Considerations

In the hope of providing better oversight (e.g. by USAID) for what we consider a worthwhile project, we suggest that project management be assigned to the same individual who is acting as project officer for the USAID/Cairo Aquaculture Development Project.

II. PROJECT BACKGROUND

Aquatic resource activities constitute one of the many areas of common interest shared by Egypt and Israel. First, the two countries' coterminous Mediterranean coastline has a unique inshore circulation pattern known as the Nile Littoral Cell. The Nile River serves as the major freshwater source to the Nile Cell in the Southeastern Mediterranean. Second, at least seven fish species of commercial importance are common to the lakes of both Egypt and Israel.

Following the end of the conflict between the two countries, and the establishment of a program and fund for regional cooperation by the U.S. (part of the International Security Assistance Act of 1978, PL 94-224), it was not surprising that a group of American, Egyptian and Israeli aquatic scientists developed a proposal for a three-year program of cooperative aquatic research under the overall management of the New Jersey Marine Sciences Corsortium. The proposal, entitled "The Cooperative Marine Technology Program for the Middle East", was officially accepted by the U.S. Agency for International Development (AID) in August 1980. This was the first such project so funded (AID/NE-CA-1706, Project No. 298-0160).

The Cooperative Program's main purposes were to develop contacts and ties between the two countries and investigate aquatic subjects important for shore protection and the increase of the food supply from the Southeastern Mediterranean and from inland salt and fresh water lakes. In the original phase the program's research effort consisted of seven sub-project areas: coastal management, biological productivity, lake management, fish nutrition, production on monosex tilapia, controlled reproduction of commercially important finfish, and development of intensive fish culture in seawater ponds.

An evaluation of the Cooperative Program's first phase was completed in March 1983. The evaluators were both positive and enthusiastic about the general level of cooperation and research progress. They recommended continuation. However, they also recognized existing socio-political and project-related impediments. More specifically the atmosphere for better communications and ties had been handicapped by events in Lebanon and potential blacklisting of Egyptian scientists by other

Arab states. Also research progress had been sometimes disappointing because of delays stemming from difficult national and international bureaucratic procedures plus unrealistically optimistic research targets.

Finally, the evaluators recognized that the number and sophistication of scientific accomplishments were proportional to the quality of the scientific base from which the work originated. Clearly the Egyptians began with a comparative disadvantage and consequently were less productive. Parenthetically, their program probably received the greatest boost.

The second phase of the program, also three years, was approved in September, and began in October, 1983. Of the original seven sub-projects only three survived the trilateral steering committee's proposal process relatively unscathed. These were coastal management, biological productivity, and production of monosex tilapia. An additional three sub-projects (nutrition, controlled reproduction, and development of intensive fish culture) were given a one-year lease-on-life to provide for a smooth termination. The final sub-project, lake management, was deleted in the AID/W review in part because the first evaluation had implied inadequate progress and had stressed the two lakes' differences and not their similarities vis-a-vis cooperative research possibilities for management and increased fish production.

Now the second phase program's technical activities are about mid-life. The atmosphere for cooperation has endured the intervening time interval. Hence a mid-term evaluation, the subject of this report, is a timely and appropriate undertaking.

III. EVALUATION METHODOLOGY

A. Reason for the Evaluation

This is a mid-term evaluation, mentioned in the documentation entitled "Program Evaluation" Section II A.2.d. External Reviews, prepared by the New Jersey Marine Sciences Consortium May 9, 1984 and submitted to AID May 16, 1985. Evaluation methodology was apparently overlooked when the project was authorized in September 1983. In fact the referenced section simply states "It is assumed that AID will continue to cover these appraisals."

B. Evaluation Timing

Phase II of the project was funded in October 1983 for a three year period. Therefore this evaluation is as close to mid-term as feasible. AID is also currently giving consideration to a Phase III proposal under the same program title. Consequently the material in this review may also provide background in the deliberations on project continuation.

C. Methodology

The basic approach to the evaluation followed the conventional pattern of the review of project documentation, reports and publications, interviews with senior project personnel in Egypt and Israel and field trips to research sites in both countries. The two team members, a fisheries biologist and an engineer, combined over four decades of experience in marine and aquatic research and in international development.

D. Preparation of A Unified Logical Framework

The logical frameworks presented to the evaluators were eleven in number. Two were presented for Coastal Management and Shore Processes, two for Biological Productivity, three for Production of Monosex Tilapia, three for Intensive Fish Culture and one for Program Management. None of these frameworks contained sections labeled "Project Purpose" or "Conditions that will indicate purpose has been achieved: EOPS". A considerable amount of the tabulated information was incorrectly classified, e.g. inputs appearing as outputs, etc.

To aid the evaluation process we have synthesized a single logical framework which we hope will be of assistance to the project and future evaluators. Material for this unifying synthesis has been drawn from the project proposal, annual reports, interviews and the original framework. Our sympathies go to the various PI's who had valiantly tried to complete the logical framework form, one which is quite foreign to the common terminology used in preparing and executing scientific research. Our sympathies also extend to the numerous AID personnel who failed to recognize the incomplete frameworks both in Phase I and Phase II. Our gratitude extends to Dr. Richard Newburg, former AID Agricultural Development Officer and now AID consultant, for clarifying our own concepts of the logical framework.

E. Detailed Documentation

Appended to this evaluation report are:

1. A unified logical framework (Appendix 1).

2. The Phase II logical frameworks submitted 5/16/84 (Appendix 2).

3. Project financial status as of 3/31/85 (Appendix 3).

4. Egyptian news article on the refusal of normalization (Appendix 4).

5. List of individuals interviewed (Appendix 5).

6. Reference list of documents consulted (Appendix 6).

7. Team itinerary for the evaluation (Appendix 7).

8. Scope of work (Appendix 8).

F. Recommendation

Evaluation Team Composition

Future evaluation teams for trilateral projects should have representation from each country, even if it means limiting the number of American

evaluators. We feel that both the constraints that limit technical cooperation and the bureaucratic bottlenecks that slow the Cooperative Marine Technology Program's progress would have been more fully clarified, perhaps leading to constructive solutions, had our teams contained fulltime Israeli and Egyptian representation. (It would also have resulted in another Egyptian travelling to Israel and simplified logistics in both countries.)

IV. EXTERNAL FACTORS

On balance, in April 1985, the positive moves toward cooperation between Egypt and Israel appear to outweigh the negative occurences, and allowing for some optimism that increased technical cooperation is probable for the future.

Negative external influences on cooperation center on the continued lack of full diplomatic relations and the political expressions by academics in opposition to normalization of Egyptian/Israeli relations. The latter include a resolution by the Egyptian University Councils in the Fall of 1984 not to engage in cooperation with the Israelis until certain specific political problems were solved and the March 1985 refusal by the Faculty of Science, Alexandria University to any form of normalization of relations with Israel (see Appendix 4). A Technology Program member's sentiment toward the discontent at Alexandria University is that it is fomented by a small group of malcontents and will soon pass from the scene.

The positive political notes are headed by Israel's withdrawal of troops from Lebanon and the trip to Cairo by Ezzer Weizman, Minister without Portfolio, exploring avenues to expand friendly and constructive bilateral relations. Israeli newspapers mention the possibilities for a "package deal" that would resolve most or all of the outstanding issues between the two countries including the contested square kilometer on the Red Sea called Taba and restoration of full diplomatic relations.

Government policy in both countries continues to encourage increased fish production and therefore is favorable toward marine and aquatic research. In Israel studies of the food chain of Lake Kinneret are underway with NSF support (Dr. Gary Vineyard and students from the University on Nevada participating) and in Egypt the government has abandoned plans to convert some coastal lake areas into irrigated farmlands and has renewed construction of the National Aquatic Center, an AID assisted development program. Also Dr. Ahmed Shoukr, of the Ministry of Agriculture completed a ten-day visit to the Israel Institute of Oceanographic and Limnological Research, September 1984, and returned to Egypt enthusiastic to have Egyptian scientists and administrators visit laboratories and offices in Israel.

V. KEY PROJECT ASSUMPTIONS

A. Summary

Generally the assumptions relating to the regional political situation remain to be validated. Improving diplomatic relations remain for the future.

By contrast, most of the assumptions relating to the collection and application of scientific knowledge have been validated.

B. Input

The input assumptions remain valid, and in fact have by-in-large been met. The equipment, save that for tilapia and fish culture in Egypt was available early on. Required personnel have been avilable in both countries even through some key replacements.

C. Output

Assumptions regarding the political climate of the region have still to be realized. Although there are some optimistic indications for improved relations (Section IV) they are yet to be realized. Consequently political pressures and social inhibitions still affect Egyptian scientists.

In general, the assumptions for coastal management and biological productivity have been proved correct. Enough data has been collected in both cases to produce the expected outputs.

The assumptions for production and fish culture of monosex tilapia have proven to be correct and validated in differing degrees, with greater validity for the Israeli research.

D. Project Purpose

Scientists still experience barriers in communication caused by political difference, hence the assumption has yet to be validated.

The progress of research in the four sub-project research activities has shown that the assumptions for achieving purpose remain valid.

E. Program Goal

The goal assumption related to cooperation between professionals remain unproven since diplomatic relations have yet to show more promise than real improvement.

The goal assumption relating to scientific knowledge remains valid with demonstrated project accomplishments.

VI. PROGRESS SINCE LAST EVALUATION

The previous evaluation took place in March 1983, toward the end of Phase I. Progress since then has been steady, and in some cases spectacular.

The exchange of information between Egypt and Israel has become a two-way conduit. Written communications from the Egyptian scientists to their Israeli counterparts are now occuring in both the coastal management and monosex tilapia sub-projects. Also the first joint publication is reported as in preparation by the biological productivity group.

The interchange of ideas and information at the Program's Annual Meeting remains open, frank and friendly. National affiliations were of little if any significance during the two days of technical and administrative discussions in which the evaluation team participated. We recommend, therefore, that future evaluations be scheduled to coincide with one of the Cooperative Marine Technology Annual Conferences so that the atmosphere and level of trilateral interaction can be understood. The first evaluation, we feel, suffered by not seeing the Program from this perspective of cooperation.

Management of the Program has profited from two initiatives. First, a steering committee for the overall Program has been constituted with two members each from Egypt and the USA and a single member for Israel. The steering committee serves to coordinate forward planning. Second, funding for the Egyptian sub-project of biological productivity goes directly to the account of the Principal investigator at Alexandria University. Consequently, the transfer of funds has been expedited.

VII. INPUTS

Overall management inputs have been received by the sub-projects in a timely manner. The NJMSC and Texas A&M are to be credited for their diligent efforts in supplying project equipment, making travel arrangements, and disbursing sub-proje funds to keep current with expenditures. Managemen has documented project activities through two "annual" reports (a third annual report is now in preparation) and numerous field trip reports.

The March 1983 Evaluation (page V) recognized the contribution to the Program by the American scientists: "The brokerage and stimulation activities of the American participants was essential not only to the creation of the Program but to its development as well. An active American middle man role, albeit at a considerably lower level of intensity, remains essential, at least until there is a marked improvement in Egyptian-Israeli political relations".

The current evaluators also support continued American participation in the Program. The American scientist is an active contributor in the promotion of greater Egyptian-Israeli cooperation as well as being a source of new technical concepts and equipment.

The majority of equipment components purchased for the sub-projects are in place and operational. CAS systems, decoders, and computer equipment were observed in coastal management research. The biological productivity group was observed using project-funded laboratory equipment and a high-tech salinity-temperature-depth recorder. The tilapia work was being aided by microscopes and a pond recirculation system. In fish culture the equipment provided was being used to construct a running-water aquarium system, analytical equipment for nutrition analyses, and pond aeration machinery.

Professional staff, including graduates, receiving part or full time support from the Program, number over 50. This in itself constitutes a mark of achievement in the public awareness being achieved by the program in the aquatic scientific community. All of the scientists and students we contacted were aware of the Program's collaborative nature, e.g., an effort to solve technical problems of common concern for both Egypt and Israel.

Numerical details of the Program's financial status are presented in Appendix 3. The accounts were provided by the Financial Office of the NJMSC. In general the records checked with field accounts, allowing for the customary delays inherent in transmitting and posting financial information. Unfortunately, the transfer of funds through the IOF to the sub-projects still seems to involve considerable time delay. This problem had also been noted in the first evaluation. In numerical terms, where the funds that were transferred directly to the Principal Investigator's account (Biological Productivity) 70 percent of the first two year's funding has been disbursed. Whereas with the funds for Coastal Management and Monosex Tilapia which first pass through the IOF Administration, only 44 percent and 32 percent respectively have been disbursed. Principal Investigators in Egypt uniformly complained of funding-caused delays where the funds were not directly controlled by the Principal Investigator. Since it is the Principal Investigator that has sub-project responsibility for the scientific progress he should have more ready access to the funds.

Recommendations

1. Funds for the Coastal Management sub-project should be transferred directly from NJMSC to the Principal Investigator's account. Since this activity is now an Authority of the Water Research Center in the Ministry of Irrigation, there is little rationale for disbursement through the IOF. If possible, Monosex Tilapia funds should also be given a more direct route to that sub-project.

2. Minimal participation of American scientists should be continued for all sub-projects in the Program.

VIII. OUTPUTS

A. Actual Progress Measured Against Projected Output in Current Project Design

In this evaluation it was decided that the project logical framework needed modification. The evaluation team has developed a suggested alternative (See Section III, EVALUATION METHODOLOGY: Appendix 1). In this section, we consider outputs as those elements of the suggested logical framework, i.e., we discuss work in progress toward providing each sub-project's stated output.

1. Management for Cooperation

The Project Manager appears to be doing everything possible to achieve cooperation at all levels of the project including "output". Field trip reports (for January and April 1984) and planning session reports (August 1984) testify to the level of management's effort to enhance communication. The evaluation team participated in a planning session in Cairo, April 16 and 17 where Israels PU's attended. Communication at general sessions and within working groups we visited (coastal management and shore processes, and Monosex Tilapia sub-projects) was excellent and indicative of the Project Manager's dedication.

As a group, Israeli scientists have visited their Egyptian counterparts on two occasions during Phase II. Also Biological Productivity and Monosex Tilapia sub-project investigators from Israel made separate trips to visit their Egyptian counterparts. No Egyptian sub-project PI has visited Israel.

2. Collaborative Scientific Activities

a. Coastal Management and Shore Processes

Both Egyptian and Israeli scientists feel that the most significant step forward during this phase is the increasing reliability of the CAS system and the

ability of both groups to do their own data decoding and analysis. Both groups now have computers, software and support expertise in-house.

Since the data gathering machinery appears to be more reliable, the PI's are free to concentrate on analytical tasks (as opposed to overcoming hardware problems).

Israeli and Egyptian collaborators (Drs. El-Wany and Carmel) intend to meet at the CCS, Scripps Institution of Oceanography, for a joint analytical effort based upon wave data which were collected when both Egyptian and Israeli systems were operating at the same time.

The data base on nearshore wave climate is expanding and both groups should be able to make good use of the information in estimating sediment transport along parts of the coast.

What information on currents (mostly on the Egyptian sub-project) is being accumulated has led to some insights on local regimes. Various patterns have been defined at Rosetta, Burulius, and Damietta. It should be emphasized that a "large picture" of current structure in the southeastern Mediterranean comparable to that being generated by the CAS systems is beyond the scope of the sub-project since many more current measurements (more current meters) would be required.

The beach profiling work is being done and valuable information is being accumulated. Analyses of the data are in progress and detailed descriptions of what is happening with respect to erosion of the Egyptian coast at certain areas should result. In addition, Israeli profiling work is taking place at selected sites to develop information on beach structure effects and time history of straight beaches.

Work on this sub-project is proceeding well. Knowledge of wave induced forces of sediment transport is critical to making inferences on sediment budgets. During this phase, one thesis and 21 papers/reports were completed; one paper/report is in the final drafting stages; two thesis and at least seven paper/reports are in preparation. We find the outputs of this sub-project well above expectation at this stage of Phase II. In particular, recent papers by Carmel, Inman, and Golik (1985) on storm wave characteristics and directional wave measurement exemplify quality outputs generated by this sub-project.

It should be mentioned that the success of this sub-project with respect to accumulating wave data has resulted from the deliberate technology transfer effort begun during Phase 1. This is exemplified by Dr. Lowe's recent April visit to Egyptian and Israeli groups to continue his work of trouble shooting and sharing the expertise of the CCS at Scripps. At this time, we believe that both groups are capable, or almost capable, of operating independently.

A consideration of importance is that the Egyptian Ministry of Irrigation has a policy where data that have been collected must be "approved" for release. This means that Egyptian data must be "cleared" before they can be shared with others. Thus the trip planned by Drs. El-Wany and Carmel to the CCs, Scripps must wait for an official approval process. This could be a problem when the investigators wish to pool resources and "view" the whole Nile littoral cell as a single system.

b. Biological Productivity

The major outputs of this sub-project could include the following: an "oceanographic baseline" for the southeastern Mediterranean; progress

toward a "total picture" of primary productivity; exposure of many participants (especially Egyptian students) to modern oceanography.

The major thrust at present is on working out details of primary production: describing the nutrient regimes; describing carbon flux at various trophic levels; and establishing distribution baselines for various plankton groups. At this time, considerable effort is going into determining where in the water column primary production is concentrated and in establishing which organisms are involved. In addition, work is being done on describing temporal and spatial distribution of various planktons from primary producers through ichthyoplankton.

Much of the primary production work, at this stage in the sub-project, is under direction of Dr. El-Sayed. During this evaluation period he participated in both Egyptian and Israeli cruises. This is very positive in our view because it contributes continuity and standardization to the data collection.

The sub-project has reaffirmed that production in the pelagic ecosystem is low, nutrients scarce, and that small phytoplankton figure importantly in total production. Present emphasis is to account for the biomass and growth of higher trophic levels in terms of existing primary production.

We regard the outputs of this project to be above and beyond expectations for several reasons: (1) Dr. El-Sayed's work, with Dr. Webber, is contributing state-of-the-art technique and experience to the project; and (2) Dr. Herman's group, now represented by Dr. Walline, is developing a "rapid-response" capability through using automated instrumentation so that sampling decisions, e.g., optimal positioning of sampling bottles for the hydrographic cast, can be made in "real time" so as to maximize the return of information.

Dr. Dowidar's group is taking full advantage of the availability of a research vessel in that many individuals, graduate students in particular, are using the ship as a research platform and, at the same time, being exposed to modern oceanography. As is the case in the Coastal management and shore processes sub-project, significant technology transfer has been accomplished and has increased sub-project output.

Several Egyptian students have received specialized training, e.g., in ichthyoplankton taxonomy. During this phase two thesis and at least 11 papers/reports are in the final drafting stages; four thesis and seven papers/reports are in preparation.

The logical framework we prepared calls for locating major nutrient sources inshore and offshore and for a synthesis of data for guiding future fisheries policy. (These outputs were based on "objectives" drafted in the Phase II project proposal). The level of sampling effort (which is driven by inputs of funds) as well as time with the project will dictate how well these sorts of outputs are realized. The ecosystem is complicated and the "complete picture" may be a long way off. However, the work being done now has never been done before in the southeastern Mediterranean. Also, any new knowledge gained as project outputs is an essential foundation for future oceanographic or fisheries work.

c. Monosex Tilapia

Outputs of this sub-project mid-term in Phase II include: additional basic data on growth rates in different Tilapia hybrids; more experience in performing crosses yielding predominantly males; improvements in freshwater fish breeding infrastructure in Egypt and Israel.

Specifically, accomplishments to date are:

1. Various hybrids of Tilapia nilotica (Nile Tilapia) x Tilapia aurea (blue Tilapia) from differing parent stocks were screened for growth rates. This work was done for both adults and young-of-the-year fish (in Israel).

2. The finding that growth of the hybrid T. nilotica x T. hornorum (Zanzibar Tilapia) was in the range of growth of other T. nilotica x T. aurea hybrids is important since this cross yields all male progreny. In the past it has been assumed that although the hybrids were all male, growth rates were too low to be economically attractive. Thus this hybrid is worthy of more study (in Israel).

3. Hormone treatment to effect sex-reversal, as practiced commercially in Israel, was found not to retard growth (after the treatment period).

4. Red Tilapia, a member of genus Tilapia having uncertain species status, was tested for growth and survival features. For the first round of experiments, survival was low. This work is important because Red Tilapia has considerable market potential on account of its attractiveness to consumers. (This work is being done in Israel).

5. An Egyptian T. aurea brood stock has been established at the IOF El-Barrage station and growth determination work has been done on T. nilotica x T. aurea hybrids (in Egypt).

6. Work is proceeding on grow-out strategies. A measure of optimal stocking rates (for achieving maximum growth) has been determined for cement lined ponds and the work will be repeated in earthen ponds. Work is also proceeding on determining optimal starting sizes for fingerlings (in Egypt).

7. Growth rate studies have been completed and are underway on effects of different concentrations in feed (for effecting sex reversal, in Egypt).

During this phase, professional exchanges took place in addition to planning sessions. Dr. Hulata visited El-Barrage.

Dr. A. Shoukri, Undersecretary of the Ministry of Agriculture, accompanied by Mr. A. Khater who is completing graduate work at Auburn University, visited the ARO laboratory at Dor and other Israeli Aquaculture sites. Dr. R. B. McGeachin visited El Barrage.

Various strains of Tilapia were exchanged during these visits. As with other sub-projects, the Israeli PI (Dr. Hulata) attended this April's planning sessions.

We find that this sub-project is performing up to expectation. Five papers/reports have been completed during this phase; a thesis and five papers/reports are in the final drafting stages; a thesis and at least three papers/reports are in preparation.

The sub-project outputs of the Israeli and Egyptian scientists differ in orientation and scope. This is partly due, we believe, to the infrastructural development of the respective facilities. In particular, the Dor laboratory is extensive in area, number of ponds, and facilities while the El-Barrage station is considerably more modest. For example, El-Barrage has experienced losses of Tilapia strains due to cold weather. Also the traditional water supply has changed. Both of these serious problems are being solved (by a new building and new well). Therefore differences in output are more a function of the setting than the will of the individual PI's.

d. Fish Culture and Nutrition (Phase-out)

Although this sub-project is in a "phase out" mode, substantial outputs have been generated. In Egypt, there are new baseline data for fish nutrition. These data will contribute to feed formulas that may be applied in Tilapia and carp culture. A consequence of this work is that interest is developing in Egypt in intensifying fish culturing practices through application of formulated feeds.

In Israel, contributions have been made in determining optimal protein/energy ratios in feeds for gilthead seabream (Sparus aurata) in intensive polyculture.

Additionally in Israel, work on photoperiod induction of gonadal maturation had borne fruit and is being successfully used (to provide fertilized seabream eggs in the off season).

In Israel work at the IOLR National Center for Mariculture has continued on intensive saltwater pond culturing systems using gilthead seabream. Nutrition studies of protein/energy ratios were extended to juvenile fish.

An effort at this time is to establish essential fatty acids. A standard test diet has been developed for use in screening experiments. Work in establishing fatty acid baselines in various ages of seabream is presently in progress. This is important because knowledge of which fatty acids are essential will permit meals to be formulated using inexpensive but fortified agricultural products.

In the intensive culture work, various problems have been investigated or are in the process of being investigated. These efforts may be summarized as follows:

1. Polyculture research with seabream, mullet and oysters where oysters serve to filter the system of phytoplankton.

2. Polyculture systems development where Penaeid shrimp are substituted for seabream in the system.

3. Developing stocking strategies and species ratios for polyculture.

4. Studying saltwater pond ecological processes related to sediment behavior and water chemistry.

5. Water quality research, particularly diurnal trends, causes and effects of oxygen and ammonia concentrations.

In short, the IOLR research in intensive seabream polyculture is considering a variety of basic problems critical to this type of mariculture.

In Egypt, the major outputs in this sub-project are in the development of nutritive feeds based upon readily available, inexpensive materials, such as agricultural or municipal waste products. Accomplishments under Phase II include:

1. Completed amino acid analyses of potential feed constituents, e.g., beer waste, wheat bran, etc.

2. Energy values established for various potential feed constituents.

3. Nutrition and growth experiments on Tilapia in still and running water aquaria using experimental pelleted feeds.

4. In addition to the feed formulation work, studies are underway on spawning induction in mullet (Mugil sp.). To date, histological studies to describe gonad maturation have been done and a brood stock has been collected and is being maintained at the IOF laboratory at Lake Quarun.

The work by Israeli and Egyptian collaborators reflects local needs. Intensive mariculture in Israel could yield high priced products such as seabream and oysters which can be sold on the international market. In Egypt the emphasis is on developing more intensive systems than exist presently and which will contribute to the country's production of protein food.

Nevertheless, many problems of pond ecology, water quality, nutrition, induced spawning, rearing of fry, etc., are common to both. Collaboration therefore is desirable. Apart from planning sessions, where the Israelis attended, we are not aware of technical exchange visits.

We believe that this sub-project, like the others, is going well. It is unfortunate that funding was curtailed since the quality and quantity of the outputs appear to be up to expectation.

In Egypt much of the Phase I support has gone into providing infrastructure. At this point in time, we assume that more rapid progress (in Egypt) could be made

with funding since many new systems, including laboratory equipment, are in place and becoming operational. During Phase II four thesis and at least 13 papers/reports are completed; two thesis and six papers/reports are in the final drafting stages; five thesis and seven papers/reports are in preparation.

X. PURPOSE

A. The Suggested Unified Logical Framework Is Used To Evaluate Progress Toward Achieving Purpose. It is quoted below:

1. Increased regional cooperation between Egypt and Israel.

2. Create the information base, through research, necessary for the achievement of Goal 2 with the following sub-projects:

   a. Coastal management and shore processes in the southeastern Mediterranean;

   b. Biological productivity of the southeastern Mediterranean in the post high Aswan high dam period;

   c. Production of monosex Tilapia; and

   d. Culture and nutrition of commercially important fishes.

B. Progress Toward End of Project Status (EOPS) Conditions:

1. Management for Cooperation

A high level of joint participation through professional exchanges has been achieved. The evaluation team took part in the 13th joint planning session of the program, a harmonious and productive meeting where planning for future collaborative efforts was prominent. Also, written sub-project communications are now flowing from Egypt to israel as well as vice-versa.

In spite of the advances cited above, the reluctance of Egyptian scientists to travel to Israel is considered to be a severe limit in progress toward complete joint participation. The linkage of this limitation in progress to external factors is difficult to assess since scientific personnel in both of the other similar regional projects (agriculture and health) have willingly traveled to Israel for

collaborative research purposes. Just why, where, and how travel restrictions are imposed is difficult to discern. However, it would behoove the Marine Technology Program to take advantage of more favorable situations available in other ministries if at all possible.

Sub-Project Transfer From IOP to MOA

Investigate the possibility for transferring monosex Tilapia research from the IOP, ASRT, Ministry of Education to the General Authority of Fish Resources, Ministry of Agriculture (MOA). The MOA has a core of personnel trained in fish breeding and has relatively well equipped laboratory facilities at the Abassa Hatchery. The collaborative policy of the MOA would make it more likely that the EOPS could be fully achieved.

2. Collaborative Research Activities

a. Progress toward EOPS in Coastal Management and Shore Processes has been outstanding and can be judged as having reached a state that indicated the purpose has been achieved. In Egypt the data generated by the project's research is being passed on to the United Nations Development Program for use in design studies of shore protection. In Israel, the analysis of wave data has produced descriptions of wave climate and sediment transport accepted in refereed international journals.

b. The accumulated volume of basic knowledge of oceanographic features and trophic relationships has been excellent. Considering the never-ending volume of basic information to be gathered, the achievement of End of Project Status for biological productivity research is somewhat of a judgement call. It is the opinion of this evaluation team that the number of successful research cruises completed, the amount of biological data analyzed, and the training time provided for both professional staff and graduate students constitute achievement of purpose.

c. Progress is more than satisfactory in research for elimination of uncontrolled spawning of Tilapia through production of all-male hybrids and sex-reversal techniques. However, some of the planned breeding crosses were not possible due to breeding stock mortality and the lack of adequate laboratory facilities - particularly in Egypt.

A preliminary assessment of the growth rates of male Tilapias has been accomplished in Egypt and further assessments are planned for the coming year.

Like the work in Biological Productivity, research in fish breeding and hybrid growth evaluation continually suggests new avenues to be explored. Consequently the achievement of purpose is, to an extent, a matter of judgement. It is the opinion of the evaluation team that this sub-project's purpose will be achieved with completion of the coming year's plan of research.

d. The phase-out progress has been outstanding in relation to the perfection of culturing techniques for rearing gilthead seabream. The progress in testing Tilapia diets for nutrient value have been limited because of the lack of facilities in the first two years of the sub-project. However, nutritional studies underway in flow-through aquaria can be considered as sufficient progress to minimally satisfy the desired end of project status condition.

Proviso For Future Funding

Future funding for cooperative fish culture research should be favorably considered with the following proviso: Egyptian scientists, possibly accompanied by graduate students, initially complete a three to six month sabbatical at the Israeli National Center for Mariculture at Elat under a program of work-study in nutrition and maricultural techniques that is mutually agreed upon in advance.

I. GOAL

Goal Statement

Quoted from the suggested logical framework the program or Sector Goals are as follows:

1. Improve international relations in the Middle East.

2. Increase production and preserve productivity capacity of key physical resources.

Goal Status and Expections

1. The notable increase in interactions and communications between Israelis and Egyptians, which constitute a part of improved international relations, have already been discussed in Section VI, Progress Since Last Evaluation. The notable roadblocks to further improvement of relations among Egyptian and Israeli scientists have also been cited.

   The major factors influencing Goal 1 expectations were eloquently expressed in the first evaluation (page 1):

   "As a general rule, international scientific relations are heavily influenced by the foreign policies and internal politics and economics of the participating countries. Even when such relations are at their freest, it is because the governments are willing or wish to have it so. Strained political relations between two countries result in strained relationships in science as well as other fields..."

2. Some of the scientific research generated by the Cooperative Marine Technology Program has resulted in practical applications that will either enhance food production or protect key physical resources. Additional useable research results can reasonably be expected from the program as it continues.

XI. BENEFICIARIES

Foremost among beneficiaries is the world-wide scientific community concerned with marine and aquatic topics. Much of the research, in all four sub-project areas, is of international caliber and applies to regions of the world outside the southeastern Mediterranean. This is particularly true of the new methods developed: for wave data acquisition and analysis, an advance in shore protection design; for the understanding of the importance of nanoplankton and picoplankton in the food chain in non-eutrophic seas, which may aid future marine fisheries; and the artificial rearing of gilthead bream and tilapia that is now about to be commercially exploited to provide additional sources of protein.

It follows, from the above, that the Egyptian fisherman and fish farmers, plus numerous members of the Israeli kibbutzim, will have future opportunities for production of more marketable fish products and that the coastal inhabitants of both countries, threatened by eroding shorelines, will receive greater protection.

The contribution that this Program has to the normalization of relations between Egypt and Israel remains ambiguous, but still deserves mention. Lasting friendships have been formed among the scientists and their families. These warm relations tend to spread and overcome past political rhetoric that distorted opinions and erected barriers to normalization on the people-to-people level. Ultimately the entire population of both nations will be beneficiaries of increased political stability.

XII. UNPLANNED EFFECTS

We were not able to identify clearcut unplanned effects. Therefore no changes in project design or operation are indicated.

XIII. LESSONS LEARNED

Relationships to Other Development Problems

This project has demonstrated that subtle forces exist which apparently inhibit certain professional interactions. In this project the kind of collaboration one would have expected by scientists was prevented. It should be emphasized that the project and design may be perfectly valid. A reallignment of PI's or funded institutions may be all that is required (See recommendations elsewhere in this report). Also, based upon our reading of the Cooperative Arid Lands Agriculture Research Program evaluation of September 1981, we believe that more progress could have been made were other institutions, e.g., the Eyptian Ministry of Agriculture, to have participated.

Suggestions for Follow-on

Follow-on work of the Phase II sub-projects is evaluated as desirable if solely for the anticipated research progress. Moreover, the follow-on could serve as leverage toward greater Egyptian/Israeli collaboration with the appropriate conditions precedent.

We are aware that proposals for additional cooperative work are in the submission process (for Phase III and IV). However their assessment was not part of the scope of work.

XIV. SPECIAL COMMENTS OR REMARKS

Oversight Considerations

In the hope of providing better oversight (e.g. by USAID) for what we consider a worthwhile project, we suggest that project management be assigned to the same individual who is acting as Project Officer for the USAID/Cairo Aquaculture Development Project.

Scope of Work

The following points were called for in the scope of work but have not been covered in detail in other sections of the report. We note here these points item by item from the scope of work:

B.6. Type of Sand...under the nearshore adjacent water.

The Egyptian group has mapped sediment types and done this work recently. Extensive sediment identification work is being done by the Israelis at Hadera.

B.7. Defined Northern Boundary of the Nile Littoral Cell.

This feature is generally recognized to be at Haifa Bay.

B.8. Analyzed the Shore Processess for Planning and Engineering Purposes at Specific Sites...(for)...the Solution of Erosion and Other Coastal Engineering Problems.

Both Egyptian and Israeli PI's are using new knowledge gained through the sub-project in offering information useful in making coastal engineering decisions.

C.6. - C.9. Biological Productivity Scope Items.

These questions are dependent on project inputs and time (See discussion in Section VIII, Outputs). Certainly insight into these questions is being generated by the sub-project and at a level which, in our opinion, is up to or beyond expectation.

D.4. Produced all Male Tilapia.

Tilapia hybrids yielding exclusively males are known. The problem is to achieve production features, e.g., rapid growth, which are economically attractive.

D.5. Produced all Male Tilapia Through Sex Reversal Using Methyltestosterone.

This technique is used by commercial fish farms. The problems of induced sex reversal revolve around production parameters, e.g., growth rates.

D.7. Developed Polyculture of Tilapia with Carp, Mullet, and Catfish.

The Israeli PI assesses hybrid growth in pond polyculture; catfish are not cultured in Israel.

E.2.f. Terminated Vitamin Needs Assessments.

We found no reference to vitamin needs ongoing or proposed.

APPENDIX 1

Project Title: Unified Logical Framework for the Cooperative Marine Technology Program for the Middle East

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goals: 1. Improve international relations in the Middle East. 2. Increase production and preserve productivity capacity of key physical resources.	Measures of Goal Achievement: 1. Increased communication, interaction and travel among citizens of Israel and other Middle Eastern Countries. 2. Application of basic principles discovered through joint (Egyptian/Israeli) research to problems of resource utilization.	Verification of Goal Achievement 1. Communications media reports travel and trade statistics, etc. 2. Engineering projects and resource management strategies based upon scientific knowledge acquired during this period.	Assumptions for Achieving Goal Targets: 1. That technical level cooperation between professionals of different nations can enhance improving diplomatic relations. 2. That when scientific knowledge is rendered available in useable form, government agencies and/or the private sector will take appropriate action to increase (food) production and manage key physical resources optimally.
Project Purpose: 1. Increase regional cooperation between Egypt and Israel. 2. Create the information base, through research, necessary for the achievement of Goal 2 with the following sub-projects: a. Coastal management and shore processes in the S.E. Mediterranean.	Conditions That Will Indicate The Purpose Has Been Achieved; End of Project Status (EOPS): 1. Joint participation in research projects and/or professional exchanges. 2. Collaborative scientific research activities: a. Increased fundamental knowledge of shore processes of the Nile littoral cell such that more rational coastal engineering/ management decisions can be made.	Verification of Purpose Achievement: 1. Joint authorship of papers or presentations at international symposia; bilateral government policies which were positively influenced by the project's results. 2. Scientific publications and symposia reporting results that use the sub-projects findings as a starting point, government and private sector adopting, wholely or in part, project findings through:	Assumptions For Achieving Purpose: 1. Science professionals are able to communicate in research without being hindered by political differences. 2. Collaborative scientific research activities: a. That information gathered on wave climate, sediment, and coastal currents will lead to realistic predictors for the con-

Project Title: Unified Logical Framework for the Cooperative Marine Technology Program for the Middle East

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Purpose: b. Biological productivity of the S.E. Mediterranean in the post High Aswan Dam Period. c. Production of monosex Tilapia. d. Culture and nutrition of commercially important fishes.	Conditions That Will Indicate The Purpose Has Been Achieved; End of Project Status (EOPS): b. Basic knowledge of oceanographic features and trophic relationships in the Southeastern Mediterranean. c. New Tilapia production techniques based on monosex hybrid: knowledge of new hybrids and strains with quantitative information on production features, e.g., growth rates, etc. d. New techniques for culturing fresh water and marine fauna with respect to: feed formulation, polyculture systems development, maximization of (economic) yield, water quality.	Verification of Purpose Achievement: a. Consultation with project related shore processes experts. b. Recognition of fish production constraints and potentials in the S.E. Mediterranean. c. Adoption of a Tilapia hybrid for increasing yield. e. Adoption of advanced culture/nutrition techniques.	Assumptions For Achieving Purpose: stuction of shore structures and government coastal management policy. b. That fundamental oceanographic features and biological processes in the S.E. Mediterranean can be identified and verified at this project's level of support. c. That the screening of various hybrids for desirable characteristics will lead to increased Tilapia production in the region. d. That the various fish culture systems/techniques being research will be adopted by the region's aquaculturists.
Outputs: 1. Management for cooperation. Management for collaboration and communication among project investigators. 2. Collaborative scientific research activities.	Magnitude of Outputs: 1. Management for cooperation. Collaboration in reporting of research findings and in performing research tasks; sharing data and research resources.	Verification of Output Achievement: 1. Management for cooperation. Joint authorships of articles and presentations; joint cruises, visits, workshops, sabbatical leaves, professional meetings; transfers of equipment, data; joint proposals.	Assumptions For Achieving Outputs: 1. Management for cooperation a. That the regional political situation will not worsen and in fact, will improve significantly.

oject Title: Unified Logical Framework for the Cooperative Marine Technology Program for the Middle East

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
utputs: a. Coastal management and shore processes: i. Nearshore wave climate and longshore sediment transport potential defined. ii. Determined importance of coastal currents as forces of sediment transport. iii. Estimated coastal changes and sediment transport rates on the basis of beach profile surveys. iv. Studied processes now modifying the continental shelf and determined sediment types and transport paths over it. v. Estimated sand reservoir and type nearshore. b. Biological productivity: i. Increased understanding of physical basis of observed chemical and biological data (including Coastal Zone Color Scanner data). ii. Located major nutrient sources inshore and offshore.	Magnitude of Outputs: 2. Collaborative scientific research activities. a. Coastal management and shore processes: with respect to making inferences about wave climate features. i. Capability to collect and analyze wave data and completed analyses of existing wave data bases with respect to sediment transport. ii. Capability to collect and analyze current data. iii. Accomplishment in developing beach survey data. iv.-v. Analyses of wave, current, and profile data as well as of data on sediment type and distribution. b. Biological productivity: i.-ii. Capability to measure physical/chemical oceanographic properties at sea and to undertake data analyses (including analyses of Coastal Zone Color Scannar data)	Verification of Output Achievement: 2. Collaborative scientific research activities. a. Coastal management and shore processes: i. Performance of CAS system; papers and reports. ii. Performance of current monitoring program; papers and reports. iii. Beach profile data base; papers and reports. iv.-v. Papers and reports. b. Biological productivity: i-iv. Number of cruises and participating scientists; nature and types of instrumentation employed; papers and reports; site visits. v. Papers and reports. c. Monosex Tilapia: i-iii. Site visits; papers and reports. d. Fish culture and Nutrition i.-vii. Site visits; papers and reports.	Assumptions For Achieving Outputs: b. That political inhibitions and social pressures which prevent real interaction are removed and that project resources are adequate to facilitate the process, e.g., travel funds. 2. Collaborative scientific research activities: a. Coastal management and shore processes: i.-v. That the data bases being built will be sufficient to produce expected outputs and that resources will be adequate to maintain the data collection systems without interruption long enough to produce expected outputs. b. Biological productivity: i.-v. That the project time period and resources furnished (as inputs) will be sufficient to produce the expected outputs, i.e., that enough stations are being occupied,

ct Title: Unified Logical Framework for the Cooperative Marine Technology Program for the Middle East

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
ts: iii. Established carbon flux pathways through several trophic levels. iv. Map seasonal distribution of ichthyoplankton and obtain preliminary feeding data. v. Synthesize project data as a basis for future fisheries policy. . Monosex Tilapia: i. Growth rates determined for adults and young-of-the-year fish for various hybrids and strains. ii. Various hybrids and strains screened for all male progeny. iii. Growth rates determined for sex-reversed fish. . Fish culture and nutrition: i. Identified ecological processes occuring in intensive fish culture saltwater ponds. ii. Investigated gilthead seabream and mullet polyculture system with oysters and macroalgae (or shrimp, oysters and algae).	Magnitude of Outputs: iii. Capability of partitioning primary producers and consumers among various planktonic components. iv. Be able to collect, at will in space and time, and identify ichthyoplankton species (or species groups) and their prey (food items). v. Analyses of project data with a view toward identifying fish production potentials and limitations of the ecosystem. c. Monosex Tilapia: i. Capability of maintaining the integrity of various stocks and hybrids over time (seasons) sufficient pond area and water supply to control experimental treatment variation. ii. Above (i) and maintenance of brood stock for producing all male progeny. iii. Above (i). d. Fish culture and nutrition: i. Existence of experimental methodologies so as	Verification of Output Achievement:	Assumptions For Achieving Outputs: enough data are being collected and that the project time-frame is long enough. c. Monosex Tilapia: i.-ii. That an all male Tilapia hybrid with desirable production features can be produced consistently. iii. That sex reversal procedures may be suitable in a production setting. d. Fish culture and nutrition: i. That intensive saltwater pond fish culture is technically and economically feasible. iii.-vi. That sophisticated culturing practices are viable in the existing social and economic settings. vii. That induced spawning will lead to reliable sources of fry for pond/lake stocking at a suitable price.

Project Title: Unified Logical Framework for the Cooperative Marine Technology Program for the Middle East

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Outputs:	Magnitude of Outputs:	Verification of Output Achievements:	Assumptions For Achieving Outputs:
iii. Developed optimal stocking strategies. iv. Determined feed composition strategies with respect to protein and lipid content v. Determined water quality impacts. vi. Established test diet for essential fatty acid screening; established fatty acid baselines for various (seabream) ages. vii. Induced spawning techniques in grey mullet investigated.	to make inferences about pond (ecological) systems. ii.-iii. Existence of sufficient pond area and water supply to control experimental treatment variation. iv.-vii. Above (ii.-iii.) and availability of analytical laboratory infrastructure.		

Project Title: Unified Logical Framework for the Cooperative Marine Technology Program for the Middle East

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Input: 1. Management for cooperation. Administrative expertise and experience in managing multi-disciplinary international groups; purchase and shipping of equipment requested by principal investigators. 2. Collaborative scientific research activities. a. Coastal management and shore processes: i. Dedicated offices and laboratories established and wave/current measurement/analysis equipment in place and operating at CPI, Alexandria, at IOLR, Haifa, and at CPS, La Jolla. ii. Expertise and previous research experience shared among the above (institutions). iii. Technology transfer accomplished though specialized training or visits by specialists. iv. External (AID) funding covering a portion of salaries, training, and travel.	Inputs: 1. Management for cooperation. Minimal delays in initiating and carrying out projects; facilitation of communications travel, reporting requirements; timely delivery of equipment; expenditures and disbursements. 2. Collaborative scientific research activities. a. Coastal management and shore processes: i. Facilities in place and equipment operable and in use. ii. Professional staff dedicated to project. iii. Travel by specialists/ technicians and time expended to transfer technology. iv. Expenditures and disbursements. b. Biological productivity: i. Facilities in place and equipment operable and in use. ii. Professional staff dedicated to project. iii. Travel by students to learn specialized techniques. iv. Expenditures and disbursements.	Inputs: 1. Records of participating institutions, external evaluators, published reports, on-site visits and project documentation.	Assumptions For Providing Inputs: 1. That the needed equipment can be purchased and implanted or operated within a reasonable period following initiation of the Program. 2. Required personnel can be hired upon commencement of the project.

Project Title: Unified Logical Framework for the Cooperative Marine Technology Program for the Middle East

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Inputs:	Inputs:	Inputs:	Assumptions For Providing Inputs:
b. Biological productivity i. Dedicated offices and laboratories established at the Department of Oceanography, Alexandria Univ., the Hydrobiological Inst., IOF, Alexandria, at the IOLR, Haifa, and at the Department of Oceanography, Texas A&M Univ.; research vessels and their support infrastructure operating and available in Egypt and Israel; oceanographic sampling equipment purchased and operating. ii. Expertise and experience of the cooperating Egyptian, Israeli, and American professionals available and dedicated to the subproject. iii. Technology transfer accomplished through specialized training. iv. External (AID) funding covering shiptime, a portion of salaries, training, and travel.	c. Monosex Tilapia: i. Facilities in place and operable at full capacity. ii. Broodstocks maintained in condition at project sites. iii. Resident professional staff dedicated to subproject; visits by guest investigators. iv. Expenditures and disbursements. d. Fish culture and nutrition: i. Facilities in place and operating. ii. Resident professional staff dedicated to project; visits by guest investigators. iii. Expenditures and disbursements.		

Project Title: Unified Logical Framework for the Cooperative Marine Technology Program for the Middle East

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Inputs:	Inputs:	Input	Assumptions For Providing Inputs:
c. Monosex Tilapia: i. Pond, laboratory and office facilities of the IOF, Cairo, of the ARO, DOR, and of the Department of Fisheries and Applied Aquacultures, Auburn University, Auburn, Alabama, dedicated to the sub-project. ii. Existing Tilapia brood-stocks for hybridization experiments. iii. Expertise and previous research experience by principal investigators available to the sub-project. iv. External (AID) funding d. Fish culture and nutrition. i. Pond, laboratory, and office facilities of the IOF, Cairo, of the IOLR, Eilat, dedicated to the sub-project; equipment for improved laboratory facilities at the IOF, Lake Quarun and at the IOLR Eilat operating and available.			

Project Title: Unified Logical Framework for the Cooperative Marine Technology Program for the Middle East

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Inputs: ii. Expertise and previous research experience by principal investigators available to the sub-project. iii. External (AID) funding (Egyptian from Phase I).	Inputs:	Inputs:	Assumptions For Providing Inputs:

Project Title & Number: U.S. Egyptian portion of Project III Coastal Management & Shore Processes in the Southeast Mediterranean

LOGICAL FRAMEWORK

Date Prepared: 10 Dec 83

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Objectives of Program: Determination of the budget of sediments along the Egyptian Mediterranean portion of the Nile Littoral Cell* and the climatology of their nearshore driving forces (waves, winds, and currents). This study is specifically concerned with determining the sources, transport paths, and sinks of nearshore sediments and with obtaining the time history and special dependence of waves and nearshore currents. The study includes six specific tasks: 1) measurement of wave climate; 2) measurement of current regime on the inner continental shelf of the Nile Delta; 3) determination of present sand sources contributing to the cell; 4) shelf processes and sediment transport paths off the Nile Delta; 5) reservoir of sand on the beach and shelf; and 6) analysis of shore processes at specific critical sites.	Measures of Goal Achievement: 1. Determination of the wave climate from existing data and from measurements of wave energy and direction at selected coastal sites. 2. Determination of the current regime from existing data and from measurements at the above coastal sites. 3. Measurements and description of the effect of waves and currents on sand levels and distribution along the coast and in proximity to coastal structures. 4. Estimation of the budget of sediments based on river discharge, deltaic erosion, entrapment rate at structures, mineral species distribution, and the annual longshore transport of sand calculated from the climatology of waves and currents 5. Recommendations for sand management along the Egyptian coastal portion of the Nile Littoral Cell.	1. Task achievements will be verified by the publication of successful measurements of wave climate, current regime and sand budget in summary reports and regular journal publications. 2. Further verification will exist when these data and the process interrelationships are translated into sand management policy recommendations.	Assumptions for achieving goal targets. 1. That valid output data are obtained from wave and current sensors and sediment survey work. 2. That continued cooperation can be maintained with Egyptian counterparts after the data summary phase to collaborate on sand management recommendations
Outputs: 1. Measurements of waves and nearshore currents. 2. Scientific papers pertaining to the six tasks above. 3. Recommended policy and procedure for managing coastal areas with particular emphasis on types and location of coastal structures.	Magnitude of Outputs 1. A data set of measurements of wave energy and direction at two coastal sites over a time period of one to three years. 2. Reports and scientific papers covering the six tasks listed in goals of narrative summary.		Assumptions for achieving outputs: 1. That continuity of funding can be maintained so that professional personnel can be continuously committed to the project. 2. That effective cooperation can be achieved with Egyptian counterparts for all phases of data acquisition, processing and reporting.
Inputs: 1. Review of existing data pertaining to the tasks listed under "Objectives of Program". 2. Measurements of waves and currents. 3. Measurement of beach profiles. 4. Measurements of sediment thickness and entrapment. 5. Determination of sediment type, mineral species, and sediment transport paths * The Nile cell extends from the Nile Delta to northern Israel (approximately from Alexandria to Haifa Bay).			Assumptions for providing inputs 1. That the needed equipment can be purchased and emplaced or operated within a reasonable period following initiation of the program 2. That equipment can be maintained and serviced by local attendants, and is not stolen, lost, or destroyed by unusual conditions. 3. That the cooperation of local, regional, and national authorities can be secured. 4. That a minimum-cost, maximum effective shipboard operating schedule can be achieved

Best Available Document

Project Title and Number: VIII. PROGRAM MANAGEMENT

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Program or Sector Goal: 1) To expand knowledge of the oceanography of the Eastern Mediterranean Sea & to employ that knowledge on behalf of the residents of the surrounding coasts. 2) To provide special stimulus & incentive toward regional cooperation in marine science & technology	Measures of Goal Achievement: 1) Observations of progress made in the technical projects. Analysis of progress reports. 2) Observations of the degrees of regional cooperation being achieved on each project.	1) Analysis of reports & publications, observation of peer reviews. 2) Continuous checking with participants, officials in the respective countries, scientists familiar with the program technologies, & respective embassies.	Assumptions for achieving goal targets: 1) The regional political will not worsen & in fact, will improve significantly. 2) That the U.S. Govt will review the ongoing work with approbation. 3) That eventually the Program can be announced publicly, thus... 4) Opening up avenues for seeking matching funds. 5) That the Program can be extended for approximately 3 Years beyond its presently scheduled termination date--depending upon conditions at the time. 6) That AID may be able to increase its support, at least to maintain pace with inflation. 7) That management will be able to accelerate, retard, cancel, and/or initiate projects according to project analysis, i.e., feedback. 8) That administrative support (i.e., relating to travel, equipment, supplies, procurement and communications) will be conducive to efficient management of the program. 9) That Program monitoring will be imaginative, understanding, and flexible.
Project Objectives: 1) (See goals listed for all of the other 7 projects) 2) Trilateral planning conferences. 3) Obtain agreement on common goals among the participants. 4) Achieve agreement on equipment to be used and cooperative purchase. 5) Arrange for scientist of each country to be working in the others' labs.	Conditions indicating purpose achieved: 1) Analysis of progress reports. 2) Assessment of conference reports & acknowledgements and criticisms of officials who receive them. 3) Analysis of dissenting opinions. 4) Monitor equipment purchases. 5) Tabulation & assessment of travel reports.	1) Peer reviews, acceptance (or rejection) of technical efforts by the consumers (e.g., public officials, industry, universities, etc.). 2) Acceptance of conference reports by public officials -- mainly USA. 3. Verify agreement by communicating periodically with all participants. 4. Verify purchases & receipts through the three respective finance officers.	
Outputs: 1) Regional planning conferences--reports of the conference. 2) Accomplishment of the goals set for the technical projects harmoniously and efficiently. 3) Statements of goals--common issue. 4) Purchase orders for equipment. 5) Scientists' travel--reports of meetings and joint project work.			
Inputs: 1) Execution of the technical projects. 2) Design & conduct of the conferences' agendas. 3) Design of goals & objectives--influencing universal acceptance. 4) Research the catalogue & determine optimum equipment for the respective tasks. 5) Arrange for each scientist to be accorded proper reception & hospitality, & conducive working conditions.			

Best Available Document

PROJECT DESIGN SUMMARY

LOGICAL FRAMEWORK

Date Prepared: 26 Nov 80

Project Title & Number: US-Israel portion of Project 111 Coastal Management & Shore Processes in the Southeast Mediterranean

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Objectives of Program: Determination of the budget of sediments along the Israeli coastal portion of the Nile Littoral Cell* and the climatology of their nearshore driving forces (waves, winds, and currents). This study is specifically concerned with determining the sources, transport paths, and sinks of nearshore sediments and with obtaining the time history and spacial dependence of waves and nearshore currents. The study includes six specific tasks. 1) measurement of wave climate; 2) measurement of nearshore current regime; 3) determination of present sand sources contributing to the cell and reservoir of available sand; 4) definition of northern boundary of the Nile cell; 5) effect of coastal structures on beaches; 6) analysis of shore processes at Ashkelon, Netanya, and Haifa.	Measures of Goal Achievement: 1. Determination of the wave climate from existing data and from measurements of wave energy and direction at selected coastal sites. 2. Determination of the current regime from existing data and from measurements at the above coastal sites. 3. Measurements and description of the effect of waves and currents on sand levels and distribution along the coast and in proximity to coastal structures. 4. Estimation of the budget of sediments based on river discharge, deltaic erosion, entrapment rate at structures, mineral species distribution, and the annual longshore transport of sand calculated from the climatology of waves and currents. 5. Recommendations for sand management along the Israeli coastal portion of the Nile Littoral Cell.	1. Task achievements will be verified by the publication of successful measurements of wave climate, current regime and sand budget in summary reports and regular journal publications. 2. Further verification will exist when these data and the process interrelationships are translated into sand management policy recommendations.	Assumptions for achieving goal targets: 1. That raw output data are obtained from wave and current sensors and sediment survey work. 2. That continued cooperation can be maintained with Israeli counterparts after the data summary phase to collaborate on sand management recommendations.
Outputs: 1. Measurements of waves and nearshore currents. 2. Scientific papers pertaining to the six tasks above. 3. Recommended policy and procedure for managing coastal areas with particular emphasis on types and location of coastal structures.	Magnitude of Outputs 1. A data set of measurements of wave energy and direction at two coastal sites over a time period of one to three years 2. Reports and scientific papers covering the six tasks listed in goals of narrative summary		Assumptions for achieving outputs: 1. That continuity of funding can be maintained so that professional personnel can be continuously committed to the project. 2. That effective cooperation can be achieved with Israeli counterparts for all phases of data acquisition, processing and reporting.
Inputs: 1. Review of existing data pertaining to the tasks listed under "Objectives of Program" 2. Measurements of waves and currents. 3. Measurement of beach profiles. 4. Measurements of sediment thickness and entrapment 5. Determination of sediment type, mineral species, and sediment transport paths			Assumptions for providing inputs 1. That the needed equipment can be purchased and emplanted or operated within a reasonable period following initiation of the program 2. That equipment can be maintained and serviced by local attendants and is not stolen, lost, or destroyed by unusual conditions 3. That the cooperation of local, regional, and national authorities can be secured 4. That a minimum-cost, maximum effective shipboard operating schedule can be achieved

* The Nile cell extends from the Nile Delta to northern Israel (approximately from Alexandria to Haifa Bay)

ISRAEL

PROJECT DESIGN SUMMARY
Logical Framework

Project Title & Number: Primary Productivity

Total U.S. Funding _____
Date Prepared _____

NARRATIVE SUMMARY	OBJECTIVE VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: 1. To evaluate present levels of primary productivity (PP) in the Eastern Mediterranean as baseline data for the assessment of potential pelagic and near shore fisheries. 2. To evaluate the suitability of satellite monitoring techniques: a) to delineate areas of high and low PP, upwellings, fronts etc., 2) to quantitate chlorophyll standing crops and potential PP, and c) to pinpoint off-shore areas particularly affected by pollution pressures. 3. To assess the major factors (nutrients, grazing pressures, etc.) responsible for observed PP levels. 4. To determine community structure of primary producers and relative contributions of net nanno and ultraphytoplankton to PP. 5. To evaluate changes in phytoplankton and PP since construction of Aswan Dam.	Measures of Goal Achievement: 1. At stations selected as representative for different water types(eg. high, low PP) - obtain data on: - PP rates, chlorophyll, phytoplankton species and counts, light penetration, temperature, salinity, O_2, macro-nutrients. 2. Assemble satellite and sea truth data (see above). 3. Nutrient supplementation and differential filtration experimental data. 4. Microscopic observations, and differential filtration data. HPLC and fluorometric pigment analysis.	1. Construction of vertical and horizontal profiles. 2. Comparison of data taken at different seasons. 3. Comparison with previously published or available data. 4. Comparison of satellite data with sea truth measurements. 5. Comparison with laboratory culture pigments.	Assumptions for achieving goal targets: 1. Suitable personnel will be found to staff Haifa lab within reasonable time of start of project (initial 1 Ph.D. with experience in Marine Biology, 1 Technician (MSc). 2. Appropriate satellite data is available to determine initial sampling stations (interpretation by U.S.PI) 3. That sampling and other equipment can be procured within reasonable time from initiation of project (samples, nets, fluorometer, XBT's, pumps, hosses productivity lines, filtration apparatus, light sensor, etc.) 4. Adequate shiptime available (at least 6-weeks long cruises plus several short (1-) days) cruises over 2 years). Initial long cruise planned for June'81 5. Satisfactory arrangement concerning routine chemical analysis can be made (e.g. with Eilat or Kinneret labs) 6. A close working cooperation is maintained with the U.S P.I.'s including participation in cruises and all aspects of research planning and implementation. Possibility of long or short term equipment loans should be explored.
Outputs: 1. Chemical and biological measurements determine trends in PP and nutrients. 2. Measurements and description of community size and structure. 3. Results of perturbation experiments. 4. Publication of above.	Magnitude of Outputs: 1. Levels of phytoplankton populations. 2. Levels of nutrient content. 3. 4-6 basic publications dealing with biological productivity in eastern Mediterranean. 4. conveyance of the information discovered to scientists working on comparison projects.		
Inputs: 1. Field data - parameter collected at sea (see details in next column). 2. Satellite data - NIMBUS-7 Coastal Zone Color Scanner (and successor). 3. Laboratory chemical analysis, microscopic analysis. 4. Controlled experiments with lab cultures of dominant organisms.		. publication of results and conclusions. Acknowledgement of use of this information supplied to scientists working on similar projects.	Assumptions for providing inputs See above.

EGYPT

Dr. ~~S. H. Ahmed El-Din~~ Nasr Dowidar

PROJECT DESIGN SUMMARY

LOGICAL FRAMEWORK

Life of Project:
From FY ____ to FY ____
Total U.S. Funding ____
Date Prepared ____

Project Title & Number Primary Productivity

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: 1. Examine the effect of the diminished outflow of the Nile River on: a) biological productivity; b) nutrient chemistry; c) species composition of plankton of the sea and lakes; d) hydrographic structure. 2. Determine the factor regulating primary production. 3. Determine the effect of the regulatory fisheries. 4. Determine the community structure of primary and secondary producers. 5. Determine how the Nile discharge stimulates phytoplankton. 6. Determine level of primary productivity despite the controlled discharge of the Nile.	**Measurement of Goal Achievement:** 1. Compare data with previously obtained measurements, prior construction of the Aswan Dam. 2. Measure temperature, salinity, currents, transparency, oxygen, and nutrients during production. 3. Assess the effect of nutrient depletion through the food chain. 4. Visual observation of the communities. 5. Measurements in specified locations outside the Nile discharge. 6. Controlled oxygen demand experiments.	1. Comparison of each value with others; construction of vertical & horizontal profiles. 2. Comparison of data at each station with data taken at other times. 3. Seasonal changes in chemical and biological characteristics. 4. The natural processes controlling the biological productivity of the erection of the High Dam.	**Assumption for achieving goal targets:** 1. Adequate shipboard time can be procured. 2. Proper sampling and analytical apparatus can can be purchased within a reasonable time from initiation of the project. 3. Free hand in transferring from one item to another in in the budget when it is necessary. 4. That a minimum-cost maximum effective ship operating schedule can be achieved, that agreement can be reached on the best vehicles for publication.
Outputs: 1. Physical, chemical and biological readings to indicate trends in nutrient content. 2. Matrices showing the changes in production, as a result of varying the input parameters. 3. Readings indicating phytoplankton population levels. 4. Publications of above.	**Magnitude of Outputs:** 1. Levels of nutrient content. 2. Levels of phytoplankton populations. 3. At least 12 publications dealing with biological productivity of the Med. 4. Conveyance of the information discovered to the scientists working on companion projects.	. Publications of results and Conclusions. . Acknowledgement of use of information by scientists working on companion projects.	
Inputs: 1. Measurements of all nutrients (NO_3, NO_2, PO_4 suspended particulate matter, particulate and dissolved organic carbon, salinity, temperature, dissolved oxygen currents, light penetration, primary productivity, chlorophyll and phaeopigment analysis, ATP. 2. Sampling at various selected stations. 3. Sampling on seasonal bases at least for one year.			**Assumptions for providing inputs:** . That sampling equipment can be installed abroad ship in working condition. . That analytical apparatus can be operating in each of the cooperating laboratories within a reasonable period following the start of the project.

Principal Investigator: R. O. Smitherman

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number IV. Production of Monosex Tilapia - U.S. Part

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Program or Sector Goal: The broader objective to which this project contributes:	Measures of Goal Achievement:		Assumptions for achieving goal targets:
1. Achieve hybridization of species. 2. Improve production using monosex populations.	1. Monosex male populations superior in growth to mixed sexes. 2. Increased yield of larger sized fish for market.	1. Statistical analysis.	1. Genetically pure strains of the appropriate species for hybridization can be maintained until verified by progeny testing. 2. Cooperation from local, regional, and national officals will remain at its present excellent level.
Project Purpose:	Conditions expected because project has been completed:		Assumptions for achieving purpose:
. Improved yields using hybrid tilapia in ponds and cages. . Feeding systems using floated or sinking pelleted feeds.	Magnitude of Purpose: 1. Achievement of growth rate increase of 40% in all male populations. 2. Achievement of 100% marketable product.		Assumptions for achieving purpose: 1. That the project can be extended for about 1 year past the presently scheduled termination date.
Outputs: . Tests of growth, yield, survival, proportion of males in hybridization trials. . Tests of different populations of *Tilapia nilotica* for hybridization. Tests of monosex population of Tilapia in polyculture with catfish, carpa, mullets or other species.	Magnitude of Outputs:		Assumptions for providing outputs: 1. That supplies purchased for this project can be in place for use within a reasonable period.

Principal Investigators: Gideon Hulata
Giora Wohlfarth

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number IV. Production of Monosex Tilapia - Israeli Part

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: 1. Increase yield of edible fish through controlling reproduction of tilapias by interspecific hybridization. 2. Evaluate different ~~interspecific hybrids~~	Measures of Goal Achievement: 1. Production of improved hybrids tested under different conditions 2. Increased production of larger sized tilapia.	1. Statistical analysis 2. Degree of use of hybrids by fish farmers.	Assumptions for achieving goal targets: 1. Sustained cooperation at national and international level.
Project Purpose: a. For fry production b. For growth rate and yield in polyculture systems stocked with tilapias, carp, silver & grass carp.	Conditions that will indicate purpose has been achieved: End of project status.		Assumptions for achieving purpose
Outputs: 1. Isolation of better producing tilapia hybrids. 2. Improved yields from polyculture fish ponds. 3. Increased proportion of market-sized tilapias.	Magnitude of Outputs:		Assumptions for achieving outputs: 1. That the project can be extended for 1-2 years beyond present termination date. 2. Presence of extension service for distributing knowledge gained to fish farmers. 3. Establishment of centers for fry production.
Inputs: 4. Knowledge of possible genotype-environment interactions of tilapia hybrids. 1. Testing growth, yield, survival, proportion of males and fry production in different tilapia hybrids. 2. Testing different isolates of *T. aurea* as parents for hybridization.	Implementation Target (Type and Quantity)		Assumptions for providing inputs: 1. That supplies purchased for this project can be in place for use within a reasonable period following commencement of the project.

Principal Investigators: M. M. Sobek
M. L. Labib

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Date of Project
From FY _____ to FY _____
Date of I.P. Updating _____
Date Prepared _____

IV. Production of Monosex Tilapia - Egyptian Part

Narrative Summary	Measurable Verifiable Indicators	Means of Verification	Important Assumptions
Increase yield of marketable tilapia by [illegible] populations through morphological separation of sexes. Evaluate production of tilapia (male) using fertilizers and supplemental feeding. Select brood stock from fast growing individuals in yield trials.	1. Production of improved marketable sized tilapia. 2. Presence of improved broodstock.	1. Statistical analysis.	1. Sustained cooperation at national and international level.
Improved yields for commercial application through population control. Feeds formulae for use in Egypt. Basic broodstock and gene pool for selection and exchange with scientific collaborators. Tests of growth, yield, survival of male Tilapia of different species in ponds and different salinity levels in the laboratory. Feeds formulation using pelleting machine and locally available ingredients. Tilapia stocks collected from various geographic locations.	1. Achievement of all-male tilapia culture. 2. Development of practical rations for tilapia culture.		1. That the project can be extended for 1-2 years beyond present termination date. 2. Presence of system for dissemination of information. 1. That supplies purchased for this project can be in place for use within a reasonable period following commencement of the project.

PROJECT DESIGN SUMMARY

LOGICAL FRAMEWORK

Project Title: Intensive Pond Fish Culture

Narrative summary

Program or sector goal

1. Identify the ecological processes occurring in intensive sea water fish ponds.
2. Develop a polyculture system of the following marine organisms: fish-oysters - macroalgae - shrimps.
3. Determination of optimal stocking density for the above system, of the different organisms.
4. Maximizing yields per unit area time & input (energy. food, labour).
5. Determination and description of the impact of water quality on growth rates of the different organisms in the system.
6. Optimization of the engineering aspects of the integrated system: pond construction materials, techniques of water circulation, dimension of ponds & seepage prevention.

Outputs

1. Catalogue of the ecological processes in the ponds & their effects on the fish-oyster-algae production of the system.
2. Marine polyculture techniques which will produce fish-oyster-macroalgae & shrimp at high food & energy conversion rates.
3. Detailed farming technique which will include prescriptions such as stocking densities, feeding regimes, water circulation, system construction etc.

in/

. Series of ponds in which experiments will be run varying stocking densities, feeding rates, water circulation, aeration rates, species composition.

. Analytical laboratory which will handle a large volume water, feeds, sediments and feces samples from ponds.

. Field samples of physical parameters of system (temperature, light, wind, evaporation, water flow rates).

bjectively Verifiable Indicators

easures of Goal Achievement:

. Production of species in the polyculture system:

a. Production of S. aurata (per unit, area & time)

b. Production of oysters (" " " ")

c. Production of Macoalgae (" " " ")

d. Production of Mugil cephalus (per unit, area & time)

e. Production of shrimps (per unit, area & time).

Maintaining balance amongst the different components of system (species & processes).

Increasing the biological efficiency of the system - more production for the same amount of food.

Freedom from diseases in the system: fish, oyster, shrimp & algae.

Clean runoff water (free of organic loads and nutrients).

New design for land based mariculture: Integrated pond (fish-algae-oyster-macroalgae; shrimps).

nitude of Outputs

Production output of system per year per hu[illegible] (1/10 hectare) : fish - 1 ton, oysters - 2.5 tons, macroalgae - 1 ton ?

Attainment of market size in 14-16 months for fish, 9-12 months for oysters.

Publications describing the system from the following aspects: system ecology (algae, nutrients, primary production), fish farming (density, species composition, food conversion coefficients, growth rates), oyster farming (as above), macroalgae (species selection, preferred chemical production, growth rates, nutrients uptake, culturing techniques). Economic of the system (cost analysis of the different components of system).

Production of (if all ponds will be built 15 ponds x 125m^2) system on annual basis:

<u>Sparus aurata</u> - 2 tons

<u>Crassostrea gigas</u> - 4 tons

<u>Ostrea edulis</u> - 1 ton

Macroalgae - 2 tons

Reduced cost of production due to system improvement is expected to be 10% per year for the first three years.

<u>Implementation Target</u>

The results of the experimental system will serve as the guide lines for the construction of the pilot farm. Final size of farm is planned to be 50 dunams (5 hectares).

Target date schedule for 1st stage of pilot farm is two years after the commencement of work in the experimental system.

<u>TASKS OF VERIFICATION</u>

Since the work is experimental, the following scientific methodology will be used:

Regular sampling of:-

I. System water at the different stations (fish, oysters & macroalgae)

II. Pond sediments

III. Oyster fecal material

IV. Fish populations (for growth rates, diseases, maturation)

V. Oyster population (as above plus quality index)

VI. Macroalgae (growth rates, harvesting rates, chemical production)

VII. Primary productivity in system.

b. Close follow up on economic parameters (cost of production: system cost, feed, water pumping, labour).

IMPORTANT ASSUMPTIONS

Assumptions for achieving goal targets:

1. That no disasters would occur in the area: natural - like floods, storms, seismic activities etc. or man made - wars.
2. That cooperation with local authorities will be maintained at present level.
3. That international (European) markets for farmed organisms will be maintained at present high level.
4. That the integrated system is the most sound one for culturing commercial marine organisms in desert regions, and that the aquatechnical (from agrotechnical) problems are economically solvable.
5. That this project should and would be extended for at least another 3 to 5 years after the present contract expires (December 1982).

Assumptions for providing inputs:

1. That the required equipment can be purchased, installed and operated within a reasonable period following the project onset.
2. That preliminary study will be terminated around January 1981 and data will be used for designing the experimental ponds.

PROJECT DESIGN SUMMARY

LOGICAL FRAMEWORK

Life of Project:
From FY _____ to FY _____
Total U.S. Funding _____
Date Proposed: _____

Project Title & Number: Intensive Pond-Culture of Marine Organisms (V)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: Optimization of technologies for the production of seafoods in saline ponds of the eastern Mediterrean region--specifically, to 1) identify, measure, and model the relations among quality and quantity of biomass production vs. environmental variables and culture practices; 2) develop systems for polyculturing such organisms as gilthead seabream, mullets, oysters, shrimps, and macroalgae; 3) compare worldwide stocks of striped mullet as to their suitability for fish culture.	Measures of Goal Achievement: 1) Rates and costs of seafood production in the experimental ponds 2) Conceptual and quantitative consistency of models with experimental outputs and with existing ecological knowledge. 3) Differential survival and growth of striped-mullet stocks cultured under similiar environmental conditions.	1) Careful measurement and accurate records of costs, production, and other variables; appropriate statistical sampling and testing. 2) Goodness-of-fit tests of modeled versus observed results; sensitivity analysis of models. 3) Acceptance of resulting manuscripts for publication in prestigious journals.	Assumptions for achieving goal targets: 1) That the geographic locations of research activity (Egypt, Israel, and Texas) are not impacted by terrorist or military activity or by severe storms, floods, or seismic activity. 2) That good cooperation with local authorities can be maintained. 3) That a stock of young gilthead seabream from Israel can be transported successfully to Texas; that stocks of striped mullet from around the world can be transported successfully to Texas. 4) That full funding of the project be guaranteed no later than 1 March 1981. 5) That the project can be extended at least 3 years beyond the presently scheduled termination date.
Outputs: 1) Models (both conceptual and computerized) and other information to aid in optimizing extant mariculture technologies and to provide a framework for the development of new technologies, including engineering practices and selection of species for polyculture systems, appropriate to the eastern Mediterranean region. 2) Improvements (e.g., new ponds) in Egyptian and Israeli facilities for mariculture research and development.	Magnitude of Outputs: 1) Increase of 10% in production of marketable/consummable seafood biomass at a 10% reduction in costs per year for the first three years. 2) At least 6 scientific publications in the areas of mariculture and marine biology.		
Inputs: 1) Existing information relevant to mariculture in the eastern Mediterranean region, particularly historical experience. 2) Experiments to evaluate culture practices and system engineering for polyculture of marine organisms, bioenergetics of gilthead seabream, and suitability of striped-mullet stocks for mariculture.			

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מעבדה לאקולוגיה ימית
אילת, ת.ד. 1212 מיקוד 88100

PROJECT DESIGN SUMMARY - LOGICAL FRAMEWORK

Name of Project - REPRODUCTION

Narrative summary

Program goals:

1. Prolong the breeding season of S. aurata from its 6 weeks natural breeding season to 6 months.
   a. By environmental manipulation (photoperiod temperature)
   b. By hormonal treatments (Gonadotropins, LH-RH, Steroids)
2. Development of new techniques for manipulating S. aurata spawning.
   Main goal is to achieve spontaneous spawning in captivity of highly viable eggs (nutrition, photoperiod, temperature)
3. Improvement of the techniques of artificial spawning of S. aurata, producing high quality eggs.
   a. Via hormonal treatment (Gonadotropins, LH-RH, Steroids)
   b. Via environmental manipulation (photoperiod, temp.)
   c. Interaction of a & b
4. The study of the gonadal cycle of S. aurata populations:
   a. Mediterranean population
   b. Gulf of Elat (Aqaba) population in captivity (sea-water ponds)
   c. Gulf of Elat population in captivity (Brackish water ponds)

Outputs

1. Prolongation of spawning season of *S. aurata* from 6 weeks to 3 months.
2. Spontaneous spawning of *S. aurata* in captivity.
3. Improved techniques of induced spawning of *S. aurata* by hormonal treatments (close to physiological levels) & environmental manipulation.
4. Development of the LH-RH technique in inducing spawning of *S. aurata*.
5. Understanding of the annual cycle of *Mugil cephalus*. Basic information towards artificial spawning of this species.

Inputs

1. Experimental set-up:

a. Photoperiod experiments — interaction of 2 parameters. Varying regimes.

b. Temperature experiments

2. Hormonal treatments using different agents [illegible], HCG, Steroids.
3. Observations on gonadal development of *Mugil cephalus* in 2-3 different environments. Histological studies of [illegible] development.

Objectively verifiable indicators

Measures of Goal Achievements

1. Spawning period duration: extension of [illegible] from [illegible] weeks (starting January) to maximum duration (number of months).
2. Increased number of *S. aurata* spontaneous spawners. [illegible] transition from incidental spontaneous spawners to controlled or manipulative spawning without hormonal treatments. Selection for spontaneous spawners
3. Inducement of gonadal maturation by means of LH-RH treatment.

4. Reduced dosage of gonadotropin for ovulation and spawning treatment → approaching physiological levels.
5. Spawning as a result of environmental manipulation (photoperiod & temperature).
6. Description of the *Mugil cephalus* gonada cycle (2 - 3 populations: Red-Sea, Mediterranean, brackish water).

Magnitude of Outputs

1. Improved techniques of artificially spawning marine fishes (*Sparus aurata*).
2. Extending spawning season beyond the natural one (expected extension → six months).
3. Generation of background information to control reproduction of *Mugil cephalus*.

Implementation Target (type & quantity)

1. Producing the information and knowhow needed for building commercial hatcheires for the marine species, *Sparus aurata* & *Mugil cephalus*.
2. Providing the infrastructure for genetic selection of the above species.

Means of Verification

1. Observation of longer spawning season of *Sparus aurata*.
2. Practicing controlled reproduction of *S. aurata* through hormonal treatments (HCG, LH-RH, Steroids); & environmental manipulation (temperature, light).
3. Publications describing the above research & development including the gonadal cycle of *Mugil cephalus*.

Important Assumptions

1. *Sparus aurata* lends itself to the proposed research and development effort.
2. Three populations of *Mugil cephalus* can be periodically sampled (Red-Sea, M Mediterranean & Brackish water ponds).
3. The basic research facilities in the mariculture laboratory, I.O.L.R., Eilat, are sound to support the research and development work.
4. The scientific personnel & the scientific infrastructure are capable and good enough to carry out the proposed work.

Assumptions for achieving outputs

1. The past experience in I.O.L.R. mariculture laboratory, provides enough information on the subject to believe that the undertaken in feasible to be achieved.
2. That the duration of this particular project was arbitrarily determined. It will take at least 3 more years to achieve goals described in it.

Assumptions for providing inputs

1. Supplies and equipment can be purchased and utilized within a resonably short time following the commencement of the project.
2. Required personnel can be hired upon commencement of the project.

APPENDIX 3

FINANCIAL STATUS (AS OF 3/31/85, IN $ 000)

Country & Product	Phase I Budget	Phase I Unspent	Phase II Years 1 & 2 Budget	Phase II Years 1 & 2 Unspent	Phase II Year 3 Budget
EGYPT					
Coastal Management	342.5	31.6	268.0	149.7	120.0
Biological Productivity	250.0	40.7	173.4	52.4	102.8
Tilapia	126.6	85.0	78.0	53.2	47.0
Fish Culture	154.0	15.9	one year		
Nutrition	106.0	44.6	no cost		
Reproduction	74.9	19.8	extension		
Lake Management	204.0	-0-			
Project Management					
Alex. U.	-0-	-0-	5.2	5.2	2.5
IOF	-0-	(81.5)	8.0	2.8	2.5
Totals	1,258.0	156.0	532.6	263.3	274.8

Appendix 3. (cont'd) Financial Status (in $ 000)

Country & Product	Phase I Budget	Phase I Unspent	Phase II Years 1 & 2 Budget	Phase II Years 1 & 2 Unspent	Phase II Year 3 Budget
ISRAEL					
Coastal Management	339.5	(3.8)	238.0	49.3	99.0
Biological Productivity	224.8	4.3	181.0	59.6	91.0
Tilapia	137.3	(1.3)	80.8	23.4	51.8
Fish Culture	146.7	(4.5)	96.8	2.8	
Nutrition	128.6	(1.9)	(Year 1 only)		
Reproduction	134.9	(8.7)			
Lake Management	199.5	(1.0)			
Project Management	-0-	(65.6)	7.0	(4.0)	3.5
Totals	1,311.3	(81.7)	603.6	131.0	245.3

Appendix 3. (cont'd) Financial Status in ($ 000)

Country & Product	Phase I Budget	Phase I Unspent	Phase II Years 1 & 2 Budget	Phase II Years 1 & 2 Unspent	Phase II Year 3 Budget
U.S.A.					
Coastal Management	327.0	-0-	157.4	131.6	56.4
Biological Productivity					
Bigelow			74.9	11.4	20.3
Texas A&M	321.2	(9.8)	120.3	66.6	62.4
Tilapia	143.3	-0-	57.6	25.9	34.0
Fish Culture	116.0	3.2	60.4 (Year 1 only)	1.5	
Nutrition	106.8	-0-			
Reproduction	59.1	2.6			
Lake Management	149.0	11.1			
Project Management					
NJMSC	334.0	11.1	178.5	37.8	84.7
Texas A&M	112.2	11.1	66.7	45.5	37.8
Totals	1,668.6	29.2	715.8	320.2	295.6

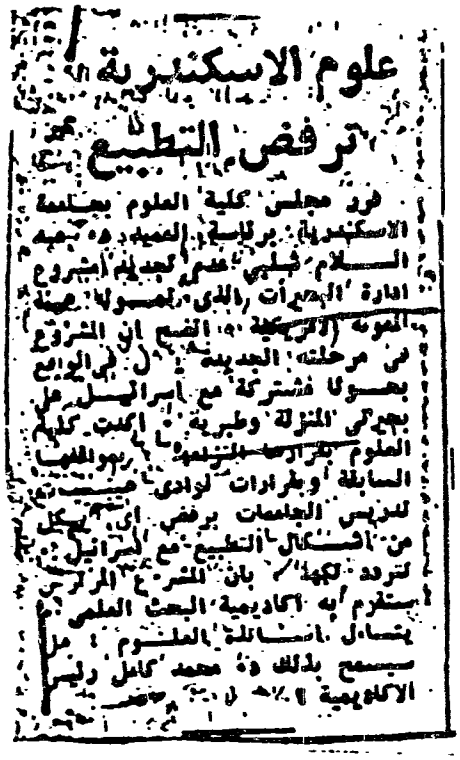
APPENDIX 4

EGYPTIAN NEWSPAPER ARTICLE ON THE REFUSAL OF NORMALIZATION FROM AL AHALY MARCH 26, 1985, PAGE 1.

Faculty Of Science, Alexandria University, refuses the normalization.

Alexandria University refuses the normalization of relations with Israel. Faculty of Science University Council chaired by the Dean Dr. Abdel Salam Shalaby decided not to renew the project for managing lakes which is financed by the US AID. It was found out that the project in its new phase represents in reality mutual researches with Israel on Manzala and Tabareya lakes.

Faculty of Science assured her refusal to any form of normalization of relations with Israel. Rumor says that the Science Research Academy will establish the project. Professors at the Faculty of Science ask "Will Dr. Mohamed Kamel, Chairman of the Academy, allow this?"



علوم الاسكندرية

ترفض التطبيع

قرر مجلس كلية العلوم بجامعة الاسكندرية برئاسة العميد د. عبد السلام شلبي عدم تجديد مشروع ادارة البحيرات الذي تمول جهة المعونة الامريكية. اتضح ان المشروع في مرحلته الجديدة يتحول في الواقع بحوثا مشتركة مع اسرائيل على بحيرتي المنزلة وطبرية. اكدت كلية العلوم بقرارها المتزامن مع رسوالتها السابقة وبقرارات نوادي هيئات التدريس بالجامعات برفض اي شكل من اشكال التطبيع مع اسرائيل. وتردد الآن بان المشروع المرتقب ستقوم به اكاديمية البحث العلمي يتساءل باحثو العلوم: هل سيسمح بذلك د. محمد كامل رئيس الاكاديمية؟

APPENDIX 5

KEY INDIVIDUALS INTERVIEWED BY COOPERATIVE MARINE TECHNOLOGY PROGRAM PHASE II EVALUATION TEAM

Auburn, Alabama:

Dr. R. O'Neil Smitherman, PI, Monosex Tilapia sub-project, Auburn University.

Dr. R.A. Dunham, PI, Monosex Tilapia sub-project, Auburn University.

Washington, D.C.:

Dr. Gary Bittner, CMTP Phase II Project Manager, Near East Bureau, AID/W.

Fort Hancock, New Jersey:

Dr. Robert B. Abel, PI and President, NJMSC.

Mr. Robert Galloway, Assistant Treasurer, NJMSC.

USAID/Cairo:

Dr. Theresa A. Ware, Program Officer.

Mr. Abdel Z. Soliman, Contracting Accounting Manager.

US Embassy/Cairo:

Mr. Robert Carr, Counsellor for Scientific and Technical Affairs, STA

Ms. Jean Fales, Science Officer, STA.

Cairo:

Dr. Richard Newberg, Senior Associate, RONCO.

Dr. Robert Lowe, Design Engineer, CCS, Scripps Institution of Oceanography, La Jolla, California.

IOF, ASRT/Cairo:

Dr. Ahmed R. Bayoumi, Director.

Dr. Mounir M. Ishak, Director, Inland Water and Fish Culture Division and PI, Culture and Nutrition of Commercially Improrant Fishes (Phase-out) sub-project.

Dr. Waheeb D. Labib, PI, Monosex Tilapia sub-project.

Dr. A. El-Rahman El-Bolock, Induced Breeding Section.

Mr. Ahmed I. El-Ibyary, Director General of Legal Department.

IOF, ASRT/Lake Quarun Laboratory:

Dr. Hussein M. El-Sedfy.

Dr. Abdel Rahman M. Helmy.

ICP, MI/Alexandria:

Dr. Ahmed A. Khafagy, Director and PI, Coastal Management and Shore Processes sub-project.

Dr. Alfy Morcos, Coastal Engineer.

Dr. Hany E.-Wany, Research Associate.

IOF Hydrobiological Laboratory/Alexandria:

Dr. Naim M. Dowidar, Professor, Oceanography Department, University of Alexandria, Faculty of Science and PI, Biological Productivity sub-project.

Dr. Sayed Z. El-Sayed, Professor, Department of Oceanography, Texas A&M University.

Dr. Larry Webber, Research Associate, Dept. of Oceanography, Texas A&M University

Cairo (Israeli/Egyptian meetings April 15-17, 1985):

Dr. Colette Serrruya, Director General, IOLR.

Dr. Zeev Carmel, Senior Scientist, IOLR and PI, Coastal Management and Shore Processes sub-project.

Dr. Abraham Golik, Senior Scientist, IOLR and PI, Coastal Management and Shore Processes sub-project.

Dr. Gideon Hulata, Director, ARO, PI, Monosex Tilapia sub-project.

Mr. Hillel Gordin, Senior Scientist and Head, NCM, IOLR; PI, Culture and Nutrition of Commercially Important Fishes (phase-out) sub-project.

Dr. George Wm. Kissil, Senior Scientist, NCM, IOLR and PI, Culture and Nutrition of Commercially Important Fishes (phase-out) sub-project.

Dr. Paul Walline, Scientist and (acting) PI, Biological Productivity sub-project.

Haifa:

Commander (Res.) Dan Adar, Deputy Director for Administration, IOLR.

IOLR Kinneret Limnological Laboratory:

Dr. Moshe Gophen, Senior Scientist and Head of the Laboratory.

Dr. Gary L. Vinyard, Department of Biology, University of Nevada.

ARO Fish and Aquaculture Research Station, Dor:

Dr. Giora W. Wohlfarth.

U. S. Embassy, Tel Aviv, Office of Science and Technology

Mr. Leroy C. Simpkins, Science Attache.

APPENDIX 6

REFERENCE LIST OF DOCUMENTS

- Evaluation, Cooperative Marine Technology Program for the Middle East. H. Pollack and C. Idyll. USAID Contract No. NEB-0150-C-00-3015-00. March, 1983.

- Second Annual Report, January 1 - December 31, 1983, Cooperative Marine Technology Program for the Middle East. S. Z. Sayed, Editor. Texas A&M University, January, 1984.

- Field Trip Reports, Cooperative Marine Technology Program for the Middle East, R.B. Abel. New Jersey Marine Science Consortium. January 17-24, April 1-14, 1984.

- Planning Session Reports, Cooperative Marine Technology Program for the Middle East. R. B. Abel. New Jersey Marine Sciences Consortium. Report of Sixth Session, August 4-8, 1983.

- Coordination Meeting of AID Eastern Mediterranean Primary Productivity Project. Anon. October 17, 1984.

- Proposal for the Consortium of the Cooperative Marine Technology Program for the Middle East (Phase II). S. Z. Sayed and R. B. Abel. Texas A&M Research Foundation and New Jersey Marine Science Consortium, January, 1983.

- Shore Protection Manual, Coastal Engineering Research Center, U.S. Army Corps of Engineers, 4th Edition, Vol. 1 & 2, 1984.

- Near East Bureau Evaluation Guidelines. United States Agency for International Development, August 1984.

- Biological Productivity of the Southeastern Mediterranean, Draft Report. January-December 1984. N.M. Dowidar. April, 1984.

- Coastal Management and Shore Processess in the Southeastern Mediterranean. Cooperative Marine Technology Program for the Middle East. Abbreviated Report, January-December, 1984. Coastal Research Institute, Alexandria, 1985.

- Production of Monosex Tilapia, Cooperative Marine Technology Program for the Middle East. Abbreviated Third Annual Report. January-December, 1984. G. Hulata and G. Wohlfarth. Agricultural Research Organization. Fish and Aquaculture Research Station. Dor, March 1983.

- Directional Wave Management at Haifa, Israel and Sediment Transport Along the Nile Littoral Cell. Z. Carmel and A. Golik. Coastal Engineering 9:21-26, 1985.

- Mid-term Evaluation of Cooperative Arid Lands Agriculture Reseach Program. USAID Contract No. PDC-1406-1-04-4087. RONCO Consulting Corporation, Washington, D.C., September 1985.

- Directional wave measurement of Haifa, Israel, and sediment transport along the Nile Littoral cell and Characteristics of storm waves off the Mediterranean coast of Israel. Z. Carmel, D. L. Inman and A. Golik. Coastal Engineering 9(1985):1-19; 21-36.

APPENDIX 7

ITINERARY OF COOPERATIVE MARINE TECHNOLOGY PROGRAM PHASE II EVALUATION TEAM, APRIL 1985

Monday, April 1, Washington
Dr. Busch travels to Washington, D.C.

Tuesday, April 2, Washington - Red Bank
Dr. Recksiek travels to Washington, D.C. Orientation at RONCO Headquarters. Confer with Mr. Gary Bittner, Near East Bureau, AID/W, followed by travel to Red Bank, New Jersey lodgings.

Wednesday, April 3, Red Bank - New York
Confer with Dr. Abel and Mr. Robert Galloway, NJMSC at Fort Hancock Laboratory. Travel to New York for flight to Cairo.

Thursday, April 4, New York - Cairo
Enroute. Early evening arrival at Cairo. Meet with Dr. Richard Newberg, RONCO.

Friday, April 5, Cairo

Islamic Sabbath. Morning free. Study project-related literature during afternoon.

Saturday, April 6, Cairo
Study project reports and make telephone contacts for Egypt agenda.

Sunday, April 7, Cairo
Morning conferences with Mr. Robert Carr and Ms. Jean Fales, STA, U.S. Embassy, Cairo, and Dr. Ahmed R. Bayoumi, IOF, ASRT. Afternoon conferences with Dr. Theresa A. Ware an Mr. Abdel Z. Soliman, USAID, Cairo.

Monday, April 8, Alexandria
Travel to Alexandria. Morning conference with Coastal Management and Shore Processes sub-project group: Dr. Ahmed A. Khafagy, Dr. Alfy Morcos and Dr. Hany El-Wany. Afternoon conference with Drs. Sayed Z. El-Sayed and Naim M. Dowidar, PI's, Biological Productivity sub-project.

Tuesday, April 9, Alexandria - Cairo
Meet Dr. Dowidar, Dr. El sayed and Dr. Dowidar's graduate students at the Hydrobiological Institute, IOF: discuss the Biological Productivity sub-project. Late afternoon travel to Cairo.

Wednesday, April 10, Cairo

Meet in Dr. Bayoumi's office at IOF, ASRT for morning meetings with PI's and associate investigators: Dr. Mounir Ishak, PI, Culture and Nutrition of Commercially Important Fishes (phase-out) sub-project with associate investigator, Dr. A. R. El-Bolock; Dr. Waheeb D. Labib, PI, Monosex Production of Tilapia sub-project. Afternoon work session at lodgings.

Thursday, April 11, Cairo

Travel to El Barrage Aquaculture Laboratory with Dr. Ishak for site visit. Discuss fish nutrition investigations with Dr. Ishak's graduate student; review with Dr. Labib the progress of monosex production of Tilapia subproject. Return to Cairo.

Friday, April 12, Cairo

Islamic Sabbath. Day free.

Saturday, April 13, Cairo

Travel with Dr. Ishak to Lake Quarun laboratory for site visit; confer with Drs. Ishak and El-Bolock along with Drs. Abdel Rahman M. Helmy and Dr. Hussein M. El-Sedfy and graduate students regarding current work and respective research interests.

Sunday, April 14, Cairo

Morning conference with Mr. Ahmed El-Ibyary, Director General of Legal Department, IOF, ASRT, on budget matters. Afternoon, Dr. Busch visits USAID/Cairo Agricultural Development Office; Dr. Recksiek visits Ms. Jean Pales, US Embassy/Cairo.

Monday, April 15, Cairo

Egyptian "Spring Day" holiday. Morning work on report. Afternoon meeting with Dr. Abel and Israeli PI's: Drs. Zeev Carmel and Abraham Golik, IOLR, Coastal Management and Shore Processes sub-project, Dr. Paul Walline, IOLR, Biological Productivity sub-project, Mr. Hillel Gordin and Dr. George Kissil, IOLR, Culture and Nutrition of Commercially Important Fishes (phase-out) sub-project, Dr. Gideon Hulata, ARO, Monosex Tilapia sub-project.

Tuesday, April 16, Cairo

Attend morning joint Israeli/Egyptian plenary session of CMTP, Dr. Colette Serruya, IOLR, and Dr. Bayoumi, IOF, ASRT, moderators. Afternoon Dr. Recksiek with Coastal Management and Shore Protection sub-project PI's and Dr. Robert Lowe, CCS, for joint Egyptian/Israeli planning and work session; Dr. Busch with Dr. Abel discussing Phase II budget matters early afternoon and with Culture and Nutrition of Commercially Important Fishes (phase-out) sub-project joint works session.

Wednesday, April 17, Cairo
Attend morning plenary session with Dr. Serruya, IOLR, moderator. Afternoon, Dr. Busch with Drs. Bayoumi and El-Ibyary, Dr. Recksiek drafting report text.

Thursday, April 18, Cairo - Haifa
Travel to Haifa and finalize agenda for Israel.

Friday, April 19, Haifa
Morning visit to IOLR at Tel-Shikmona, confer with Commander (Res.) Dan Adar and tour laboratory facilities. Afternoon site visit with Dr. Moshe Gophen to Kinneret Limnological Laboratory, IOLR (Lake Kinneret); meet Dr. Gary L. Vinyard, University of Nevada. Return to Haifa.

Saturday, April 20, Haifa
Israeli Sabbath. Draft report text.

Sunday, April 21, Haifa
Site visit to ARO Fish Aquaculture Research Station, Dor. Confer with Dr. Gideon Hulata and Dr. Giora W. Wohlfarth on progress of Monosex Tilapia sub-project. Afternoon confer with Drs. A. Golik and Z. Carmel, PI's, Coastal Management and Shore Processes sub-project.

Monday, April 22 and Tuesday, April 23, Haifa
Dr. Recksiek joins Biological Productivity sub-project for two-day cruise aboard R/V Shikmona, in the company of Dr. Paul Walline, Chief Scientist, Dr. Sayed El-Sayed, PI, and Dr. Larry Webber, Research Associate (of Dr. El-Sayed). Dr. Busch works on report text.

Wednesday, April 24, Haifa
Report writing.

Thursday, April 25, Haifa - Elat
Israeli Independence Day. Early morning flight to Elat.

Friday, April 26, Elat
Site visit to National Center for Mariculture, IOLR.

Saturday, April 27, Elat
Israeli Sabbath. Draft report text.

Sunday, April 28, Elat - Tel-Aviv
Morning flight to Tel-Aviv. Continue report text drafting during afternoon.

Monday, April 29, Tel-Aviv
Edit draft report.

Tuesday, April 30, Tel-Aviv
Deliver report draft to Mr. Leroy C. Simpkins, Science Attache, United States Embassy.

APPENDIX 8

SCOPE OF WORK

The Engineer/International Relations Expert will be the Team Leader and will evaluate the project's efforts in promoting regional cooperation. The Team Leader is responsible for dividing the scope of work between the Marine Biologist and himself or herself. The evaluation will determine the success of the following points:

A. Regional Cooperation

1. Increases in cooperation between Egypt and Israel in Marine Science and Technology.

2. Created contacts and linkages between Egyptian and Israeli scientists and institutions.

3. Developed principles, techniques, and precedents for scientific and technical cooperation between Egypt and Israel.

4. Demonstrated values of regional cooperation through translation of research results into practical, useful achievements which are widely understood in both societies.

5. Ensurance that the research projects increasingly become truly cooperative research activities.

B. Coastal Management and Shore Processes in the Southeastern Mediterranean

1. Fostered contacts and linkages between Egyptian and Israeli scientists and institutions working in shore processes.

2. Determined wave climate in the nearshore and defined the longshore sediment transport potential. Applied information to identify areas of erosion/accretion along beaches and near structures.

3. Measured the prevailing currents on the continental shelf and determined their importance as a driving force for sediment transfer.

4. Estimated local sediment transport rates on the basis of recurrent beach profile surveys, especially in the vicinity of man-made structures and along areas of known erosion/accretion.

5. Studied the processes now modifying the continental shelf and determined the sediment types and transport paths over the shelf.

6. Estimated the reservoir and type of sand which is present on the beaches and under the nearshore adjacent water.

7. Defined the northern boundary of the Nile littoral cell and the transport modes of sediment from the system.

8. Analyzed the shore processes for planning and engineering purposes at specific, critical sites to apply knowledge of shore processes and wave/current budgets to engineering guidelines and to the solution of erosion and other coastal engineering problems.

C. <u>Biological Productivity of the Southeastern Mediterranean in the Post Aswan High Dam Period</u>

1. Fostered contacts and linkages between Egyptian and Israeli scientists and institutions working on primary productivity.

2. Examined the effect of the diminished outflow of the Nile River on:

   i. Biological productivity
   ii. Nutrient chemistry
   iii. Species composition of plankton of the sea lakes

3. Determined the factors regulating primary productivity.

4. Determined the effect of the regulatory processes on pelagic fisheries.

5. Determined the community structure of primary and secondary producers.

6. Determined how the Nile discharge stimulates phytoplankton.

7. Determined the level of primary productivity given the controlled discharge of the Nile.

8. Determined whether the diatom-sardine food chain has been replaced by another food chain.

9. Synthesized the collected data to outline a sound basis for future fishery policy and help determine future research goals for Egypt and Israel in biological oceanography and fishery science.

D. Monosex Production of Tilapia

1. Fostered contacts and linkages between Egyptian and Israeli scientists and institutions working in aquaculture.

2. Continued research activities in the monosex production of tilapia through hybridization, sex reversal and separation of sexes.

3. Assessed growth rates of tilapia.

4. Produced all male Tilapia through hybridization between *T. nilotica* and *T. aurea* and other species or strains.

5. Produced all male Tilapia through sex reversal using methylestosterone.

6. Improved existing pelleted foods.

7. Developed polycultures of Tilapia with carp, mullet and catfish.

E. Fish Culture (Phase-Out)

1. Fostered contacts and linkages between Egyptian and Israeli scientists and institutions working in fish culture.

2. Phased out fish culture activities carried out in Phase I of the Cooperative Marine Technology Project. Among the phase-out tasks to be carried out are:

   a. Identified the ecological processes occuring in sea ponds.

   b. Developed a polyculture of the gilthead seabream with oysters, shrimp and macroalgae.

   c. Finished determination of optimal stocking densities for best food conversion efficiencies for highest yield per average per year.

d. Determined impact of water quality on growth.

e. Completed determinations of optimal energy protein rations and essential fatty acids for practical diets for gilthead bream.

f. Terminated vitamin needs assessments.

3. Review the current status of this sub-activity and compare it with the logical framework matrix. Determine whether AID should continue to support research of this sub-activity and how long it would take to apply the research. Is the end of sub-activity status well defined? Is the gilthead bream a species of fish that is mutually beneficial to all parties involved?

F. Assess the progress of the project in relation to the semi-annual reports, the logical framework matrix for each sub-activity, the financial plan (obligations and disbursements).

G. Evaluation Methodology: The team will examine documentary evidence, interview participants and observers in the U.S., Egypt and Israel, and visit project sites to verify the evidence.