

SEA GRANT INTERNATIONAL PROGRAM  
THE THIRD YEAR

by

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#### Introduction

Section 3 of the National Sea Grant College Program Act (P.L. 94-461) established the International Cooperation Assistance Program in 1976. Its goals are (1) to enhance the research and development capabilities of developing foreign nations with respect to ocean and coastal resources, and (2) to promote the international exchange of information and data with respect to the assessment, development, use, and conservation of such resources. The Congress envisioned that grants made under this legislation would promote cooperation between U.S. universities and their counterparts in developing countries. Grants were to be made only to U.S. institutions, and consultation with the Secretary of State was required before grants were made.

This legislation was amended by P.L. 95-428 to broaden the second goal stated above and allow cooperation with other developed nations in information and data exchange.

The act was again amended by P.L. 96-289 to change the name of the program to "Sea Grant International Program." As expressed in House Report No. 96-841, this change was made to more accurately describe the true nature of the international program.

The legislation, as amended, is given in Appendix A to this report.

Guidelines for the Sea Grant International Program (SGIP) were published in the Federal Register on April 11, 1978. They were quite brief, largely repeating the authorizing legislation. The guidelines did specify that SGIP proposals would be expected to address:

- (1) The nature and scope of the proposed project;
- (2) The utilization of institutional and other appropriate resources in the implementation of the project;

- (3) A clear indication of the foreign participant's commitment to the project;
- (4) Identification of accomplishments expected from a single granting interval;
- (5) Implicit or explicit out-year commitment of resources; and
- (6) The impact of the proposed project on the institution receiving funding.

The guidelines made it clear that SGIP projects should involve genuine cooperation between the grantee institution and the institution(s) in the developing country, and that any project submitted by a Sea Grant institution should take advantage of the marine capability already in existence at that institution.

The guidelines for SGIP are given in Appendix B to this report.

P.L. 96-289 also set an authorized funding level not to exceed \$5,000,000 for each of fiscal years 1981, 1982, and 1983.

#### Goals of SGIP

The goals of SGIP were more fully described in two previous reports on this program. Consequently, they will only be summarized here.

The primary goals of SGIP are those stated in the authorizing legislation:

"To (1) enhance the research and development capability of developing foreign nations with respect to ocean and coastal resources, as such term is defined in section 203 of the National Sea Grant Program Act; and (2) promote the exchange among the United States and foreign nations (including, but not limited to, developing foreign nations) of information and data with respect to the assessment, development, utilization, and conservation of such resources." (Section 3, P.L. 94-461, amended by P.L. 95-428)

A significant but implicit goal of SGIP is to help create an atmosphere which is conducive to cooperation between U.S. scientists and those in developing countries.

In establishing SGIP as part of the Sea Grant College Program, the Congress evidently wished that it produce results qualitatively similar to those produced by Sea Grant in this country, i.e. the building of scientific and technological capacity to identify marine resource problems and to solve them.

Another goal of SGIP is to make a contribution to the economic and social development of the developing world. SGIP should foster the development process by strengthening indigenous scientific and technological institutions and by supporting education and training programs.

Finally, it is desirable that technology transfer be a mutual sharing rather than simply a one-way transfer.

#### Grants Management Goals

In addition to the above goals which one might wish to find exemplified in the various international projects, there are other program-wide goals which managers in the Office of Sea Grant should strive to accomplish.

Continuity of Effort. Cooperative international projects, especially in developing countries, generally have to run for several years in order to produce any significant results. So it is advisable that each project be supported for a sufficient duration to have a real impact, even if this means fewer projects are supported than might otherwise be possible.

New Projects. Since both scientific and political elements in oceanic affairs are changing rapidly, it is desirable that SGIP be in a position to begin some new projects each year in response to these changes. This means that--the above continuity of effort notwithstanding--program managers should try to avoid a situation in which all resources are pre-committed and no new projects can be started in any year.

Geographic Distribution. If the Law of the Sea Conference has done nothing else, it has awakened developing coastal nations to the economic potential of their oceanic resources and to the need to possess indigenous marine research and development capabilities. Since SGIP manifestly lacks the resources to support cooperative projects with each and every one of these nations, a reasonable goal is to distribute projects broadly among the developing nations and to have at least one project in each of the principal developing regions of the globe.

#### Administering the Program.

As in the two previous fiscal years, the Office of Sea Grant continued during FY 80 to encourage universities to submit brief preliminary proposals before development of formal proposals. This procedure was designed to prevent the full-blown development of projects which stood little chance of being supported. It was also done to avoid causing unrealistic expectations in the cooperating foreign countries. Informal advice from a Sea Grant program manager that a proposal is inappropriate for further development does not prevent a proposer from submitting a formal proposal if he chooses to do so, and a preliminary proposal is not a strict requirement.

Generally speaking, there was no change in direction for the program, i.e.

- Emphasis was to be on projects in education and training;
- Projects should, to the extent possible, build upon existing relationships with institutions in developing countries;
- Projects should not raise unfounded expectations in developing countries; and
- Projects should be genuinely cooperative, with some real evidence that the foreign partner is committed to the work.

Ten formal proposals were received in the Office of Sea Grant in the course of FY 80. These proposals asked for an aggregate of approximately \$1.3 million. Five of the proposals asked for continued support for work which was started under SGIP auspices in earlier fiscal years.

These ten formal proposals were reviewed by people who are knowledgeable in marine education, training, research, advisory service, and international relations. They were also discussed in interagency meetings held in the Office of Sea Grant and the Department of State. Some of the issues taken into consideration included technical excellence, evidence of genuine cooperation with developing countries in project formulation, evidence of commitment on the part of developing countries, geographic balance, and subject matter balance. All proposals were also reviewed by officials in the Department of State.

Funding decisions were made at various times in the course of FY 80, with the last decisions of the fiscal year being made on August 1, 1980. Three projects were awarded support for a two-year period; three projects were awarded support for one year; and four projects were declined by the Office of Sea Grant.

#### Funded Projects

Table I below gives the grantee institution, participating developing country, duration, and size of grant for each project which was supported out of FY 80 funds.

TABLE I

## SGIP Projects Supported with FY 80 Funds

| <u>Grantee Institution</u> | <u>Developing Country</u> | <u>Duration</u> | <u>Amount</u> |
|----------------------------|---------------------------|-----------------|---------------|
| University of Hawaii       | South Pacific Nations     | 2 years         | \$195,700     |
| University of Delaware     | Costa Rica                | 2 years         | 320,000       |
| University of Miami        | Colombia                  | 1 year          | 111,600       |
| Florida Sea Grant Program  | India                     | ----            | 1,300         |
| Louisiana State U.         | Mexico                    | 1 year          | 35,800        |
| S. Carolina Sea Grant      | Israel                    | 1 year          | 70,000        |
| Lehigh University          | India                     | 2 years         | 175,000       |
|                            |                           |                 | \$909,400     |
|                            |                           | TOTAL           |               |

Progress reports on the continuing projects are given in Appendix C to this report.

It should be noted that four of these projects (Hawaii, Delaware, Miami, and Louisiana State) are continuations of projects begun in earlier fiscal years. The grant of \$1,300 to the Florida Sea Grant College Program was a supplement to an existing grant to allow completion of a cooperative training project at the Indian Institute of Technology.

The grant to the South Carolina Sea Grant Consortium was also for support of a continuing project. This training project in wave measurements and coastal management at the Israel National Oceanographic Institute was originally supported by a grant to the Virginia Institute of Marine Science. When the principal investigator moved to the University of South Carolina, a grant of \$70,000 was awarded to the South Carolina Sea Grant Consortium to continue the project.

The only new SGIP project started in FY 80 is between Lehigh University and the Indian Institute of Technology in Kanpur. The overall objective of this education project is to increase the capabilities of Indian ocean engineers in the field of geotechnology. Details may be found in Appendix C.

All the projects which have been supported by SGIP to date are shown in Table II, with cumulative durations and funding totals.

TABLE II

## SGIP Projects Supported to Date

| <u>Grantee Institution</u> | <u>Developing Country</u> | <u>Cumulative Duration</u> | <u>Cumulative Funding</u> |
|----------------------------|---------------------------|----------------------------|---------------------------|
| University of Hawaii       | South Pacific Nations     | 3 years                    | \$ 288,500                |
| Oregon State U.            | Chile and Mexico          | 3 years                    | 280,000                   |
| U. of California           | Mexico                    | 2 years                    | 240,000                   |
| Florida S.G. Program       | India                     | 1 year                     | 19,300                    |
| Louisiana State U.         | Mexico                    | 3 years                    | 104,200                   |
| Maryland S.G. Program      | Egypt                     | 2 years                    | 134,400                   |
| U. of Rhode Island         | Malaysia                  | 3 years                    | 280,000                   |
| New York S.G. Institute    | Chile                     | 2.5 years                  | 72,000                    |
| U. of Delaware             | Costa Rica                | 4 years                    | 623,500                   |
| VIMS/S. Carolina           | Israel                    | 2 years                    | 201,400                   |
| University of Miami        | Colombia                  | 3 years                    | 311,500                   |
| Lehigh University          | India                     | 2 years                    | 175,000                   |
|                            |                           | TOTAL                      | \$2,729,800               |

Progress to Date

SGIP has awarded three annual sets of grants to U.S. universities for cooperative marine projects which emphasize education and training. Because the first set of grants was made at the very end of FY 78, no project has been in actual operation for more than two years. Almost all the cooperating foreign institutions are universities. Those that are not universities themselves are associated closely with universities; in no case are they government ministries. In each case, the cooperative project was built on some pre-existing relationship between the U.S. grantee university and the institution in the developing country.

One project, that between the Florida Sea Grant College Program and the Indian Institute of Technology at Bombay, has come to a conclusion. Another project, that between the New York Sea Grant Institute and the University of Concepcion in Chile, is due to be completed in the next

half year. All the remaining projects are due to continue for at least one more year. Under these circumstances, it is difficult--or perhaps impossible--to carry out any definitive evaluation of the program. But it is reasonable to examine the progress which each of the international projects is making.

This progress should be examined from two points of view. First, what progress is being made toward accomplishment of each individual project's objectives as set out in the original proposal? Second, how does accomplishment of individual project objectives contribute to accomplishment of overall program goals?

Project Objectives. Concentrating for the moment on the eleven continuing projects being supported by SGIP, i.e. leaving aside the new one at Lehigh University, it appears that all the projects are fulfilling their objectives. This is being done despite unanticipated delays and unforeseen problems caused by such factors as distant and uncertain communication and transportation, changes in project personnel, cultural barriers, and languages differences.

By way of concrete example, an international project between the University of Hawaii and the University of the South Pacific is helping to train marine extension agents for the eleven small Pacific island nations served by the University of the South Pacific. A workshop on use and management of inshore marine resources was held at Fiji in November 1979. The first agent, a fisheries specialist, is being trained to work in Fiji. A second agent is doing initial survey work in Tonga before going to the University of Hawaii for training in extension techniques. The two universities are also carrying out a faculty exchange program.

Professors Nelson Marshall and Harlan Lampe at the University of Rhode Island are working with colleagues at three Malaysian universities in the fields of fisheries and coastal management. They have been training Malaysian faculty members in fisheries economics methods, improving graduate and undergraduate instruction in fishery economics, strengthening capabilities in fish population research and coastal management, and helping Malaysian faculty members develop research projects for local funding.

A project between The Johns Hopkins University (part of the Maryland Sea Grant Program) and the High Institute of Public Health in Alexandria is enhancing the capabilities of Egyptian microbiologists in marine environmental microbiology. A workshop was held on advances in environmental microbiological techniques; Egyptian students have been trained in tracer virus techniques in field research and monitoring; and an Egyptian lecturer recently completed four months of specialized training at Johns Hopkins.

Program Goals. While it is reasonably clear that project investigators are accomplishing the objectives set forth in their funded proposals, it is harder to show how these add up to accomplishment of overall program goals. Somehow, it always seems to come down to a



matter of personal judgement; and the most one can ask is that such judgements be made by adequately informed and objective people.

The last two annual reports on SGIP have recommended a formal evaluation of the program at the end of its third or fourth year of operation. This evaluation would look at such things as adherence to the intent of the legislation, administration of grant funds, technical review procedures, interagency coordination, accomplishment of program goals, and initial effects on participating developing countries.

Since no project has been in operation for more than two years, it is still too early for the recommended formal evaluation. During the past year, however, the opportunity presented itself to have SGIP evaluated by a subcommittee of the Ocean Policy Committee of the National Academy of Sciences. This evaluation is part of a larger study of the whole field of marine technical assistance. Accordingly, the subcommittee of the Ocean Policy Committee was asked to include SGIP in its evaluation of marine technical assistance mechanisms. The subcommittee agreed; it is now carrying out the evaluation; and the results should be available by Fall 1981

### Recommendations

After three years of grants, it is clear that some steps could be taken to make SGIP a more effective instrument for accomplishing its goals. These recommendations have to do with its budget, geographic distribution of effort, grants management strategy, public affairs, and types of cooperative activity.

Budget. SGIP has had a budget of approximately \$900,000 per year in each of the last three fiscal years. This level budget was sufficient to begin a limited number of projects, even with the rising cost of necessary international travel and the effects of inflation. To date, no project has had to be terminated prematurely.

It must be recognized, however, that the building of indigenous marine research capability in developing countries is a long range matter requiring continuity of funding. Available funds will have to grow quite rapidly to sustain the program to the point where it can really achieve its goals.

Geographic Distribution of Effort. Ideally, one might wish to see international projects well distributed among the developing areas of the globe to serve as a symbol of our interest in strengthening marine research and development capabilities on a worldwide basis. To date, SGIP is supporting projects in Latin America and the Caribbean, the Middle East, Southern Asia, and Oceania. Tropical Africa is the only principal area of the developing world in which SGIP is not supporting any projects whatever. It is recommended that managers of the Sea Grant College Program make a sincere effort to support one or more projects in tropical Africa.

Grants Management Strategy. Cooperative international projects, especially in developing countries, generally have to run for several years in order to produce significant results. The present strategy of making one and two-year grants is based on this idea; emphasis is on continuity of effort instead of quantitative growth in the number of projects. It is recommended that program managers continue to follow this approach, and even that they award three-year grants when this becomes feasible.

Public Affairs. Though there have been articles about SGIP in the MTS Journal and Sea Grant 70's as well as news releases from NOAA and from the Sea Grant institutions, it is still true that the program has had a low profile. This was the result of a deliberate decision in the Office of Sea Grant, a decision based on the fact that the program was so new and there was so little to tell. In addition, there was a desire to not arouse unrealistic expectations in the developing world.

Now SGIP is beginning to grow up and there is evidence of substantial progress which should be told to legislators, taxpayers, the U.S. oceanographic research community, and scientific communities in other countries. Consequently, it is recommended that there be a more vigorous effort in public affairs about SGIP during FY 81 and FY 82.

Types of Cooperative Activity. For the past three years, emphasis in SGIP has been on education and training activities. Now that a number of developing country personnel have been trained in various marine fields, it would be profitable to involve them in small cooperative research activities. After all, one of the best ways of learning how to perform research is to actually do some. It is recommended, therefore, that SGIP support some relatively small cooperative research projects as soon as the program's funding level increases sufficiently.

APPENDIX A

Legislation Establishing the  
Sea Grant International Program

(P.L. 94-461, amended by P.L. 95-428  
and P.L. 96-289)

SEC. 3. SEA GRANT INTERNATIONAL PROGRAM.

33 U.S.C. 1124a

(a) IN GENERAL--The Secretary of Commerce (hereafter in this section referred to as the "Secretary") may enter into contracts and make grants under this section to--

(1) enhance the research and development capability of developing foreign nations with respect to ocean and coastal resources, as such term is defined in section 203 of the National Sea Grant College Program Act; and

(2) promote the exchange among the United States and foreign nations (including, but not limited to, developing foreign nations) of information and data with respect to the assessment, development, utilization and conservation of such resources.

(b) ELIGIBILITY AND PROCEDURE.--Any sea grant college and sea grant regional consortium (as defined in section 203 of the National Sea Grant College Program Act) and any institution of higher education, laboratory or institute (if such institution, laboratory, or institute is located within any State (as defined in such section 203)) may apply for and receive financial assistance under this section. Each grant or contract under this section shall be made pursuant to such requirements as the Secretary shall, after consultation with the Secretary of State, by regulation prescribe. Application shall be made in such form, and with such content and other submissions, as may be so required. Before approving any application for a grant or contract under this section, the Secretary shall consult with the Secretary of State. Any grant made, or contract entered into, under this section shall be subject to the limitations and provisions set forth in section 205(d) (2) and (4) of the National Sea Grant College Program Act and to such other terms, conditions, and requirements as the Secretary deems necessary or appropriate.

(c) AUTHORIZATION FOR APPROPRIATIONS.--There are authorized to be appropriated for purposes of carrying out this section not to exceed the following amounts--

(1) \$3,000,000 for each of fiscal years 1977, 1978, and 1979.

(2) \$5,000,000 for fiscal year 1980.

(3) Not to exceed \$5,000,000 for fiscal year 1981, not to exceed \$5,000,000 for fiscal year 1982, and not to exceed \$5,000,000 for fiscal year 1983.

## APPENDIX B

Guidelines for the International Cooperation Assistance Program  
Federal Register for April 11, 1978, page 15309

### **Subpart D—International Cooperation Assistance**

#### **§ 917.30 General.**

(a) 33 U.S.C. 1124a sets up a program of International Cooperation Assistance in marine research, marine education and training, and marine advisory services designed to enhance the research and technical capability of developing foreign nations with respect to ocean and coastal resources and to promote the international exchange of information and data with respect to the assessment, development, utilization, and conservation of such resources. Any Sea Grant College or Sea Grant Regional Consortium or any institution of higher education, laboratory, or institute (if such institution, laboratory or institute is located within any state) may apply for and receive International Cooperation Assistance funding.

(b) International Cooperation Assistance funding proposals will be expected to address: (1) the nature and focus of the proposed project, (2) the utilization of institutional and other appropriate resources in the implementation of the project, (3) a clear indication of the foreign participant's (individual or institution) commitment to the project, (4) identification of accomplishments expected from a single granting interval, (5) implicit or explicit out-year commitment of resources, and (6)

the impact of the proposed project on the institution receiving funding.

(c) The projects supported by International Cooperation Assistance funding are intended to be genuinely cooperative. Innovation and uniqueness will be significant factors in the determination of proposals to be funded. In the case of a proposed international project that is submitted from an institution where a Sea Grant program is in existence, the extent to which the proposed project takes advantage of the Sea Grant institutional capability existing at that institution and thereby strengthening it, as opposed to being a mere appendage to the ongoing Sea Grant program, will also be an important evaluation factor. The U.S. Department of State will be given the opportunity to review all International Cooperation Assistance projects and none will be funded without this consultation. Because the United Nations Educational, Scientific, and Cultural Organization (UNESCO) also funds international projects of the kind that can be funded under the Sea Grant International Cooperation Assistance program, and, to effect coordination in this area between Sea Grant and UNESCO, the Division of Marine Sciences (UNESCO) will be informed of all International Cooperation Assistance projects funded.

## APPENDIX C

### Project Summaries and Progress Reports

Project summaries and progress reports are presented in the order used in Table II above.

#### University of Hawaii - University of the South Pacific

The University of the South Pacific serves the educational needs of eleven Pacific island nations: Solomons, Fiji, Tuvalu, Kiribati, Vanuatu, Cook, Nauru, Niue, Tokelau, Tonga, and Western Samoa. The project is led by Dr. Philip Helfrich and Dr. Jack Davidson of the University of Hawaii and Dr. Uday Raj of the University of the South Pacific. Objectives are (1) to conduct a faculty exchange program between the two universities in order to improve tropical marine science course offerings and overall professional improvement, (2) to establish a functional marine extension service at the University of the South Pacific, and (3) to evaluate the program and develop a follow-up plan.

During the past year a seminar/workshop was held on the use and management of inshore marine resources of tropical Pacific islands. The meeting was attended by faculty members of both universities, representatives of local government and industry, and students in the USP departments of fisheries and marine sciences. Proceedings are being prepared for publication.

With respect to the establishment of marine extension service in the South Pacific, two new agents have been hired. The first, Mr. Johnston Seto from Fiji, is being trained in fisheries management. The second, Mr. Steven Halapua from Tonga, has a background as a resource economist and is presently doing survey work in Tonga before going to the University of Hawaii for additional training in extension techniques.

Some other activities included a baseline study of the first oil exploration on a South Pacific coral reef, exchange of publications, four satellite conferences via PEACESAT, and production of extension materials.

#### Oregon State University - Chilean and Mexican Universities

This project "An International Cooperative Assistance Program for Latin America (with Emphasis in Chile and Mexico)" involves personnel from Oregon State, the Catholic University of Valparaiso, and other Chilean and Mexican universities. The principal investigators are Dr. William Q. Wick and Dr. Victor Neal of Oregon State.

Objectives are (1) to determine suitable opportunities for marine advisory service activities in Latin America; (2) to transfer knowledge of coastal processes and techniques of study to Chilean colleagues by means of an academic course, a sampling program, and technician

training; (3) to apply remote sensing capabilities of NIMBUS-7 satellite to study the physical, chemical, and biological nature of the waters off Chile; (4) to conduct workshops on modeling approaches and fisheries technology with Latin American personnel; (5) to train Mexican students and scientists in marine mammal research and management; and (6) to continue support for distribution of the newsletter "Exposure."

During the past year a workshop on marine advisory services was planned for December 1980 at the University of Chile at Antofagasta; a short course on beaches and estuaries was held at the Catholic University of Valparaiso; and a workshop entitled "The Role of Dynamic Models in Fishery Management" was held at the University of Chile at Osorno. Chlorophyll maps produced from satellite surveillance have not yet been released, and this has delayed accomplishment of the third objective given above. The training of Mexican personnel in marine mammal management will be carried out in the coming year.

In addition to scheduled activities, Sea Grant funds have been used to support travel of faculty members to Chile to teach short courses in fish disease and the aquaculture of salmonids.

#### University of California - Mexican Universities

This project "Informational and Education Assistance to Marine Science Institutions in Mexico" involves people from the University of California Sea Grant College Program; Instituto Nacional de Pesca; Escuela Superior de Ciencias Marinas, Ensenada; Universidad Autonoma de Baja California; Centro de Investigaciones y de Educacion Superior de Ensenada; Centro de Investigaciones Biologicas, La Paz; and Universidad Autonoma de Baja California Sur, La Paz. The principal investigators are Dr. Richard A. Schwartzlose and Dr. George T. Hemingway.

Principal objectives are (1) to train a self-supporting, self-perpetuating cadre of marine research technicians for the Mexican science community; (2) to acquire reprints, volumes, and hard copies of documents and journals for the Mexican institutions; (3) to provide short courses for faculty and staff members of the Mexican institutions; and (4) to provide access upon request to short-term, intensive training through attendance at summer courses by faculty members of the Mexican institutions.

During the past year thirteen lectures were offered at Escuela Superior de Ciencias Marinas, Ensenada, on a wide variety of marine science topics. The teachers volunteered their time, and Sea Grant paid their travel expenses. Seven lectures are now being offered during the Fall term at Centro Interdisciplinario de Ciencias del Mar, the marine science campus of the Instituto Politecnico Nacional. Dr. Richard Eppy held a three-day workshop on analysis of chlorophyll and determination of primary productivity; Ed Coughran, Director of the UCSD Computer Center, taught computer programming at Ensenada; Dr. Geoff Moser of the NOAA Southwest Fisheries Center spend a week in Mexico City teaching identification of California Current ichthyoplankton; and Drs. Zedler and Hazen gave a week-long course in the field and classroom on coastal lagoons and antiestuarine ecosystems.

The longest course was five months in duration. Two oceanologists, Victor Moreno and Armando Rosas of the Instituto Nacional de Pesca, learned deep-sea reversing thermometer technology. They are now prepared to start a thermometer calibration laboratory in Mazatlan.

University of Florida - Indian Institute of Technology, Bombay

This one-year project, entitled "A Short Course on Small Harbor Engineering in India," has been completed. It was under the direction of Dr. A. J. Mehta of the University of Florida and Dr. S. Narashimhan of the Indian Institute of Technology.

The objective of the course was to review coastal engineering requirements for the design and maintenance of small and intermediate size commercial harbors. These harbors are a key factor in the growth of maritime trade, including the export of seafood products such as frozen shrimp. In response to the need for projected increases in these exports, the government of India has conceived a master plan to improve existing harbors and construct a number of new ones. This course served as a forum to identify coastal engineering problems and to work out solutions that might assist engineers in the design and maintenance of the planned harbors.

The short course was held January 2-13, 1980, at the Indian Institute of Technology, Bombay. Partial support was provided by the Dredging Corporation of India (New Delhi), Central Water and Power Research Station (Pune), and the National Institute of Oceanography (Goa). There were 57 participants in the short course, most of them engineers from existing ports, but with several from academic and governmental institutions. Fifteen Indian and four foreign speakers dealt with topics such as the physical regime of the Indian coastline, design wave and wave force computations, estimation of coastal and estuarine sediment transport, inlet stability and sand bypassing, the design and economics of harbor structures, case studies of harbor models, and dredging as a key engineering and economic factor in harbor design. Thirty-two of the participants took part in a formal evaluation of the short course, with most of them reacting quite favorably. Lecture notes were bound into three volume sets and distributed to the participants as well as to interested agencies.

Louisiana State University - Universidad Nacional Autonoma de Mexico (UNAM)

This project "An Ecological Program for the Laguna de Terminos (Campeche, Mexico) with Special Reference to Fishery Resources and the Potential Impacts of Man" is under the leadership of Dr. John Day of LSU's Center for Wetland Resources. His Mexican counterpart is Dr. Alfredo Laguarda, Director of UNAM's Center for Marine Sciences and Limnology.

During the past year, the objectives of the project were (1) to continue a cooperative study of management topics associated with the shrimp fishery of Laguna de Terminos, (2) to transfer the programs and data of a hydrodynamic model to Mexican scientists and train them in its use, and (3) to continue to train students in field studies necessary to complete an ecosystem analysis. All of these objectives have been substantially achieved.

### Maryland Sea Grant Program - High Institute of Public Health, Alexandria

This project "Strengthening Environmental Microbiology and Pollution Monitoring Capabilities at the High Institute of Public Health, Alexandria, Egypt" involves personnel from The Johns Hopkins University and the Department of Microbiology at the High Institute. Principal investigators are Drs. Kazuyoshi Kawata and Vincent P. Olivieri in the Division of Environmental Health Engineering at Johns Hopkins.

The specific objectives are (1) to hold workshops on recent environmental microbiological techniques, (2) to train microbiology students in the tracer virus technique in field research and monitoring, and (3) to hold a seminar on environmental microbiological studies in tropical waters during each year of the two year project.

In March 1980 the principal investigators presented a three-day seminar to twenty-two persons from the High Institute of Public Health, the Egyptian Institute of Medical Research, the Faculty of Pharmacy, and NAMRU-3 (a U.S.Navy medical research unit based in Cairo). Sixteen students then spent the following three weeks in a workshop on such topics as enumeration of pathogens in canal water and wastewater, bacterial viruses in water, the die-away of selected microorganisms in water, field measurements at a Mediterranean outfall, and the process of disinfection.

When the investigators returned to the United States in April, they were accompanied by Dr. Thoraya El Shasley, a lecturer at the High Institute who came to spend four months at The Johns Hopkins University as a post-doctoral fellow. She has since returned to Egypt and is continuing work in culturing and enumeration techniques.

### University of Rhode Island - Malaysian Universities

This project "Cooperative Development of Marine Resources Capability in Malaysia" involves people from URI, Universiti Malaya, Universiti Pertanian Malaysia, and Universiti Sains Malaysia. Project directors are Drs. Nelson Marshall and Harlan Lampe of URI.

Objectives are (1) to retrain professionally qualified Malaysian economists in fisheries economics methods, (2) to improve the teaching of fisheries economics at the Malaysian universities, (3) to assess current economic conditions in the fisheries sector on the east coast of Peninsular Malaysia, (4) to strengthen university capability to handle instruction and research in fish population dynamics and to introduce research basic to fish management, and (5) to work with Malaysian faculty members to develop research projects that will permit the role of mangroves to be determined and factored into coastal management decisions.

During the past year, seminars related to fisheries economics issues were presented, analysis of costs and earnings of small-scale fisherman was begun, four students received advice on fisheries related theses, and



computer programs were adapted for use at the Malaysian universities. An international symposium on mangrove ecosystems was held, and papers with joint Malaysian-American authorship were delivered. Several Malaysian faculty members have spent short periods of time at URI for further study. Although not funded by Sea Grant, Captain Mohammed Ibrahim--a key faculty member of the fisheries/marine science group at Universiti Pertanian Malaysia--has completed the Master of Marine Affairs Program at URI and is enrolling as a PH. D. candidate in the Graduate School of Oceanography.

#### New York Sea Grant Institute - University of Concepcion, Chile

This project "Strengthening Marine Sciences Capabilities and Programs at the University of Concepcion, Chile" involves personnel from the Marine Sciences Research Center at Stony Brook and the Department of Marine Biology and Oceanography at the University of Concepcion. The principal investigators are Lisandro A. Chuecas, Chairman of the Department of Marine Biology and Oceanography at the University of Concepcion, and Iver W. Duedall, Associate Professor of Chemical Oceanography at the Marine Sciences Research Center.

The overall objective is to train Chilean university personnel so they can carry out research which contributes to coastal management in Chile. Specific objectives are (1) to train faculty members in research methods which are used in coastal research and (2) to supplement the teaching and research programs at the University of Concepcion.

During the past year several faculty members from the University of Concepcion spent short periods at the Marine Sciences Research Center taking courses, attending seminars, and planning cooperative research projects. Faculty members from the Marine Sciences Research Center also offered courses and provided thesis guidance at the University of Concepcion. Professor Marcos Retamal (UC), for example, began work with Dr. Peter Weyl (MSRC) on the establishment of a marine resources inventory for Region VIII in Chile. After consultation with experts in Virginia, Maryland, and New York, Professor Irene Lopez (UC) prepared a manual on the culture of shellfish. The presidents of the two universities recently met to renew the memorandum of understanding under which this cooperative project is carried out.

#### University of Delaware - University of Costa Rica

This project "Joint University of Costa Rica/University of Delaware Marine Studies Program: Manpower Training and Pollution Assessment" involves people from the Delaware Sea Grant College Program and several departments at the University of Costa Rica. Objectives are (1) to work with Costa Rican trainees in carrying out a preliminary ecological assessment of marine resources in the Gulf of Nicoya, (2) to study the effects of current circulation on pollutant dispersion in the Gulf of Nicoya, (3) to provide a well-equipped modern and economical research

vessel for training and research, and (4) to continue an on-going exchange of personnel between the two universities for training graduate students and technicians.

During the past year, cooperative training and research continued in the areas of general marine ecology, chemical and physical oceanography, remote sensing, and operation and maintenance of the research vessel. Dr. Manuel Murillo, Vice-President for Research at the University of Costa Rica, continued to coordinate support activities, while the training of junior scientists, students, and boat personnel was directed by Drs. Charles Epifanio, Vic Klemas, and Don Maurer and Captains Donald Evans, Timothy Pfeiffer, and Thomas White of the University of Delaware. Two young scientists--Ana Dittel and Jose Vargas--who are presently faculty members at the University of Costa Rica, organized and supervised a group of undergraduates who took part in cruises and participated in analysis of data. Rolando Hofmeister, who had studied marine biology as an undergraduate at the University of Costa Rica, continued to serve as apprentice boat master and by year's end was competent to serve as captain of R/V Skimmer.

Three papers based on research conducted during the past year are presently in preparation and both Ana Dittel and Jose Vargas are involved in preparation and authorship.

#### South Carolina Sea Grant Consortium - Israel National Oceanographic Institute

This project "Improvement and Application of Ocean Wave Data Acquisition and Modeling Techniques for the Facilitation of Coastal Management Decisions in Israel and in the U.S." is led by Dr. Victor Goldsmith from the University of South Carolina and Dr. Abraham Golik from INOI.

The project aims to strengthen the capabilities of both Israeli and U.S. scientists in the field of wave information and coastal zone planning. Specific objectives are (1) to train Israeli personnel in wave measurement and modeling techniques, (2) to exchange and compare wave data obtained in the same manner, and (3) to improve Israeli advisory service activity in the field of wave information and coastal zone planning.

Despite the normal disruption involved in the transfer of this project from one academic institution to another, during the past year the training of Israeli scientists and technicians continued, a directional wave gauge was installed and operated south of Haifa, a scientific paper employing wave data was published, and another paper has been submitted for publication. In order to promote international exchange of marine information, a permanent data bank of all regional wave information was created. Although data analysis is not yet completed, several requests for synthesized data have been answered.

#### University of Miami - Colombian Institutions

This project "Marine Resources and Environmental Sciences Training and Information Exchange Program for Colombia" is under the direction of

Dr. Francis Williams, Professor in the Division of Biology and Living Resources at the Rosensteel School of the University of Miami.

Objectives are (1) to provide a series of lectures and seminars on the principles of multidisciplinary research and the application of these principles to tropical coastal areas such as Cartagena Bay and (2) to provide on-the-job experience in the design, planning, execution, and coordination of field and laboratory programs to provide the data needed for development of plans to manage coastal resources, through an integrated study of Cartagena Bay.

During the first year, emphasis was on completion of formal training courses for Colombian university students and faculty members, together with government scientists and technicians. Field studies in Cartagena Bay were also started. The second year saw the continuation of the broad scale multidisciplinary study of Cartagena Bay designed to provide an essential part of the data necessary for managing the area. Equally important, the study has simultaneously provided excellent on-the-job training in the field and laboratory for a large cadre of Colombian scientists, technicians and university students.

The Cartagena Bay study consists of hydrodynamical, chemical and biological tasks. As each part of the study becomes familiar to Colombian personnel, the principal role of the Miami staff has shifted to one of quality control, general supervision, and providing continuing impetus for progress. The hydrodynamical and chemical tasks have proceeded on schedule and have already produced valuable results. The biological work is somewhat behind schedule because of lack of a suitable boat. The third and final year will see completion of the field sampling, an increasing effort on analyses and interpretation of results, and report writing.

Lehigh University - Indian Institute of Technology, Kanpur

This project "Graduate Education in Geotechnical Ocean Engineering at the Indian Institute of Technology, Kanpur" is under the direction of Dr. Adrian Richards, Director of the Marine Geotechnical Laboratory at Lehigh University. His counterpart at the Indian Institute of Technology is Dr. Umesh Dayal.

The overall objective of this education project is to increase the capabilities of Indian ocean engineers in the field of geotechnology. Specific objectives are (1) to train Indian students in the design, construction, and testing of geotechnical equipment; (2) to introduce students to field work by beginning geotechnical research on the stability of Ganges Delta sediments; (3) to facilitate international exchange of information and data between the two institutions; (4) to compare and contrast Ganges data with existing data from the Mississippi Delta; and (5) to organize a short-term intensive course in ocean engineering.

A grant of \$175,000 was awarded to Lehigh University on August 29, 1980, to support this project for the next two years.

