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INTERNATIONAL CENTER FOR MARINE
RESOURCE DEVELOPMENT

Annual Report

for

ACTIVITIES UNDER 211(d) GRANT AID/csd #2455

May 1970 - June 30, 1971

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INTRODUCTION

Focus of Concentration

Vast amounts of money, effort and skill have been channeled into economic development since World War II, first as part of reconstruction under the Marshall Plan, and more recently as "economic development". We have learned that the techniques and institutions applicable to reconstruction are not necessarily directly applicable to development. Out of a few successes in agriculture has come a substantial body of literature which deals with many of the aspects of economic development: land tenure, social equity, per capita income, employment and basic nutrition (particularly that of children). But other problems persist. Practical solutions to them will have to be found under the mounting pressures of increasing population, diminishing basic resources and slowly responding institutions.

There is reason to believe that the harvest of fishery resources has not made very much of a contribution to economic development in the developing world even though fishery production has grown at nearly 6% per year for almost two decades. While substantial amounts of foreign exchange have been earned by developing countries through international trade in fishery products, systematic methods of translating elements of these earnings into economic development objectives have been few.

Efforts to dissect the workings of the fishery economy are increasing however, and prospects have improved for using the benefits from the fishery sector in overall economic development. Without minimizing the problems of the industrial sector, special attention needs to be given to the fishery contribution to development of the rural sector.

The Rural Sector

In most underdeveloped countries, the coastal fisheries which are basically rural in character are the most in need of development efforts. Throughout the world these fisheries account for the greatest number of fishing boats and fishermen and a substantial amount of the catch is used directly for human consumption. For this reason alone their problems should claim the immediate attention of development program planners. In many cases shore establishments spring up originally to meet the needs of these fisheries and the whole structure of a fisheries industry often begins with them. Moreover the inshore fisheries can be a source of trained crew for high-seas fishing vessels.

The development prospects for many of these small fleets will depend on their potential to benefit from sound management practices. There are problems of productivity and operational efficiency that must be solved. Most of the coastal fisheries are labor intensive. They lack adequate mechanisms for credit, market and infrastructure, and access to training facilities.

Realizing that the relatively slow growth of the rural sector inhibits economic progress by frustrating rural development and encouraging urban migration, the Center has brought its capabilities up to a level where it can carry its activities off the URI campus and into the areas of most critical need for fisheries development.

Wherever rural sector fisheries problems may appear in the developing world it should ultimately be within the capabilities of the Center to respond with explicit contributions in economic analysis, food technology and development planning, all growing out of Center programs of research, teaching and extension.

Worldwide, the need for economic development has out-
stripped the scope of present financial commitments to a
point where the problems are surfacing rapidly on many fronts.
To solve these problems we must find new ways of responding
which reach beyond our present limited financial capacities
and institutions.

Three Program Areas

The three program areas identified in last year's re-
port (p. 16) characterize the principal growth and direction
of ICMRD activity:

Economic research, analysis and planning leading to
development of coastal communities and their marine
resources and fisheries; (the planning of coastal land
and water use, fisheries sectoral analyses, studies of
rural employment, income distribution, credit and mar-
keting and essential service infrastructures).

Marine foods technology development aimed at closing
the gap between production and consumption of marine
products; (the science of food and nutrition and ad-
vanced food technology applied to the economic prob-
lems of sanitation, toxicity and waste in the proces-
sing of marine resource products).

Technical assistance and extension activities culmin-
ating in the establishing of working relationships with
other institutions: (the development of pre-investment
and investment projects for international lending in-
stitutions, assistance for institutions that are build-
ing training and educational programs, follow-up sec-
toral analyses, rural marketing and trade development).

These programs as proposed in the original outline for the ICMRD grow naturally out of the marine and sea-grant orientation of the University in resource economics, oceanography, sociology, geography, and food and nutritional sciences.

Related University Marine Programs

Of the dozen of more degree programs, certificate programs and informational services under the marine aegis at URI, three have increasing relevance to the ICMRD.

(1) The Law of the Sea Institute, which meets annually at URI, is dedicated to the stimulation and exchange of information and ideas relating to international use and control of the marine environment. In its occasional papers it presents professional views which are germane to many of the development problems facing the Center. As the Center deals with specific problems of coastal zone fishery development, it draws upon the source material provided by the Institute. At the same time the Law of the Sea Institute provides for the pooling of theoretical information to which the Center will contribute practical experience as its work in the under-developed countries expands. In time the Center can be the proving ground or structure whereby many of the Institute's legal, political and economic theories and the hard realities of resource development come face to face.

The presence of the International Center for Marine Resource Development at URI has been catalytic in stimulating the choice of subject for next year's conference by the Law of the Sea Institute Executive Board. In June 26-29, 1972, the Law of the Sea Institute will deal with "The Interest and Needs of the Developing Countries in the 1973 Law of the Sea General Conference".

(2) The URI Master of Marine Affairs program is providing an important adjunct activity to the ICMRD program. The curriculum, the first of its kind in the country, cuts across disciplinary lines to include the Departments of Resource Economics, Geography, Geology, Ocean Engineering and Political Science and the Graduate School of Oceanography.

(3) The Graduate Certificate Program in International Development Studies has been established. The departments of Economics, Geography, Political Science and Resource Economics offer, each spring semester, a five-course, 15 credit program leading to a Graduate Certificate awarded by the Dean of the Graduate Students. The Department of Sociology and Anthropology will also participate in certain aspects of this new program. Sponsored by the University's Planning Committee on International Studies and supported by the ICMRD, this graduate program is designed to provide a supplementary, interdisciplinary concentration on the problems and processes of modernization and international development.

The Law of the Sea Institute, the Master of Marine Affairs program, the Graduate Certificate Program in Development Studies and the International Center for Marine Resource Development at URI are constantly focusing on the urgent problems of international legal and political frameworks for dealing with uses of the world's oceans.

Staff

The heart of the Center is its faculty. The careful building of a strong staff with solid roots in international experience continues to be a major concern. With the appointment of three full-time faculty and the decision to draw more heavily on the time of two tenured University faculty, there are now the equivalent of three and three-quarters full-time University faculty wholly concerned with Center problems. Full-time ser-

ices of an additional faculty member in resource economics will be added in September 1971. A number of other faculty are increasingly involved directly and indirectly in Center-related research and teaching (see Appendix I, c.v.).

A new full-time position in the Department of Resource Economics will be financed by the Center from July 1971. This new staff position has been filled by Thomas F. Weaver (see Appendix I, c.v.). Professor Weaver spent the year 1966 in Raipur District, India studying irrigation and agricultural development methods. During 1967-71 he was a visiting fellow at the University of Malaya where he was involved in university development, teaching and research projects. He is currently completing research studies initiated there on irrigation, small-holder development, forest industrial development and land-holding patterns. He will turn his attention to the ways in which the development process can be applied to the problems of the rural fishery.

BACKGROUND

The Center and World Development

It has become increasingly apparent to us that the kind of assistance the Center is working to provide may be the best hope for making optimum use of present and future development efforts in the area of living marine resources.

The massive commitments by the Food and Agriculture Organization (FAO), the World Bank, and the United Nations Development Programme (UNDP) which support a complex array of fishery development programs all over the developing world are holding back nutritional and economic disaster on many fronts. Seeing itself as an important corollary to these international programs, the Center has developed a better view of its function in supplying some of the assistance necessary for these developing countries to attain their long-term fisheries development goals. The forging of professional bonds among institutions, the sharing of research and personnel, the cooperative training of faculty and graduate students to assure continuity and growth of developing fishery structures, may be the means by which many of these efforts will stand and flourish rather than falter.

Terms of the 211(d) Grant

Under the terms of the original 211(d) grant, the ICMRD was designed to build upon the existing marine resource activities at the University of Rhode Island and to sustain and help define these mutually productive relationships as both the marine programs and the Center continue to expand. The concept of the Center is developing within this framework. We feel that the grant has played an important part in the University commitment to move ahead in the international sphere. At the same time, the Center has strengthened its own competence

as an international agency. It is developing its teaching and research proficiency and accumulating a reservoir of consulting and information services.

Original Objectives

The specific objectives for the ICMRD outlined in the original proposal were:

1. To conduct a series of multi-discipline studies dealing with the role of marine resources, particularly fisheries, in less developed countries.
2. To organize courses of study and seminars, interdisciplinary were desirable, in degree programs related to marine resources and their role in the food and nutritional needs and development programs of less-developed countries.
3. To increase the capacity of the University to provide administrators and researchers in less-developed countries with advanced, general and specialized education in various aspects of marine resource utilization.
4. To provide training and educational opportunities for professional staff members of the Agency for International Development (AID), the National Marine Fisheries Service (NMFS), and other interested public and private agencies through short courses, symposia and University course work.

Policy Background

In last year's annual report the deliberations of the policy committee were reviewed at length. That section of the report can be referred to for more detailed information about the initial priorities formulated for the Center by the committee.

Briefly, two avenues of research development were emphasized: (1) encouragement of research in marine resource develop-

ment in areas that the Center feels are priority concerns and (2) provision for development into international dimensions of individual research interests in marine resource development. The committee also authorized fellowship assistance programs and "seed" grants for faculty research. Mechanisms were worked out for the appointment of Center-related faculty, "release time" faculty and visiting faculty. In addition the committee emphasized the importance of formulating cooperative programs with other institutions, both foreign and domestic.

It might be appropriate to quote the following paragraph from last year's report concerning two long-range problems the Center must face:

"The demands for individuals capable of evaluating fisheries development opportunities are extraordinarily large, but within the University structure it is difficult to meet what are often short time horizons and to make faculty members available on this basis....Until we have increased our sources of support and the number of individuals involved in international marine resource development substantially it will continue to be difficult to respond to the short term needs for technical consultation".

DISCUSSION AND WORK PLAN

Research

General

As the Center has plotted its course for the future creative contributions have begun to come forward from within and without the University. Two kinds of research programs were originally defined: individual research assistance and departmental research grant aid.

Faculty research programs that have attracted funding by the Center have begun to emerge. Those projects along with the Center's specific research, teaching and cooperative accomplishments to date are explained further along in this report. They include research in Latin American fisheries resource economics, groundwork for a cooperative effort in food technology for developing countries being formulated by URI in concert with other U.S. universities, attempts to establish a continuing South China Seas fisheries symposium and workshop the compilation of human marine adaptation information and a multitude of research projects now under way involving Center staff and Center associated faculty and the research skills of a dozen or more departments and disciplines.

Year's Activities: Sprague

Dr. Lucian M. Sprague has prepared substantial amounts of background material for a technical seminar on fishery development potentials in the South China Sea. He was asked by the secretariat of the South East Asian Fisheries Development Center (SEAFDEC) to organize a working party which would develop a specific framework for the seminar prior to Indo-Pacific Fisheries Council (IPFC) meetings being held in New Zealand this year. Early attempts for such a meeting to be held in June 1971 were made through the Office of Regional

Economic Development in Bangkok.

However, the proposal for such a workshop will probably be presented through RED to the Conference of Economic Ministers of the South East Asia region for consideration on their agenda in the near future.

The focus of the discussions will be on the strengthening of effective regional bodies which could take leadership in developing rational fishery policy for the South China Sea region or at least for member countries.

Year's Activities: Chichester

Dr. Clinton O. Chichester has been one of the prime movers in the formation of a cooperative program for assisting developing countries with food technology problems (CODOT, see Appendix II).

It is evident that a shift in population is under way in the developing countries. The double pressures of increasing urbanization and declining rural population will force some re-thinking of the methods now used to supply populations with food and other resources. The emphasis on agricultural production has resulted in significant increases in the available food supply but the difficulty in many developing countries lies in bridging the gap between agricultural production and the consumer. In order to constitute an adequate and safe diet the food supply must be processed and preserved so that it can be made available in the urban market unaffected by vagaries of weather or seasonal changes.

In the developed countries where economic growth has kept pace with the needs of the people a highly sophisticated technology has been developed. The developing countries are obviously

not in a position to accept and utilize this network directly.

The need exists for a program that will: (1) develop centers in this country for training foreign students in international food technology; (2) help with the development of host country institutions; and (3) develop research programs here specifically related to food technology problems in other regions of the world.

The Consortium for the Development of Technology (CODOT) was conceived three years ago when Dr. Chichester contacted a number of university departments of food science and technology to determine their interest in a program directed toward the developing countries.

In the last year, the Consortium concept has been utilized to develop strong ties between the Consortium and a number of Latin American and Far Eastern universities and to supply experts and recent graduates to programs in various parts of the world. In a limited way it has acted as a unit in attacking some of the problems in food technology.

Initial attempts have been made at working out a food technology contract between the five universities and the Central American Research Institute for Industry (ICAITI) and the Regional Office for Central America (ROCAP) in Guatemala. Of the groups in the Consortium both the University of California and the University of Rhode Island have letters of agreement to work with ICAITI in the development of food science and technology. It is hoped that the mechanism of CODOT can be utilized, beginning perhaps in Central America and expanding its effectiveness elsewhere in the developing world.

There are ten graduate students working under the direction of Dr. Clinton Chichester in the Department of Food and Resource Chemistry. One student who received a Masters Degree in June, has been working in the area of fish protein concentrate under Dr. Chichester's guidance. Two post-doctoral fellows in the department, one for Australia and one from Germany, have been working with Dr. Chichester on his study of carotenoids.

Year's Activities: Lampe

Professor Harlan C. Lampe spent six weeks from December 14, 1970 to February 3, 1971 in Latin America exploring the export potentials for fisheries products and the investment possibilities for fisheries development. At the request of the Inter-American Development Bank, he visited Mexico, Brazil, Argentina, and Chile, reporting also on Guatemala, Panama, Venezuela, Colombia, Peru and Honduras. He conferred with businessmen, government officials and university faculties collecting information on the prospects for trade, the potential supplies of fisheries products in each area, and other internal requirements which affect development efforts.

He gained improved perspectives on operating conditions within the industry and on prospects for increasing the use of resources through the opening of new fishing areas. During his study he also found that in some cases knowledge of the financial conditions necessary for development was completely lacking and would have to be supplied before development efforts could get underway.

On the research side, Professor Lampe's study provided a working base from which a systems structure for the Latin American fishing industry could be modeled. Out of his trip came material which can be used to simulate models both for

the fishing industry and for the distribution of fishery products. In addition he compiled data which can be used to produce a demand/price/supply analysis for fish and fisheries products.

Professor Lampe completed a similar study for the IADB in the Dominican Republic eighteen months ago to assist that body's initial venture into fishery development there. His findings on both trips produced significant data for the type of guidelines which must be worked out before funds can be directed to the areas where they will encourage sound fishery programs based on adequate information.

Graduate research under the direction of Professor Lampe has resulted in an unpublished working paper on the economics of aquaculture. The paper was submitted to Robert Johnson of the East Asia Division of AID who asked the ICMRD for background information on costs and possible cost benefit ratios of representative aquaculture efforts to assist in planning by the Technical Assistance Bureau.

Year's Activities: Landberg

In November 1970 Professor Leif Landberg attended the annual meeting of the American Anthropological Association in San Diego where he participated in the formation of a new AAA sub-group of the Human Marine Adaptations Study Group (HMASG). Most of its members are anthropologists, sociologists and geographers. He was named acting secretary and bibliographer for the group and charged with assembling a preliminary bibliography of maritime social studies. Compilation of the bibliography is now underway by Professor Landberg with some clerical assistance provided by Center personnel.

Under an NSF Grant-in-Aid, Professor Landberg and a

fellow member of the URI Department of Anthropology and Sociology, Dr. William Rosengren, are gathering information on maritime-related social research which is either in progress or has recently been completed to be published as an "Index of Maritime Studies".

Both the index and the bibliography will provide important services for those seeking maritime-sociological source material. As such resources develop they also increase the ability of the Center to supply precise guidance on information resources to inquiring agencies. At the initial meeting, the HMASG also initiated an occasional newsletter entitled "Marine Man" which will be the organ for circulating and disseminating some of the material in Professor Landberg's bibliographic work.

Year's Activities: Sieburth

Dr. John Sieburth has been conducting research investigating the seaweed-microbial food base. The specific part of his research supported by the Center is the seaweed-yeast eco-system. Since the carbohydrates of seaweeds are not metabolized by vertebrates but can be consumed by yeasts to provide microbial bio-mass either for fish culture or for human consumption, the study is concerned with the conversion of the seaweed solubles to yeast bio-mass. This work will be of considerable value in coastal aquaculture programs in the future.

Year's Activities: Other

At the request of the International Bank for Reconstruction and Development (IBRD) of the World Bank, the Center was asked to prepare a program of assessment (social, economic and biological) of the consequences of a major engineering project in East Pakistan.

The mission to appraise the Dacca South-West project has made a decision to postpone empoldering tract 3 until the necessary study of the role and potential of fishing in the area and the tract has been conducted. In the short run the study should improve the projects as a development project and limit the negative effect on fishing in the adjacent rivers. In the long run the study may help to establish the real need for the proposed "Pre-investment Survey of Fisheries" and to define the role of fishing in the development of the Province.

The study was to have been undertaken to arrive at policy decisions to safeguard the legitimate fishing interests in and surrounding the project and to realize the physical potential thorough and detailed studies on land tenure, the bureaucratic phenomenon and the power relationships in the countryside, and a farm management study which is linked to issues of social change would appear to be necessary.

Without such complimentary studies, there is a real danger that the reaction to a fish study, however good, would be "So What"? The studies would also throw valuable light on the numerous issues, the changed and rapidly changing agricultural situation raises and which neither Government nor the Bank knows how or where to tackle, but which presumably adversely affect development efforts.

Considerable progress was made in outlining the requirements for such a study, however, the untimely disastrous Typhoon followed by the current civil war put all such efforts on the shelf for the foreseeable future.

Teaching

Year's Activities

Dr. Sprague conducted a seminar course in Living Marine Resources (Oceanography 694) during the Spring semester, 1971. In September, 1971, Dr. Sprague will introduce a new course (Oceanography 693) in Living Marine Resources and Their Legal and Political Implications. The course will be built around a classroom simulation of two fishery organizations - an established domestic body and a new international body.

Also during the Spring semester, 1971, Professors Landberg and Lampe participated in the teaching of an interdisciplinary seminar on Regional Economic Development (Economics 565) in Problems of Modernization in Developing Nations. The seminar was the first to be given under the new Graduate Certificate Program in International Development Studies sponsored by the University Planning Committee on International Studies and supported, in part, by the Center. Beginning in 1971, the Certificate Program will be offered in each Spring semester. It consists of a five course program leading to a graduate certificate awarded by the Dean of the Graduate School and is built around the above mentioned core seminar in which the Departments of Economics, Geography, Political Science and Resource Economics, as well as Sociology and Anthropology are represented.

A course in Economic Growth and Development (Economics 463) supported by the Center deals with basic problems in economic growth and development of so-called backward or pre-industrial countries with emphasis on population trends, agrarian reforms, capital formation, international aid programs and the respective roles of private and public enterprise.

A new course in Resource Economics (Resource Economics 430)

has been submitted and approved and will be given for the first time in the academic year 1971-72. Entitled International Resource Development, it deals with economic development as it relates to the coastal zone and marine resources. The political and institutional constraints upon resource development will also be considered, as will the role of natural resources exploitation in relation to domestic consumption and world trade. The course is intended to provide an international dimension for those students majoring in Economics who have a special interest in marine resource economics.

Continued support has been provided for Economic Planning and Public Policy in Developing Nations (Economics 566). The course focuses on resource and financial planning in public and private sectors of developing nations with emphasis on planning tools, allocation of domestic and foreign resources, and national economic policies.

During February the Center circulated among associated faculty a request by the University of Florida for assistance in preparing the fishery portion of their program of Development Planning at the National Agricultural Center in Saigon. The project which was being carried out for AID/Education under the direction of Dr. D. O. Spinks was engaged in preparing a 10-year development program for the National Agricultural Center, including advice on curriculum planning and development of cooperative graduate and research programs between Viet Nam and the University of Florida.

Dr. Andreas Holmsen of the URI Department of Resource Economics was selected to work with the University of Florida on the fisheries curriculum section of the project. He visited the University of Florida in February for preliminary briefings

with Dr. Spinks and Dr. Hugh Popenoe before travelling to Viet Nam in May to make his curriculum study at the NAC. Dr. Holmsen's report on his work there, entitled "Recommendations on Fisheries Programs at the National Agricultural Center of South Viet Nam", has been included in the comprehensive report submitted to AID by Dr. Spink's task force.

During a visit to the Center during May, Mr. Tran Van Tri, Director of the Fisheries of South Viet Nam, discussed with Dr. Holmsen and Dr. Sprague the areas in which the relationships begun by Dr. Holmsen during his visit to Viet Nam could contribute to future cooperative programs between the Center and the agency headed by Mr. Tri.

Seminars

During February and March of 1971 seven seminars by distinguished guest lecturers on Issues of International Economic Development were presented under Center auspices. Professors Sprague and Landberg were co-chairman for the series which was presented each Wednesday at the noon hour on the URI campus and well attended. The seven guest speakers, beginning on February 9 and continuing through March 23, are listed in Appendix

On May 27-29, the Department of Sociology and Anthropology sponsored a symposium on Modernization and Environment - The Impact of Western Ideas on Traditional Societies. Leif Landberg presented a paper co-authored with Pamela L. W. Landberg on "Aspects of Modernization in a Tanzanian Coastal Community". The paper grew out of the Landberg's study of East African fishing villages. It is presently being prepared for publication.

A special lecture series on the The Necessary Revolutions for Human and Resource Development scheduled for May 5-7 by

Dr. Geoffrey Kesteven, Director of the FAO Fisheries Development Project in Mexico, regrettably was cancelled when Dr. Kesteven was unable to attend. This series is scheduled for presentation November 8 through 12, 1971 at URI.

The second in the distinguished guest lecture series, a series of nine seminars on Issues in International Development II, is planned for Fall 1971 and will be sponsored jointly by the Center and the International Studies Committee.

On May 20-22, Dr. Emil Mrak, Chancellor Emeritus of the University of California at Davis visited with members of the URI Department of Food and Resource Chemistry to discuss the food technology problems and to consult with members of the department on their research programs.

Cooperative Programs

Formal and informal working arrangements with other universities form an important segment of ICMRD activities. From the outset the Center has been closely involved with Auburn University (Auburn, Alabama) where the International Center for Aquaculture was established under a 211(d) grant. The University of Florida (Gainesville) with its extension work in tropical agriculture in Latin America and its similarly-oriented land-grant background, has lent its research competence in Latin American socio-economic problems to an interchange of personnel and information with the Center. The first in a series of occasional papers published by the Center is one prepared by Dr. Clarence Idyll of the University of Miami for presentation at the Center's first International Development seminar in the Spring of 1971.

Currently the University of Tennessee and the Center are working out the terms of a joint study in India. Under the pro-

visions of an AID contract, Tennessee will investigate Indian agricultural programs. They have requested that the ICMRD consider a sub-contract to conduct the coastal fisheries section of the program.

The expansion of affiliations with other institutions is expected to accelerate as other preliminary exchanges begin to bear fruit. The careful groundwork of information dissemination by the Center during its initial months has brought forth a number of inquiries from many quarters. The special proficiencies of the Center will undoubtedly be called upon by an increasing number of institutions as they become aware of the ICMRD and its marine resource development competence.

The curriculum planning assistance given this year through the Center to the National Agricultural Center in South Viet Nam is the kind of bond that could mark the beginning of an international network of institutional cooperation.

A plan for "Strengthening the Development of the Research and Training of the University of Washington, the University of California, the University of Wisconsin, Michigan State University and the University of Rhode Island in Food Science and Technology for the Augmentation of Food Supplies in Developing Countries" was submitted by the ICMRD in behalf of the Food Technology Executive Board and Coordinating Committee of the above institutions (CODOT). Brazil, Argentina and Chile had indicated they were anxious to move forward in food technology development. The proposal suggested the appointment of one or more visiting faculty from these countries initially. It later identified some of the Asian nations which might welcome food technology assistance in their development programs. The National Academy of Sciences Committee had already singled out food science technology as an area of highest

priority in the Latin American countries struggling to increase their available supplies of protein. The proposal was designed to place the Center and the University in a leading position in developing food technology on an international scale and to attract additional funding from such sources as the U.S. food industry.

Related Activities

Dr. Sprague has continued a relationship with the International Bank for Reconstruction and Development growing out of his studies in Iran. At their request he supplied them with terms of reference for oil sardine and surface tuna fisheries. Submitted by Dr. Sprague and prepared in cooperation with consultant Dayton L. Alverson, the report covered "A Program of Resource Assessment and Evaluation for Commercially Important Fishery Stocks, Particularly Oil Sardine and Surface Tuna Species, in the Waters Adjacent to Iran".

Participant Trainees

A Center fellowship announcement circulated during the academic year brought forth a number of applicants. The first fellowship was awarded to a student in the graduate program in Resource Economics at URI. As of July 1, 1971 he was appointed research fellow by the Center. He will concentrate his graduate thesis program on a study and economic analysis of subsistence fisheries. Beginning in September, he will spend six months in Mexico studying remuneration patterns in the development of the shrimp industry on both coasts of that country.

The Visiting Worker Fellowship is offered specifically for overseas workers. Although a good prospect for the first of these fellowships was forced to decline, there have been some excellent nominations and a tentative selection has been made.

During April, a letter was circulated by Dr. Sprague among seventy or so professional colleagues requesting suggestions for candidates for the Visiting Worker post. Persons with socio-economic, legal-political, credit, marketing, processing and distribution experience rather than those with purely resource backgrounds were specifically sought. In requesting candidates, it was pointed out that the visiting worker will be expected to engage in scholarly pursuits, produce manuscripts, give seminars and guide the work of advanced graduate students in Center related programs.

In June, five trainees selected by the Intergovernmental Oceanographic Commission of UNESCO attended a training course in the United States in cooperation with the National Oceanographic Data Center, Woods Hole Oceanographic Institute, and URI. During the week of July 12, 1971 they were the responsibility of the ICMRD. The trainees were given five special lectures by URI faculty (Professors Sprague, Lampe, Holmsen, Alexander, and Saila) on various aspects of marine resources, law, economics and industry problems. They were taken on field trips to the URI marine facilities, the Narragansett Bay Campus, and the fisheries training program at Wickford, Rhode Island as well as scheduled for individual discussions with several faculty members.

Other Activities

Conferences

On October 8, 1970 five Center staff associates gave an informal presentation for forty faculty members to acquaint them with the objectives of the Center. The seminar was designed to make the diversified segments of the University community aware of the international scope of the ICMRD. "Policy people in developing nations are asking us for advice", Dr.

Sprague told them, "and agencies such as the World Bank are also becoming aware of the Center and asking it for assistance".

Members of the staff discussed briefly high-protein food for under-nourished children in Chile (Chichester); a survey of Iranian fisheries for the World Bank (Sprague); a program for the development of fisheries cooperatives in the Dominican Republic for FAO (Lampe); work with the Peruvian fishing industry for FAO (Holmsen); and social factors in a local fishing economy in Tanzania (Landberg).

In August 1970, a conference on Food Technology was held at the University under the direction of Dr. Chichester. Attending were some of the U.S. leaders in nutrition and food science and experts in food and nutrition from Brazil, Japan, and Scotland.

The conference explored some of the problems in food technology in developing nations and examined some of the directions in which the U.S. is moving to improve its own food technology efforts and its ability to assist in developing food technology programs for other nations.

A preliminary transcript of the conference has been distributed and a more formal document and follow-up meeting are planned.

Library

The Center has accumulated considerable library holdings and continues to receive and store large amounts of material. This collection of "gray" literature, periodicals, bulletins and papers will have to be classified to become the kind of resource anticipated in the planning of the Center (see Appendix III).

The material is presently filed by subject matter. To make this classification conform to common bibliographic procedures we will need the services of a well-qualified librarian. We may also need to invest in some capital equipment if recommendations by library consultants are to be followed. The use of microphotography which can reproduce up to sixty pages on a single fiche card is one method that is being explored. It would necessitate the purchase of a reader-printer plus copying equipment.

During the year a Center research assistant prepared a bibliography of AID fisheries documents. Out of this effort we were able to assist AID by supply certain bibliographic materials helpful to them.

Visitors

Hellmuth A. Sievers, Head of the National Oceanographic Data Center, Head of the Department of Oceanography of the Hydrographic Institute of the Chilean Navy, and professor of oceanography at Catholic University of Valparaiso, conferred with Center staff during a visit on May 30, 1971. Following his visit, the Center circulated a letter to 28 associated faculty who might be interested in participating in teaching and research experience at CUV, especially in the areas of physical, chemical and geological oceanography. The University has begun a four-year undergraduate course in physical oceanography and is seeking academic collaboration with U.S. universities having oceanography programs. The request for assistance was initiated through the Hydrographic Institute of the Chilean Navy.

Mr. Tran Van Do of South Viet Nam visited the ICMRD for two weeks under the sponsorship of the Development Administration Program of the Institute of Public Services in Hartford,

Connecticut. He was introduced to faculty working in his area of interest and spent several days studying the literature available in the Center library.

In June, Lars Vidaeus, Fisheries Officer for Marketing with the Food and Agriculture Organization of the United Nations, Rome, met with Dr. Holmsen and Dr. Sprague to discuss graduate studies in marine resource economics.

Claudio Schustan, M.D. of Chile visited the Center for a week in June as a guest of Dr. Chichester, to take part in discussions on nutrition, food technology and to tour the URI Marine Technology and Commercial Fisheries Laboratory at Wickford.

The visit in May by Mr. Tran Van Tri, Director of Fisheries in South Viet Nam, has already been mentioned as an important step in our liaison with that country. Mr. Tri discussed problems of fishery development in South Viet Nam and expressed considerable interest in the planning concepts outlined in a draft proposal for support for technical assistance being prepared by the Center.

Other

Dr. Chichester was involved in preparing 29 research bulletins and professional publications during the year, of which he co-authored 24 and edited five. They covered research in the areas of marine carotenoids, Chilean rapeseed meal, yeasts and cereal protein substitutes. He also co-authored a volume on the safety of marine food products to be published in September by Academic Press.

The first in a series of occasional papers published by the Center is now available. It was first presented at the

seminar series on Issues of International Development given by the Center in the Spring of 1971. Entitled "Fishery Development Potentials in the Caribbean and Adjacent Seas", the paper was prepared by Dr. Clarence Idyll, Professor and Chairman in the Division of Fishery Sciences, School of Marine and Atmospheric Sciences at the University of Miami, Florida.

Travel

Under a grant from the National Institute of Health (NIH) Dr. Sprague attended a conference on the Sanitary Quality and Microbial Safety of Fisheries Products in Mayaguez, Puerto Rico on September 7-11, 1970 where he presented a paper on "Prospects of the World's Fishery Resources with Emphasis on the Western Hemisphere".

At the request of the United Nations Food and Agricultural Organization (FAO), Dr. Sprague attended a five-day working party in Bangkok, Thailand from September 17 through October 1 to plan the 14th FAO/IPFC Symposium on Coastal Aquaculture scheduled for the following month. He was convenor and chairman of the symposium which took place in Bangkok November 16-18. En route to Thailand in November, he conferred with U.S. Overseas Mission (USOM) and AID regional personnel in the Philippines and Thailand.

Dr. Sprague visited with AID and IBRD officials in Washington in August, October, and again in January. In February he participated in a review of the 211(d) grant with AID officials together with Professors Lampe, Chichester, and Landberg of the ICMRD staff and Mr. Thomas White, Business Manager of the Graduate School of Oceanography of the University.

In May he discussed with AID people in Washington the technical assistance proposal being prepared by the Center.

Under NAS funding, Dr. Sprague attended meetings in Washington in April of the Sub-committee on Animal Health of the National Academy of Sciences Committee on Animal Health. He has been re-appointed to a second one-year term on the sub-committee beginning July 1, 1971. The committee is a sub-group of the Agricultural Board, Biology and Agriculture Division of the National Research Council of the National Academy of Sciences.

In June Dr. Sprague attended a meeting of the Association of U.S. University Directors of International Agricultural Programs at the University of Illinois.

Later the same month, at the request of Dr. Werner Baum, President of the University, he attended a seminar in Atlanta sponsored by the International Programs Office of the National Association of State Universities and Land-Grant Colleges.

Professor Andreas Holmsen traveled to Bangkok, Thailand and Kuwait from May 10 through 19 to confer with officials of the Thai government, members of the U.S. Regional Economic Development Office and faculty at Kasetsart University. In Kuwait he discussed Persian Gulf fisheries problems with government officials and members of private industry. In Bangkok and Kuwait he travelled under a grant from Center funds covering local per diem expenses only.

On behalf of the Center, Dr. C. O. Chichester chaired a group on protein food development which met in Thailand in late November. On the same trip he stopped in Chile to present papers (December 2-7) before the Society on Latin American Nutrition.

Dr. Chichester also attended meetings in November (Seattle)

of a consortium of U.S. institutions engaged in food science and technology.

In January he represented the U.S. National Academy of Science at a workshop in Santiago, Chile and visited with various officials in Argentina.

In May he was elected chairman of the Directors of Food and Science Programs of the United States, an organization which grew out of the annual meeting in Washington of the Institute of Food Technologists.

Dr. Chichester travelled to Caracas, Venezuela on June 11-17, 1971 to discuss the possibilities of developing cooperative efforts in resource development with Venezuela and adjacent countries and to explore links between the Center and some of the groups working in similar fields at the University of Venezuela and other Latin American universities.

He attended meetings in August in Guatemala of the Central American Research Institute for Industrial Technology (ICAITI).

FUTURE PLANS

Cooperative Program - India

As mentioned previously, plans are going forward for a cooperative project involving the Center and the University of Tennessee.

Under a contract with AID the University of Tennessee is assisting in the development of the Mysore University of Agricultural Science (MUAS) Bangalore, India. Beginning in 1964 the University of Tennessee has been providing advisory assistance to MUAS administration and faculty to help them develop a university patterned somewhat after the land-grant institutions in the United States.

MUAS has recently decided to establish a College of Fisheries at Bangalore that will include both marine and inland fisheries studies. Since the University of Tennessee does not have a college of fisheries, it has requested that the ICMRD supply the necessary technical assistance to help set up programs of teaching and research and to aid in the planning of physical facilities.

The initial advisory effort will require about three months work in India. An agreement between the universities is under consideration by means of which the Center would provide advisory and other technical assistance in marine fisheries as needed.

Seminar

The second seminar series "Issues in International Development II" is being planned now for the Fall of 1971. Sponsored jointly by the Center and the URI International Studies Committee, the seminar will bring nine distinguished

guest lecturers to the URI campus. The seminar may now be judged to be a continuing effort and will continue with different emphases and with different chairmen.

A two-day workshop on the problems of subsistence fishermen originally scheduled for May 1971 has been planned to take place during the five-day visit here of Dr. Geoffrey Kesteven, FAO/Mexico, in November, and will coincide with his lecturers for the International Development Seminar. Entitled "An Informal Workshop on the Problems of the Subsistence Fisherman", the two-day program will explore the social, political and administrative problems of the management and exploitation of fisheries resources.

Research Proposals

Upon his return in June from a year's work with UNESCO in France, Dr. Saul Saila submitted a proposal to the Assistant Secretary for Fisheries and Wildlife, U.S. Department of State, in which he outlined a two-phase Improvement and Economic Stabilization Plan for Icelandic Fisheries.

Under the plan for the first phase, Dr. Saila would direct the transfer of American lobsters to Icelandic waters using a stock bred at the URI Marine Experiment Station. In addition, a small number of egg-bearing lobsters would be transferred to the marine aquarium at Reykjavik, Iceland for study by personnel of the Marine Research Institute of Iceland. Juvenile culture methods necessary for successful transfer are already under development at URI by Professor A. Sastry. Included in this first phase would be studies of benthic ecology in Iceland near-shore waters and studies of sites in Iceland for large-scale fish and lobster rearing facilities utilizing water from hot springs and fresh and sea water.

The second phase will study any additional food values gained by cultivation of the stock in the heated Icelandic waters. Naturally the second phase of the study will be observed with interest for its possible application to increase the protein value of shellfish under special rearing conditions.

The Center is planning to provide a "seed" grant to fund initial studies set forth in a proposal by Dr. Nelson Marshall on the fisheries potential of small island areas.

Small island fisheries probably lack the potential to support large-scale, heavily capitalized commercial enterprises. On the other hand, local needs on a subsistence basis are great and must be multiplied thousands of times when island populations of the world are considered. Findings applicable to coral reef and lagoon environment may also have a bearing on coastal areas of larger islands, such as parts of New Guinea and Indonesia, where there are major population crises and extensive reef and lagoon areas.

Funding of the proposal by Dr. Marshall would allow work to begin in selected reef areas to examine (1) the trophic potential of coral reef lagoon environments, and (2) the harvest potential of reef areas under simulation and systems models analyses.

Several other research proposals are being prepared for Center consideration and it is believed that they will additionally strengthen our capabilities in relation to the problems of the rural development in coastal areas.

Travel

In August Dr. Chichester will coordinate the setting up

of a workshop in food technology for the University and the National Academy of Sciences and will meet with his NAS counterpart in Argentina to develop food programs, particularly in marine resources, for Latin America.

Also in August, he will attend the third Western Hemisphere Conference on Food and Nutrition in Miami. He is a member of the committee planning the meeting under the auspices of the American Medical Association and the Society of Latin American Nutritionists.

He will travel to South America in late summer to organize a workshop on food technology that will be attended by National Academy of Science representatives from Argentina, Chile and Peru.

Technical Assistance

A proposal entitled "Proposal for a Five-Fold Technical Assistance Program for the Development of Coastal Fisheries in the Low Income Countries" was submitted to AID in June 1971 by the Center outlining a five-fold program of technical assistance to aid the development of coastal fisheries in the low-income countries and stated some of the exigencies in development planning faced by the Center.

It proposed a project that would enable the Center to:

- (1) Identify problems in coastal fisheries and establish networks along which information and technical assistance can flow.
- (2) Provide technical assistance for economic analysis, sector analysis and pre-investment and planning studies utilizing a systems approach, and develop improved systems of integrating capital-intensive and subsistence

fisheries to provide better mobilization of efforts in the fisheries sector as a whole.

- (3) Formulate programs of food science and technology that will apply to the economic development aspects of particular coastal fishery resources.
- (4) Develop cooperative assistance and exchange programs with foreign institutions of higher education to help them define their capabilities in the teaching, research and extension service activities needed by marine coastal communities.

In a letter to AID in June, 1971 endorsing the technical assistance proposal, the Honorable Claiborne Pell, Senator from Rhode Island wrote:

"I believe that the Center has assembled a staff of unusual competence and abilities and is in a position to make positive contributions in this promising area of international assistance.

"I have long believed that insufficient emphasis is given, in our international assistance programs, to marine resource development. Because of the importance of this work, and the exceptional quality of this proposal, I hope that your agency will give the proposal favorable consideration".

We feel that the ideas embodied in the preliminary proposal reflect the thinking that is shaping the plans for the future at the Center. In our opinion AID is the agency best able to provide the kinds of support necessary for such a project.

As stated in that proposal, there is a need at all levels of policy for a greater awareness of the monetary, nutritional and rural development aspects of fisheries and for more effective

use of technical and scientific tools to manage and utilize the available resources.

There is also a need to evaluate the effectiveness of the capital-intensive fishery to determine better ways of controlling investment capital, and to provide strengthened technical advice regarding management of the stocks and fishing techniques.

Nearly every low-income country with a reasonable fisheries resource base could benefit from an economic analysis of the fishery sector in terms of national economic development goals and employment policies.

It is already apparent that it will become increasingly difficult to maintain the overall growth rate in the lower income countries unless substantial technical aids are made available to them.

Visiting Workers

Two visiting workers will be invited to our campus through Center support during the Spring of 1972.

Dr. A. R. K. Zobairi of Dacca, East Pakistan will be appointed to the Department of Oceanography. He will prepare a paper on the contribution of the fishery sector to the development process; offer a course at the graduate or undergraduate level in fisheries development; participate in seminars and informal discussions with graduate students interested in aquatic resources; and serve as a link between our activities and those of the International Center for Aquaculture of Auburn University in Alabama

Dr. Y. Iitaka, Chairman of the Department of Fisheries at Kinki University, Higashi-Osaka, Japan has been selected to serve in the Department of Fisheries and Marine Technology here at the University. During his three month appointment his responsibilities will include presentation of two or three seminars on international fisheries open to the entire University and general public; presentation of one weekly seminar for a period of about ten weeks to students in the Fisheries program; preparation of at least one professional paper on some aspect of fishing gear and/or materials; and participation as a speaker at the annual Fishermen's Forum at URI in the Spring of 1972.

BUDGET EXPENDITURES FOR FISCAL YEAR 1971

Salaries:	
Director, L. M. Sprague	\$ 24,300
Technical Assistant, D. A. Durocher	5,600
Prof. Resource Chemistry, C. O. Chichester	20,000
Assis. Prof. Anthropology L. C. W. Landberg	11,000
Publications Assistant	1,125
Student Help	85
Fringe Benefits (10.8%)	6,708
Travel:	
Domestic	2,866
Foreign	1,515
Research Support:	
Dr. C. Chichester	6,097
Prof. Landberg	1,829
Dr. J. Sieburth	5,794
Dr. Sprague	4,158
Curriculum Development:	
Dept. of Economics	2,500
Visiting Lecture Series and Professional Visitors	1,914
Supplies	448
Equipment	513
Library	351
Communications	632
Publications:	
Circulars and reports	458
Other	1,222
TOTAL	\$ 99,215

International Travel Breakdown:

Dr. Lucian M. Sprague - July 1970 The Hague, Amsterdam to attend FAO/Second World Food Congress	\$ 709
Dr. Nelson Marshall - November 1970 Barbados, The Caribbean to attend Fifth Liaison Officers meeting sponsored by FAO	477
Dr. Lucian M. Sprague - December 1970 Tokyo, Japan expensze only	85
Dr. Lucian M. Sprague - December 1970 Bangkok, Thailand and Manila, The Philippines	188
Dr. Andreas A. Holmsen - April 1971 Bangkok, Thailand expenses only	56
TOTAL	\$1,515

Equipment Breakdown:

Model #715 Selectric Typewriter
IBM Corporation
180 South Main Street
Providence, Rhode Island

Total Cost \$ 188

Combination Punch and Binding Machine
General Binding Corporation
Highland Circle
Needham, Massachusetts

Total Cost 125

TOTAL \$ 613

BUDGET FOR PLANNING PURPOSES

	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>
Salaries:					
Director	22,543	24,300	26,925	28,400	29,000
Technical Assistant	3,684	5,600	6,250	7,000	7,300
Prof.Resource Chemistry		20,000	20,000	20,000	20,000
Assis.Prof.Anthropology		11,000	12,750	14,000	14,700
Publications Assis.		1,125	3,000	3,500	4,000
Student Help		85	100	150	200
Prof.Resource Economics			17,000	17,000	17,000
Add.Resource Economics			15,000	15,000	15,000
Add. Faculty					<u>15,000</u>
Sub-total	<u>26,227</u>	<u>62,110</u>	<u>101,025</u>	<u>105,050</u>	<u>122,200</u>
fringe Benefits (10.8%)	2,832	6,708	10,911	11,345	13,198
Travel:					
Domestic	573	2,866	3,500	3,500	3,500
Foreign	1,317	1,515	2,500	2,500	2,500
Research Support:					
Dr. Chichester		6,097	7,500	8,000	8,000
Prof. Landberg		1,829	3,000	3,500	3,500
Dr. Sieburth	4,775	5,794	6,300		
Dr. Marshall			8,000	8,000	
Dr. Sprague		4,158	3,500	4,000	5,000
Dr. Lampe			4,000	3,000	
Dr. Saila			8,000	3,500	
Antic./Resource Chemistry			750	750	
Antic./Food & Nutrition			5,000	5,000	
Exper. Small Grants Program			3,000	2,000	
Curriculum Development:					
Dept. Economics		2,500	2,500	2,500	
Fellowship			5,500	11,000	15,000
Visiting Lecture Series and Professional Visitors	250	1,914	2,500	4,250	5,000
Visiting Faculty			21,500	15,500	15,500
Supplies	184	448	550	700	875
Equipment	1,037	613	800	850	1,000
Library		351	500	600	750
Communications	157	632	700	800	900
Publications:					
Occasional paper series			2,500	2,500	2,500
Circulars and reports		458	600	750	900
Miscellaneous			100	100	100
Other	1,364	1,222	2,500	3,000	4,500
Contingency					<u>1,471</u>
Sub-total	<u>38,716</u>	<u>99,215</u>	<u>207,236</u>	<u>202,695</u>	<u>206,394</u>
Receipts for Services	- 4,256				
TOTAL	<u>34,460</u>	<u>99,215</u>	<u>207,236</u>	<u>202,695</u>	<u>206,394</u>

TOTAL GRANT - \$750,000

APPENDIX I

**C.V. Files for Professional
Staff of the International
Center for Marine Resource
Development, 1971**

NAME: Lucian Matthew Sprague

EDUCATION:

A.B.	1950	University of California, Santa Barbara Social Science
Ph.D.	1957	University of California, Davis Genetics
	1966-67	U.S. Government Fellow, Institute for Human Genetics, University of Uppsala, Uppsala, Sweden

EMPLOYMENT:

University of Rhode Island, Kingston, Rhode Island
Professor of Oceanography, Graduate School of Oceanography
and Director of the International Center for Marine Resource
Development: 1969 - present

The Rockefeller Foundation, New York, New York
Associate Director for Medical and Natural Sciences;
1967 - 1969

U.S. Bureau of Commercial Fisheries, Honolulu, Hawaii
Deputy Area Director; 1962 - 1967
(Acting Area Director during Director's absence on
Guggenheim Fellowship; 1963 - 1964)

U.S. Bureau of Commercial Fisheries, Honolulu, Hawaii
Chief, Subpopulations Program; 1960 - 1962

U.S. Bureau of Commercial Fisheries, La Jolla, California
Chief, Subpopulations Program; 1956 - 1960

EXPERIENCE:

Three years experience with the California Sardine industry
as part of a government-university-industry effort; the
California Cooperative Fisheries Investigations

Seven years experience with all aspects of Central and
Western Pacific tuna fisheries

Two years experiences examining the critical problems of South East Asian fishery development, particularly the fresh and brackish water inland and coastal zone fisheries, government organizations, and university programs of relevance to these problems

Experience as Director of the International Center for Marine Resource Development at the University of Rhode Island - an experimental US/Agency for International Development sponsored 211(d) program to develop interdisciplinary competence in dealing with marine resource development problems in the LDCs.

PROFESSIONAL SOCIETIES:

Fellow AAAS; Sigma XI; American Institute for Fishery Research Biologists; American Fisheries Society; Genetics Society of America; American Academy of Arts and Sciences; Gulf and Caribbean Fisheries Institute; Association of U. S. Directors of International Agricultural Programs; New York Academy of Sciences; Marine Technology Society

OTHER PROFESSIONAL ACTIVITIES:

Consultant, Editor, Author, or Co-author of study team of field survey reports:

U.S. Civil Administration of Ryukyu Islands, Fisheries - Oceanography Research in the Ryukyu Islands, 1964

U.S. Bureau of Commercial Fisheries, The Norwegian Method of Purse Seining and its Application to Central Pacific Fisheries, 1966

National Academy of Sciences, U.S. and National Science Development Board, Philippines, "Research" in Proceedings, Philippines - U.S. Workshop on Fisheries Oceanography, 1967

The Universidad del Valle, Cali, Colombia, Academic and Economic Opportunities in the Region of the Bahia de Malaga, 1969

Report to the International Programs Office, University of Florida, on Aquatic Sciences at the University of Florida, 1969

The Rockefeller Foundation, Consultant, 1970

International Bank for Reconstruction and Development, Agricultural Sector Review of Iran: Fisheries, 1970

International Bank for Reconstruction and Development, Agricultural Sector Review of Thailand: Fisheries, 1971

Convenor and Chairman:

IPFC/FAO Working Party on Coastal Aquaculture, Jangkok, 1969

IPFC/FAO Symposium on Coastal Aquaculture, Bangkok, 1970

Member:

Hawaii State Governor's Committee on Science and Technology,
1963-65
FAO Expert Panel for the Facilitation of Tuna Research, 1964
National Academy of Sciences, Committee on Oceanography,
Ocean Manpower Data Panel, 1969-present
National Academy of Sciences, Sub-Committee on Aquatic
Animal Health, Committee on Animal Health, 1970-present
Marine Technology Society, Marine Biological Resources
Committee, Conference on Food-Drugs From the Sea,
1969-present
U.S. Delegation to International Oceanographic Commission
meeting, Paris, France, 1971

PUBLICATIONS:

Representative titles from more than fifteen scientific
articles:

1953 Cushing, John E., and L. M. Sprague. Agglutinations
of the Erythrocytes of Various Fish by Human and Other
Sera. American Naturalist, Vol. 836, pp. 307-316.

1958 Sprague, L. M. On the Distribution and Inheritance
of a Natural Antibody in Cattle. Genetics, Vol. 43,
No. 6, pp. 913-918.

1962 Sprague, L. M. Studies of the Erythrocyte Antigens
on the Skipjack Tuna (Katsuwonus pelamis). American
Naturalist, Vol. XCVI, No. 889, pp. 233-238.

1962 Sprague, L. M., and A. M. Vrooman. A Racial Analysis
of the Pacific Sardine (Sardinops caerulea) Based on
Studies of Erythrocyte Antigents. Annals of the New York
Academy of Sciences, Vol. 97, Article 1, pp. 131-138.

1967 Sprague, L. M. Multiple Molecular Forms of Serum
Esterase in Three Tuna Species from the Pacific Ocean.
Hereditas, 57:198-204.

1970 Sprague, L. M. The Potential for Brackish Water
Culture Along the Gulf of Thailand. Proceedings - Food
and Drugs From the Sea Conference, 1969, pp. 93-101.

1970 Sprague, L. M. Electrophoretic Patterns of Skip-
jack Tuna Tissue Esterase. Hereditas, 65:187-190.

1970 Sprague, L. M. Prospects of the World Fishery
Resources with Emphasis on the Western Hemisphere.
Academic Press, Inc. (in press).

1971 Sprague, L. M., and J. H. Arnold. Trends in Use and Prospects for the Future Harvest of World Fisheries Resources. Presented at meeting of American Oil Chemists' Society, October 1971, (in press).

November 19, 1971

CURRICULUM VITAE

C. O. Chichester

Education: B.S. (Chemical Engineering) - Massachusetts Institute of Technology, Cambridge, Mass. - 1949
M.S. (Food Science) - University of California, Berkeley - 1951
Ph.D. (Agric. Chem.) - University of California, Berkeley - 1954

Present Position: Professor, Department of Food and Resource Chemistry, University of Rhode Island, Kingston, Rhode Island
Director, International Food Science Programs
International Center for Marine Resource Development

Membership in the following scientific societies:

American Chemical Society; Institute of Food Technologists; Society of Experimental Stress Analysis; Association of Automotive Medicine; New York Academy of Sciences; Spectroscopy Society; American Society of Biological Chemistry; American Institute of Nutrition; American Public Health Association; American Optical Society; American Institute of Chemical Engineers; American Medical Association; American Society of Clinical Nutrition; Latin American Society of Nutrition.

Serving on the following committees:

Institute of Food Technologists: Committee on World Food Programs
Executive Committee, North. Calif. Section
Subcommittee on Scholarships and Awards

American Standards Association: Committee on Vehicular Head Protection Z90.1

National Academy of Sciences: Committee on Research in Life Sciences (Panel 22)
Chairman Committee on Nutrition in Space
Committee on Space Medicine
Committee on Space Biology
Panel on Waste Management
Committee on Biological Experimentation on Gemini and Apollo
Committee on Marine Protein Resources
Food Protection Committee
Chairman Food Science Committee
Office of the Foreign Secretary
Chairman Thailand Mission
Member Argentina Mission
Member Chilean Mission
Chairman Food Science and Technology Mission (Argentina, Chile and Peru)

National Institutes of Health: Chairman Environmental Biology and Chemistry Study Section
Planning Committee of Environmental Biology and Chemistry Study Section
Committee on Training in Environmental Health

Nutrition Section - (NIH)
(formerly ICNND):
Steering Committee in Agriculture
Organizing Committee
Consultant on Bolivian Nutrition Survey
Consultant on Guatemalan Nutrition Survey
Consultant on El Salvador Nutrition Survey
Consultant on Paraguayan Nutrition Survey
Consultant on Colombian Nutrition Survey

International Standards
Organization:
U. S. Representative on Z-90 Committee

American Medical Association
Council on Foods and Nutrition
Vice president of Council on Foods and
Nutrition
Chairman Food Science Committee
Committee on Third Western Hemisphere
Conference on Nutrition

American Public Health Association:
Committee on Programs, Section on Food
and Nutrition

Meals for Millions:
Consultant on Fish Protein Concentrate

Advanced Research Projects Agency:
Consultant on Army Rations

Snell Memorial Foundation:
President
Board of Directors

Agency for International Development:
Consultant on Fish Protein Concentrate

Caribbean Research Laboratories:
Board of Directors

Society of Clinical Nutrition:
Committee on Awards

Association of Food Science
Administrators:
Chairman Executive Committee

Publications: Senior Editor, Advances in Food Research, now in the 20th volume
Editor, together with E. M. Mrak and G. F. Stewart, of Monographs
in Food Science and Technology, 10 volumes
Author of approximately 210 papers over the last 20 years on
chemistry, engineering, and nutrition in food science
Editor, Essays in Toxicology, 3 volumes
Editorial Board, Food and Agricultural Chemistry
Editorial Board, Invertebrate Pathology
Recipient of the Bernardo O'Higgins Award from the government
of Chile for work on the nutrition of children
Recipient of Medal from Czechoslovakian Academy of Science for
work in nutrition
Recipient of Medal from Czechoslovakian Secretary of Agriculture for work on
the Maillard Reaction

Thomas F. Weaver

Married -- three children ages 14, 10, 5

Education

B.S. - 1958, Penna. State University, Major - Agronomy, Minor - Agricultural Economics.

M.S. - 1962, Cornell University, Major - Agricultural Meteorology, Minor - Crop Ecology.

Thesis - Nocturnal Air Drainage in the Vicinity of Mt. Pleasant, New York

Ph.D. - 1966, Cornell University, Agricultural Economics, Major - Agricultural Development and Policy, Minors - Farm Management, Applied Anthropology.

Thesis - Irrigation and Agricultural Development in Raipur District, Madhya Pradesh, India

Professional Job Experience

1. Research Associate, Cornell University, 1966-67.
2. Visiting Professor, Agricultural Development Council, 1967-1971.
Assignment - Visiting Fellow, University of Malaya
Duties: a) Teaching, Agricultural Development, Land Economics, Farm Management, Research Seminar, Introduction to Price Analysis.
b) M.S. Programs, Development of programs and supervision of M.S. candidates.
c) Research, Supervisor of senior thesis in Agricultural Economics, development of staff research activities including forest industries, irrigation, and rural socio-economic studies.
d) Workshops and seminars, participation in various training and development seminars; primarily in cooperation with government personnel.
e) Fellowship, Identification and administration of A.D.C. Fellowship candidates.

Publications

Books - Developing Rural India, Plan and Practice, Cornell Univ. Press, 1958.

Monographs - Irrigation Evaluation Under Monsoon Rainfall Patterns, Cornell Int. Agri. Dev. Bull. No. 10, N.Y. State College of Agriculture, 1968.

Articles - Tan Eock Thien, "A Review of Malaysian Rice Policy and Production", Faculty of Agri., Univ. of Malaya, 1969, to be published in proceedings, Malaysian Agricultural Society.

_____, Leh Ming Kai, "Rice Production under Double Cropping Technology", Faculty of Agriculture, Univ. of Malaya, 1969, to be published in proceedings, Malaysian Agricultural Society.

_____, Ridzuan bin Abdul Rahmin, "The Adoption Process Under New Rice Technology", Faculty of Agriculture, Univ. of Malaya, 1969, to be published in Proceedings, Malaysian Agricultural Society.

_____, Joseph K.T., "Towards an Economic Classification of Soils", Geographica, Univ. of Malaya Press, Oct. 1970.

In Process

1. Irrigation Development in the Green Revolution.
2. _____, Joseph, K. T., eds., An Agricultural Resource Atlas of Malaysia and Singapore, twenty five contributors covering the economy and natural resources, commissioned by Oxford Univ. Press, to be published 1971.
3. _____, Lai Kok Chou, Lim Kim Peng, The Vegetable Industry of West Malaysia.
4. Research and Development Priorities in South-East Asia.

Other

Occasional papers, advisory papers for the Government of Malaysia on Agricultural Credit, The Tapioca Industry and the Rubber Smallholder Industry.

Research Activities

Currently completing research studies initiated during stay in Malaysia, including irrigation, smallholder development, forest industrial development, and land holding patterns.

Professional Societies

1. American Agricultural Economics Association
2. American Academy of Political Science

Awards

Cornell International Development Fellowship - 1963-1964.
Phi Kappa Phi, Cornell University.

NAME: Leif C. W. Landberg

EDUCATION:

A.B.	1960	University of California, Los Angeles
M.A.	1963	University of Arizona
	1967	Advanced to Ph.D. Candidacy, University of California, Davis
Ph.C.	1969	Candidate in Philosophy, University of California, Davis

EMPLOYMENT:

Teaching experience:

Department of Anthropology, University of Arizona,
Teaching Assistant (linguistics), Sept. 1961-June 1962

Department of Anthropology, University of Arizona,
Teaching Assistant (linguistics, cultural anthropology)
Sept. 1962-June 1963

Department of Anthropology, University of California,
Davis, Teaching Assistant (physical anthropology)
Sept. 1965-June 1966

Department of Anthropology, University of California,
Davis, Teaching Associate (physical anthropology)
July 1966-July 1967

Department of Sociology and Anthropology, University of
Rhode Island, Instructor in Anthropology, Sept. 1971-
present

Field experience:

Archaeological aide, University of California, Santa
Barbara, Aug.-Sept. 1958

Archaeological aide, University of California, Santa
Barbara, Aug.-Sept. 1959

Archaeological Specialist, Museum of New Mexico, June-
Sept. 1962

Archaeological Specialist, Department of Parks and
Recreation, State of California, June-Sept. 1968
(Field Director and Administrator of the Old Sacramento
Historical Archaeology Salvage Project, Sacramento.
Editor of, and author of introduction for contract
report "Archaeological Investigations at Old
Sacramento, California", on file at the Department of
Parks and Recreation, Sacramento, California).

Military service:

U.S. Army, Specialist 4th Class, July 1963-August 1965.
Honorable Discharge, June 1969

FIELD WORK:

Social anthropological investigations in a Swahili-speaking fishing community of Tanzania, East Africa. February 1968-November 1969, Foreign Area Fellowship Program.

HONORS:

Foreign Area Pre-doctoral Research Fellow, African Studies Program, Sept. 1967-May 1970
National Institute of Mental Health Pre-doctoral Fellowship awarded March 1967, but decline in order to accept Foreign Area Pre-doctoral Fellowship, 1967
National Defense Foreign Language Graduate Fellow (NDEA Title VI), Summer 1967 - for the study of Swahili
Research Associate, Department of Sociology, University College, Dar es Salaam, Tanzania, Feb. 1968-Feb. 1970
Sigma XI, University of California, Davis, 1969

PROFESSIONAL SOCIETIES:

Member: American Anthropological Association; International African Institute; Royal Anthropological Institute; The Tanzanian Society; Sigma XI

PROFESSIONAL ACTIVITIES:

Contributing Editor, Annual Report, Archaeological Survey, Vol. 8 (1966), Department of Anthropology, University of California, Los Angeles
Panel Discussant for "Post-1800 Historic Sites", International Conference on Historic Archaeology, January 6-7, 1967, Dallas, Texas
Discussant for papers presented at Maritime Anthropology Meeting, Nov. 20, 1970, San Diego, California (American Anthropological Association Annual Meeting)
Bibliographer for "Human Marine Adaptations Study Group", formed at 69th Annual Meeting of the American Anthropological Association, San Diego, 1970
Editorial Reviewer, for American Antiquity, 1970
Co-chairman, Distinguished Guest Seminar Studies Series on International Development, International Center for Marine Resource Development, University of Rhode Island, Kingston, Spring 1971
Member, Editorial Board of "Occasional Paper Series" in International Marine Resource Development, ICMRD, University of Rhode Island, Kingston, 1971 -
Participant in Symposium on "Modernization and the Environment - The Impact of Western Ideas on Traditional Societies", University of Rhode Island, May 27-29, 1971
Participant, Workshop on the Problems of the Subsistence Fisherman, ICMRD, University of Rhode Island, Nov. 10-11, 1971

PUBLICATIONS:

- 1965 The Chumash Indians of Southern California.
Southwest Museum.
- 1966 Tuna Tagging and the Extra-Oceanic Distribution
of Curved, Single-piece Shell Fishhooks, American
Antiquity, Vol. 31, No. 4, pp. 485-493, Salt Lake City.
- 1966 "Historical Perspectives on the Aboriginal Fisheries
of the Santa Barbara Region, California", Annual Meeting
of the Society for American Archaeology, May 1966, Reno,
Nevada
- 1968 Comments and Addenda on Tuna Tagging and Shell
Fishhooks, American Antiquity, Vol. 33, No. 1, pp. 98-100,
Salt Lake City.
- 1968 Problems of Past-1800 Urban Sites Archaeology at
Old Sacramento, California. Historical Archaeology, 1967
pp. 71-78. Society for Historical Archaeology.
- 1969 "We are all "Nduga": Social Composition of Ngalawa
Fishing Crews in a Swahili Village of the Mrima Coast.
University Social Science Conference Paper No. 624
(Part G-Sociology), University of East Africa, Makerere
College, Kampala.
- 1969 With Pamela L. W. Landberg, "Household Composition
and the Growth of Neighborhoods in a Swahili Village".
Sociology Staff/Student Seminar, Department of Sociology
University College, Dar-es-Salaam, Aug. 1969
- 1971 With Pamela L. W. Landberg, "Economic Aspects of
Modernization in a Tanzanian Coastal Community", paper
presented in symposium "Modernization and the Traditional
Socio-Cultural Environment", University of Rhode Island
May, 1971
- 1971 "Socio-economic Correlates of Fishing Effort in the
Coastal Fisheries of Northern Tanzania", paper given at
the 70th Annual Meeting of the American Anthropological
Association, November 1971, New York.
- 1971 A Marine-Oriented Ecological Interpretation of the
Aboriginal Settlement Patterns of San Nicolas Island,
California.

RESEARCH IN PROGRESS

- Ph.D. dissertation (University of California, Davis),
Social and Economic Networks of Ngalawa (Double Out-
rigger Canoe) Fishermen, Tanzania, East Africa.
- A Bibliography of Maritime Social Studies (for the
Human Marine Adaptations Study Group and the Inter-
national Center for Marine Resource Development, URI)
- Development of an Index of Current Maritime Social Re-
search (with Prof. William R. Rosengren) N.S.F. Grant-
in-Aid, University of Rhode Island Research Committee,
awarded January 1971.

November 23, 1971

APPENDIX II

Consortium for the Development of Technology (CODOT) Organization and Objectives

Food technology, world-wide, has been badly neglected in the developing and low-income countries. These countries have recently placed appropriate emphasis on the output of agriculture, but have paid little or no attention to the transition of the output of agriculture to the consumer.

Most agricultural programs in the low-income and developing countries have concentrated their efforts on increasing production, but have not made major inroads in marketing, preserving, modifying, or storing the products of agriculture and fisheries. The conversion of raw agricultural products to safe, utilizable products for human populations also has been neglected. Agriculture, including aquatic resources, must of necessity supply food, but technology must be used to control losses in prospective food products, to augment the distribution of foods and to develop materials which will better satisfy the food requirements of individuals.

The major link between the production capabilities of the world and the bellies of the people who require a supply of nutrients is technology. There are many things that food technology can do to alleviate some of the world's food problems. One is the elimination, as much as possible, of wastage. Losses in food between production and consumption vary between countries, but are invariably higher in the low-income countries. Estimates of this loss range from 30 to 60 percent. Improvement in acceptability of food is necessary if the people are to get the nutrients needed. The development of new food sources and the development of food products for export are other areas in which food technology can make substantial contributions.

Development of the Consortium

In February of 1970 representatives of five U.S. universities, with strong interests in food technology and overseas development processes, met to discuss the development of food technology programs in low-income and developing countries. Each of the universities represented had previous experiences on programs of this type in various parts of the world. Not all of these experiences had been as successful and fruitful as might be desired. Also participating in this discussion was a representative of the United States Agency for International Development.

From the discussion that took place it became evident that in food technology, no single university or other research institution is endowed with all the expertise necessary to develop the numerous facets of the area of food technology. Therefore, it is important to recognize the comparatively limited resources of any one institution in food technology, particularly if one considers the urgency and need on a worldwide basis. Different institutions have different expertise within the area, and thus an argument can be developed that a group of food technology departments within a number of universities can put together complementary strengths and resources.

Organization of the Consortium

With a realization of the above situation and with the interest and concern of those attending the meeting, it was agreed that a Consortium of five universities be formed to attempt to do something about the status of food technology in low-income and developing countries. The universities participating in the Consortium are: University of Washington, University of California (Davis), University of Wisconsin (Madison), Michigan State University, and the University of Rhode Island. These universities were selected for their expertise in the following areas of food technology:

University of Washington: teaching and research in food science and technology of fishery and other marine food resources.

University of California (Davis): teaching and research in the problems of the preservation of fruit and vegetable products and in the study and utilization of fermentation as a means of preservation in developing countries.

University of Wisconsin (Madison): instruction and research related to better utilization of dairy products and the augmentation of programs of food safety, both of which are of extreme importance in the developing countries.

Michigan State University: teaching and research in the area of animal products (primarily meats) and of food engineering.

University of Rhode Island: teaching and research on the utilization of marine products for human food and animal food supplements, the economic management and nutritional integration of marine products with agricultural products, and pesticide monitoring of marine foods.

Executive Coordinating Committee

This committee is composed of the chairmen of the food science and technology departments or their designated representative of the universities participating in the Consortium. Professor Clinton O. Chichester of the University of Rhode Island serves as chairman of this committee.

Financial and Business Matters

The International Center for Marine Resource Development of the University of Rhode Island acts as the contracting and business agent for the Consortium. The University of Rhode Island can enter into contracts and grant arrangements for the Consortium and will act as disbursing agent to the other universities participating in the Consortium for any funds involved.

Official Address

The official address for the Executive Committee of the Consortium is the International Center for Marine Resource Development, University of Rhode Island, Kingston, Rhode Island, 02881. Telephone number (401) 792-2466. Cable address: CODOT, Kingston, R. I.

Objectives of the Consortium

The general objective of the Consortium is to develop food technology expertise in developing countries particularly the upgrading of present technology and the introduction of low-cost preservation techniques such as drying and fermentation or canning on a scale suitable for the country. The Consortium is concerned not only with the mere transfer of technology, but desires the development of processes adapted to the regions which are to be served where food technology is just beginning to emerge as a discipline.

To accomplish this objective, these five universities propose to concentrate on building joint long-range competencies and resources in the area of food science and technology for tropical and temperate countries. They will develop faculty interest in the problems of developing countries, offer training for individuals from overseas, develop research programs directed toward solving the food technology problems of low-income countries in cooperation with institutions in the host countries, supply a broad range of consultation services to the countries, develop in-country training programs, and build institutions in host countries capable of dealing with their food problems.

The general objective of the Consortium can be achieved by satisfying the following specific objectives:

- 1) Identification of priority problems in selected developing countries and the establishment of research programs in these areas.

2) Training of U.S. and foreign nationals in food technology areas directed to the priority problems of the developing countries.

3) Relate objectives 1 and 2 to institutional building initially proposed in the Latin and Central American region, but to be expanded into other areas.

4) Promote the utilization of knowledge in food technology through extension activities, short courses and pilot demonstrations in the host countries, with particular emphasis placed on developing communications with local and international industrial sectors.

5) Make available technical competence for overseas consulting.

APPENDIX III

Publications Acquired for ICMRD Library During Fiscal Year

- Some Issues Emerging from Recent Breakthroughs in Food
Production - K. L. Turk
- Scientific Exploration of the South Pacific - NAS
- Oceanography Information Sources/70 - NAS
- Directory of Oceanographers in the United States - NAS
- Oceanography 1966: Achievements and Opportunities - NAS
- A Future for European Agriculture - The Atlantic Institute
- Oceans from Space - Proceedings of a Symposium on the Status
of Knowledge, Critical Research Needs and Po-
tential Research Facilities Relating to the Study
of the Oceans from Space
- The Community Economic Base Study - C. M. Tiebout
- Agricultural Development in the Mekong Basin: Goals, Priorities,
and Strategies - A Resources for the Future Study
- The Folklore of Capitalism - T. Arnold
- Social Factors in Economic Development: The Argentine Case
- R. R. Fillol
- The Diplomacy of the Dollar - H. Feis
- The Hidden Faces of Free Enterprise - J. R. Bunting
- Controlling Pollution - M. T. Goldman
- Landmarks in Political Economy - E. J. Hamilton
- Computer Simulation of Competitive Market Response - A. Amstutz
- The Labor Market - B. J. McCormick and O. Smith
- The Growth of the American Economy to 1860 - D. North and R. Thomas
- Mass Communications and American Empire - H. I. Schiller
- Absentee Ownership: The Case of America - T. Verblen

Development in a Divided World - D. Seers and L. Joy

Basic Concepts in Sociology - M. Weber

Jobs and Agricultural Development - R. D'A. Shaw

The Growth of the World Population - NAS

Trade and Trade Policy - Burenstem and Linder

Prospects of the World Food Supply - NAS

Wastes Management Concepts of Coastal Zone: Requirements
for Research and Investigation - NAS

Readings in Economic Development - T. Morgan

Research for the World Food Crisis - AAAS

Formulation of Research Policies - AAAS

Agriculture and the Quality of Our Environment - AAAS

The Role of the Military in Underdeveloped Countries - J. Johnson

The Economic Development of Underdeveloped Countries - J. Bhagwati

Education, Manpower and Economic Growth - Harbison

Two Views on Aid to Developing Countries - B. Ward and P. T. Bauer

Food for Tomorrow: Resources, Environment, Distribution - NAS

Maximizing Agricultural Productivity through Efficient Land
Use and Application of Technology - NAS

The Role of Animal Agriculture in Meeting World Needs - NAS

Population and Food Supply - Hutchinson

Development Problems in Latin America - University of Texas

Alternatives for Balancing World Food Production and Needs -
Iowa State University

Economic Crisis in World Agriculture - Schultz

International Dimensions in Business - Michigan State University

Marketing in Economic Development - Michigan State University

Toward a World of Plenty - B. J. Ward

San Diego Law Review, Vol. 7, No. 3 - University of San Diego

Periodicals Being Received by ICMRD:

Fishery Market News Reports - from Chicago and Boston

Industrial Fishery Products, Situation and Outlook - NOAA

Shellfish, Situation and Outlook - NOAA

On Station - Nautilus Press

Ocean Science News - Nautilus Press

Coastal Zone Management - Nautilus Press

Sport Fishing Institute Bulletin - S. I.

Maritimes - University of Rhode Island

NEMRIP Newsletter - New England Marine Resources Information
Program, University of Rhode Island

News Reports - NAS

Association of Sea Grant Program Institutions Newsletter - URI

Atlantic Community News

The Government Executive

The Investor

War On Hunger/AID

American Scientist

Foreign Policy

Hawaii Economic Review