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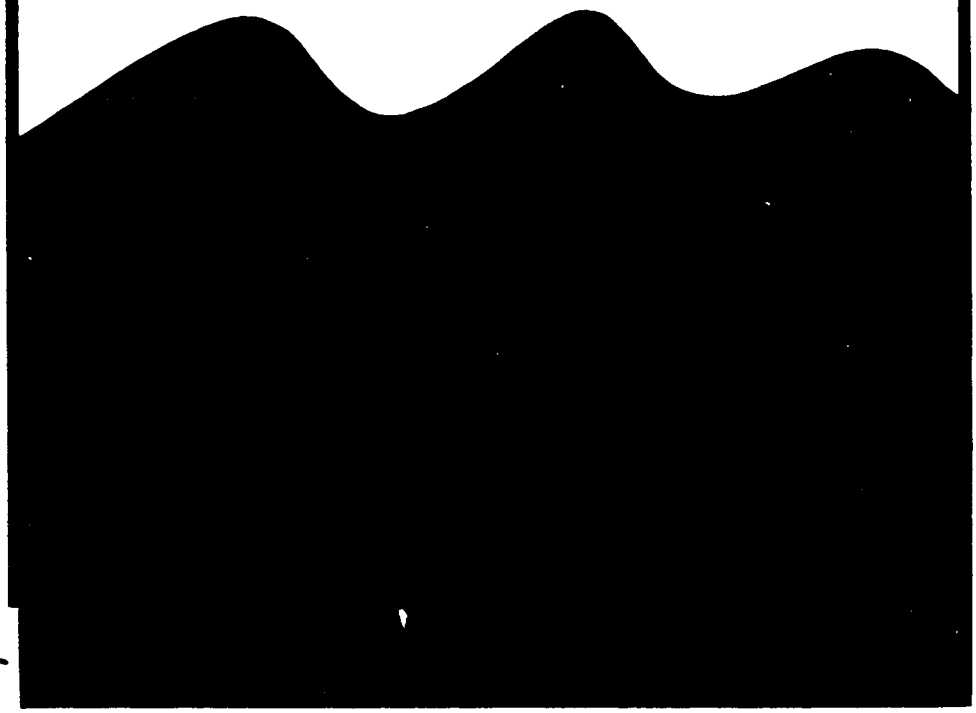
ABSTRACT

The annual meeting of the Sea Grant Association provides a forum for exchanging information on projects and planning among Sea Grant personnel and representatives of government, industry, and the public. Adhering to the 1974 conference theme, Sea Grant - An Action Catalyst, speakers discussed ways the Sea Grant program identifies marine resource needs and brings to bear on them a wide array of institutions, agencies, and industries. Presentations were divided into four parts: (1) Special Addresses; (2) Sea Grant's Framework for Local and State Action; (3) Framework for Sea Grant/Industry Interaction; and (4) Developing a Framework for Sea Grant's International Involvement. Appendices include a summary of the business meeting, Sea Grant Association History, and a list of conference participants. (RH)

PROCEEDINGS

THE SEA GRANT ASSOCIATION

7th Annual Meeting
University of Washington
October 1974



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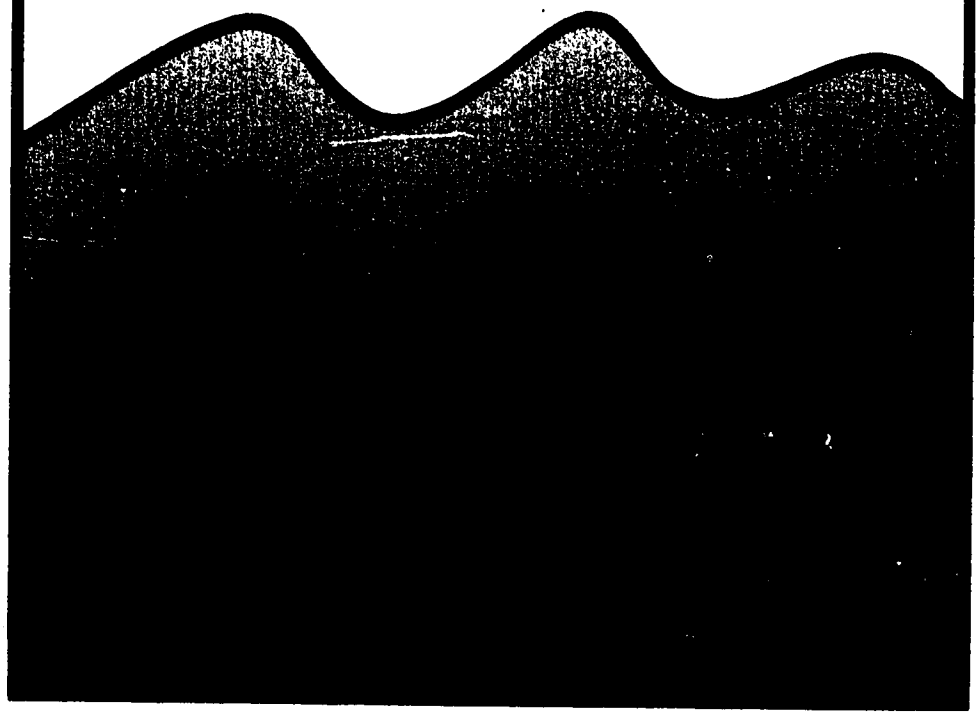

Seventh National Sea Grant Conference

Hosts	Dr. John R. Hogness, President University of Washington
	Dr. George W. Farwell Vice President for Research University of Washington
	Dr. Stanley R. Murphy, Director Washington Sea Grant Program University of Washington
Association President	Dr. William S. Gaither, Dean College of Marine Sciences University of Delaware
Program Committee	Chairman: Dr. Stanley R. Murphy University of Washington Dr. David Dean, University of Maine Dr. William Gaither, University of Delaware Dr. Bruce Mattox, Mississippi-Alabama Sea Grant Consortium Dr. Robert Ragotzkie, University of Wisconsin Dr. Robert Warren, University of Southern California
Conference Coordinator	Robert E. Williams
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Proceedings Editors	Patricia Peyton Sharon Schreiber
Artist	Robin Bentley

Foreword

The annual meeting of the Sea Grant Association provides a forum for exchanging information on projects and planning among Sea Grant personnel and representatives of government, industry, and the public. Adhering to the 1974 conference theme, "Sea Grant--An Action Catalyst," speakers discussed ways the Sea Grant program identifies marine resource needs and, despite modest funding, brings to bear on them a wide array of institutions, agencies, and industries.

The University of Washington served as host institution for the annual meeting held at the Olympic Hotel in Seattle. Many hours of labor were devoted to planning a program to fit the theme and to arranging and executing the three-day conference. This report is the final step in these activities, and it contains the written versions of all the formal presentations save two which were not available at press time.

Special thanks are extended to the following sessions chairmen for their help in conducting the conference: Marc J. Hershman, D. Rodney Mack, Edward D. Ehlers, Otto Klima, Harold E. Lokken, John Blair, and Donald L. McKernan.

The comments of our guest speakers were invaluable in establishing the conference tone and our appreciation and thanks go to John Hogness, James Dolliver, Joel Pritchard, Robert Abel, James Walsh, Philip Roedel, Walter Pereyra, Ricardo H. Mendez Z., and Joel Hedgpeth.

Finally, we are much indebted to the Oceanographic Commission of Washington who provided the financial support which has made possible the publication of these proceedings.

Stanley R. Murphy, Director
Washington Sea Grant Program

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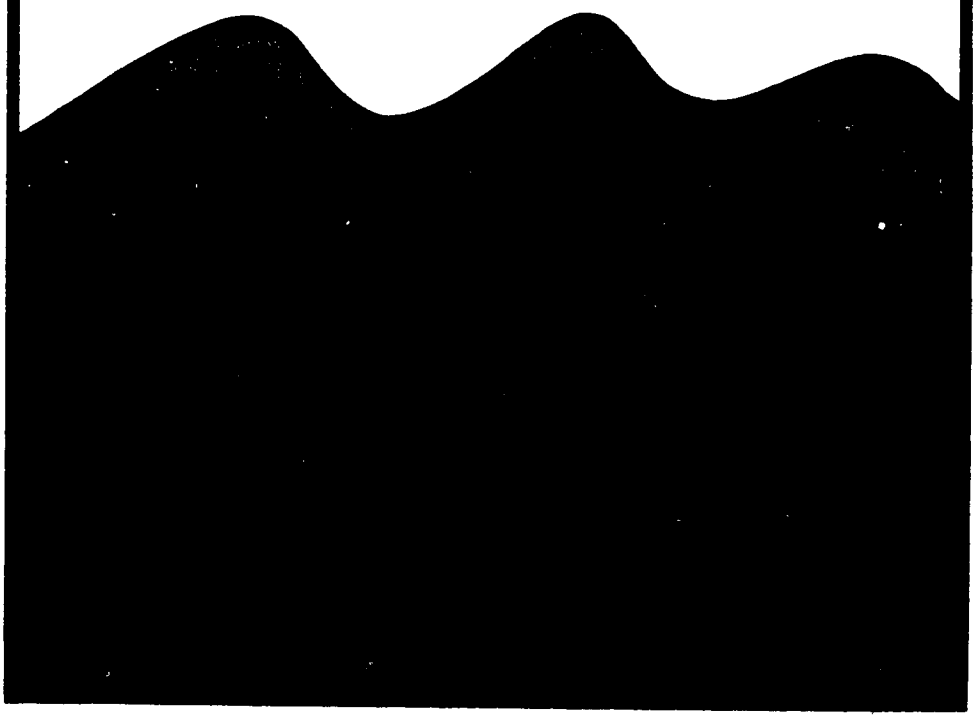

Welcome to University of Washington

John R. Hogness

President, University of Washington

As president of the University of Washington, one of the first four Sea Grant Colleges, I join Dr. Stanley R. Murphy, director of our Division of Marine Resources, in welcoming you to Seattle and to the seventh annual meeting of the Sea Grant Association. I particularly wish to welcome Dr. Athelstan F. Spilhaus who, in 1963 when he was dean of the Institute of Technology at the University of Minnesota, created the concept of the Sea Grant college, patterning it after the century-old Land Grant college program.

Sea Grant was an innovative idea, encouraging the development of marine resources, including animal and vegetable life and mineral wealth, through federal grants--and matching funds--to institutions already engaged in activities in this field. A Sea Grant college would specialize in the application of science and technology to the ocean, as in underwater prospecting, mining, food resources development, marine pharmacology and medicine, pollution control, shipping and navigation, forecasting of weather and climate, and recreational uses.

The timeliness of the Sea Grant program accounts largely for its success. Fundamental research in marine sciences over the previous decades produced the basic knowledge necessary to make an applied effort possible. Our own marine science program at the University of Washington began in the 1890's when faculty zoologists went on specimen-collecting trips to the San Juan Islands in Puget Sound.

But despite efforts in this country over the years to develop marine resources, it was obvious by 1966 that, although the United States Navy was the most powerful in the world, our traditional marine industries were weak and, on a comparative basis, growing weaker. The growth of the Union of Soviet Socialist Republics' oceanography program was well known. In the preceding 30-year period, the annual Russian fish catch expanded from 0.5 million tons to 5.6 million tons. During the same period the United States' fish catch oscillated between 2.0 and 2.7 million tons per year. The 1958 Geneva convention on the Law of the Sea gave local control of the seabed and submarine area adjacent to the coast to the depth of 200 meters, or beyond that limit to where the depths of the superjacent waters admit the exploitation of its natural resources. In other words, those countries who first could exploit the depths of the ocean could control them. And it was not in the United States' best interest to forfeit our right to 70

percent of the earth's surface because of our failure to master our ocean areas.

Congress agreed that it was time to put our acquired fundamental understanding of marine sciences to work. Senator Claiborne Pell (Rhode Island) and Representative Paul Rogers (Florida) introduced a bill which, in a relatively short time, became the Sea Grant College and Program Act of 1966, expedited through the legislative process by the Senate Commerce Committee, chaired by Washington's Senator Warren Magnuson.

It is intriguing to consider the parallel between the Land Grant Bill -- first introduced into Congress in 1859, vetoed by President Buchanan, reintroduced in 1862 and signed into law by President Lincoln -- and today's Sea Grant Act. The Morrill, or Land Grant Act of 1862, opened frontiers in agriculture and manufacturing by granting every state 30,000 acres of land for each representative and senator it had in Congress. The land was to be sold, the proceeds invested, and the income used to create and maintain a college for agriculture and mechanical arts. Like the Sea Grant Act, it was intended to apply previously accrued knowledge.

By 1966 land frontiers had all but disappeared. But still before us was our last great frontier--the sea. Thus was born the Sea Grant program; not to create new institutions, but rather to support programs of education, training, research, and advisory services at established institutions already involved in the study of marine sciences. And the term "marine sciences" was defined in the act as "oceanographic and scientific endeavors and disciplines, engineering, and technology in and with relation to the marine environment...and the fields with respect to the study of the economic, legal, medical, or sociological problems arising out of the management, use, development, recovery, and control of the natural resources of the marine environment."

One index of the timeliness of the program was its enthusiastic reception by both faculties and students. Here was the opportunity for innovation in education, applied research, and advisory services in an area which may well be the world's last great hope for achieving a balance between food supply and expanding populations.

At this time, only eight years after its creation, it is fair to say that the Sea Grant program has gone very well indeed. As early as May, 1970, Dr. William MacElroy, then director of the National Science Foundation, reported that "the program has demonstrated its great value in a remarkably short time." He went on to point out that universities traditionally are composed of numerous fairly autonomous colleges, schools, and departments--an organizational arrangement that often impedes cooperation across departmental lines. Surely one of the outstanding successes of the Sea Grant program is that it has provided a means of breaking down traditional barriers between disciplines, as evidenced in the act's description of "marine sciences." It is of particular interest to me that at the University of Washington, for instance, truly interdisciplinary impacts are being made on marine science problems through the cooperative efforts of such diverse areas as oceanography, law, biology, fisheries, economics, engineering, geology, sociology, and pharmacology.

Nor do these impacts, or the remarkable progress of the Sea Grant program, represent either lavish funding or a large proportion of marine activities. At the University of Washington, Sea Grant supports slightly less than 10 percent of ongoing marine affairs. Although through fiscal year 1975 $186 million has been authorized for nationwide Sea Grant programs, only $116.3, or approximately 62 - 1/2 percent, has been appropriated. Fiscal year 1969 was the sole period that the amount of money authorized actually was appropriated. Of course, the total still is a significant amount of money, especially when one-third matching funds are added as required by the Sea Grant Act.

I am convinced that the principal reason Sea Grant continues to capture the imagination of faculty and students is that it couples applied research with the program's explicit requirements for information transfer mechanisms specified as "advisory services." Thus it reaches out into the community to identify problems in the marine area, and then applies the expertise of the university community and its resources to seek solutions.

When the University of Washington began its initial Sea Grant program in 1968, the marine community of the state responded, and we now have close working relationships with various agencies of the state government whose mandates concern themselves with its marine resources. The Oceanographic Commission of Washington has participated in the program from the beginning. The state departments of ecology, fisheries, and natural resources have entered the program as active supporters. And the marine industries have come to Sea Grant for assistance in developing resources. Sea Grant helped organize the American Salmon Growers Association to provide a forum for exchange of information among growers, the agencies that regulate their activities, and the Sea Grant College. As an example of the assistance we have been able to provide through Sea Grant, the University gave technical aid to a fledgling company developing an innovative method of cleaning ships' hulls while in the water. That so-called "Sea Mesh System" is a viable new industry.

Although Sea Grant in this state is based at the University of Washington, it is by no means confined to that institution. Investigators at other four-year colleges participate in the program, and there is a strong component of Sea Grant in our community college system. We have a close association with our sister university, Washington State, through its cooperative extension program. Underway are plans to place Sea Grant field agents out into the communities of western Washington to strengthen the ties between the program and its constituents.

Your theme for this seventh annual meeting--"Sea Grant - An Action Catalyst"--well describes the purpose, the achievements, and the potential of the Sea Grant program, now grown to involvement with 51 institutions including seven Sea Grant Colleges. Each of these conferences emphasizes the importance of sharing ideas and exchanging information. It offers the opportunity to review your progress over the years. And it provides an occasion for exploring new, coordinated efforts among those in your association and other groups and individuals concerned with the development of our marine resources.

I congratulate you on your achievements and wish you well in present and future efforts to conquer the sea. The resources of the University of Washington are yours.

How Do We Make Sea Grant a Catalyst for Action?

Joel Pritchard

U.S. Representative, State of Washington

I don't need to tell my audience today about the significance and potential of our oceans. In fact, I hope that you will continue your fine efforts toward developing and expanding this significance. The oceans are a vast and beautiful domain which has a decisive role in man's future on this planet. And the cutting edge for this nation's exploration of our planet's last great frontier rests in large part with Sea Grant. You have important tasks ahead of you.

That is why the topic of this conference is so appropriate. How do we make Sea Grant more effective? How do we make it a true catalyst for action?

In this election year, I will resist the temptation to indicate that the only sensible way to have a more effective program is to have vast amounts of new federal funds. More funds for ocean programs are needed and could undoubtedly be put to better use than in almost any other major field in the country. But in this field, as in others, our key emphasis must be on making existing programs more effective and on making the dollars stretch. Productivity should become a watchword in America.

While I do not come with any profound formulas, I do have some practical advice from the world of politics. To make Sea Grant more effective, I propose more involvement, better communications, and a more practical orientation. Implementation of these proposals will provide not only a more effective ocean program, but it will help educate what is an essentially land-oriented national society into the wonders and potential of the oceans.

First, for more involvement I suggest that those who work with grants share their experiences and solicit the views of those in the community who will be affected by the results of the research. America's land frontier temperament was marked by rugged individualism. But that won't work with our ocean frontier. The task of developing the ocean is far too complicated and sophisticated for that. Moreover, I suspect that scientists and researchers often feel unappreciated and misunderstood while I know that the rest of us often feel left out and dwarfed by the sweep of technology and the wonders of science. In these times, perhaps

more than ever, we need to involve more people and to develop a stronger sense of national unity. Yes, Sea Grant can even help with that.

This is a policy I have followed during my two years as a congressman, and I have realized many benefits from it. Throughout my term I have held frequent District Days to go out and talk with people on a one-to-one basis. I think that during this process we learned from one another. I was especially pleased that President Ford also adopted this framework with his approach toward inflation. It was very refreshing to watch a President soliciting views and listening to problems of people from all walks of life. One of the primary reasons for the tragedy of Watergate was that those in power were isolated and decided *for* people rather than *with* them. Such a concept has no more place in the work of Sea Grant than it does in our political system.

So, I suggest that if you work with Sea Grant, seek out the people who might be interested in your project. If it involves research on a fishing problem, find some fishermen or preferably a fishermen's organization and explain to them what the objectives of the project are and how it aims to solve a problem affecting them. Then, if possible keep this group up to date with progress reports and a final report. I don't expect that a significant portion of the time available need be spent at this. But if you try it, I think you'll find it both an enjoyable and rewarding experience. Moreover, you may get some good ideas on how to improve your plans and certainly will get a better understanding of the people and their concerns. As well as improving existing projects, such an experience can generate good ideas for new ones. Perhaps of most practical importance, you will begin building a stronger base of support in the community for Sea Grant. It may take some time, but that community base of support reflected in the hundreds of communities across the country affected by Sea Grant will result in greater national awareness of ocean concerns. It is perhaps unfortunate, but the scientists and researchers have no strong lobby in Congress; more involvement with groups in the community will increase your political muscle.

For better communications, I suggest that you let people know what you are doing. Advertise your successes. This is an area where politicians have a special expertise. All of you know how we are never reluctant to let our constituents know what we've done for them.

Here in Seattle both of our major daily papers have a marine section, and there are several weeklies directed toward those interested in marine matters. I'm sure that other cities have similar facilities. I suggest then that on completion of a project, you write a brief synopsis explaining the nature of the work and what it aims to accomplish and send it to the newspapers. It should be short and explain the project in layman's terms. Don't expect to always get newspaper coverage, but even if you don't, you will be building a consciousness in the press that can be extremely useful.

Also, break down the stereotype of the "ivory tower types". In your involvement with concerned groups and your efforts to get through to the press emphasize the practical objectives and why something that sounds exotic can really produce tangible benefits. An example from the Washington Sea Grant program is: "Marine Plant Polymers, Part III; A Kinetic Analysis of the Alkaline Degredation of

Polysaccharides with Specific Reference by (1-3) -B-d-glucans." I have no doubt that this is an important and useful project, but before it is recognized as such by the average taxpayer, it will need explaining.

I stress the importance of this because of the adverse reaction that impractical sounding projects can have in the press and in political speeches if they are not explained and understood. Government funding for strange sounding projects is always easy prey for those wishing to sensationalize. It is critical to beat the detractors to the punch. An explanation in defense is often ignored and in any event always seems just a little less convincing. Often the damage will already have been done. An explanation in advance will be better received and more educational and will reduce the temptation to take "cheap shots".

Finally in the communication area, don't forget the people who are elected to serve you --local, state and national. Use them if you have specific problems or requests. We can't always be helpful, but you will never know unless you ask. If we have more requests, we can do a better job of serving you. If we are more educated in ocean-related ideas, we will be better equipped to explore new national programs and policies for the oceans. Effective communication *is* an essential part of the groundwork for a new awareness of the ocean's importance.

As the third factor in this equation, I suggest that you make every effort to achieve a practical orientation to the work you do. Much of the problem here can be solved by the other two factors -- more involvement and better communication. A much better understanding of the practical nature of the work can be achieved by involving more people and by communicating the essential nature of the work. However, I suspect that some, perhaps a small part, of the impracticality is not just perceived but real. This is of course the toughest problem, and one where I have no specific suggestions. I will merely ask that you emphasize the necessity for practical results in your work. I am not being critical here but am just asking you to be careful and to take that very important second look.

While I do not have practical suggestions in this area, I do have an excellent example. Dr. Lauren Donaldson who is well known by many of you has been associated for many years with fisheries research at the University of Washington. As I understand it, at one time he was critized for not being a pure scientist and for the non-scientific way in which he proceeded. He replied that that sort of objection didn't constrain him, for he regarded himself as a simple fish farmer. Yet this fish farmer has had a tremendous impact. His hatchery products and techniques are known and copied around the world. Donaldson salmon now swim in the Atlantic, in the Great Lakes, off the coast of Japan, as well as in our own waters. I was recently in Japan and witnessed the respect with which he is held there. The desire to relate to all types of people, a down-to-earth approach, and a willingness to share the fruits of one's labor are qualities that will make almost any endeavor more effective. I think they will be especially useful in Sea Grant programs.

Probably more than any other factor, the land frontier experience has shaped the American character. But our country and world are changing. We are much more inter-dependent now, and the rugged individualism that has served this country

so well will have to be modified if we are to live in a peaceful nation and world.

In this sense, the great ocean opportunities can be a new social frontier as well as a physical one. If you in Sea Grant can involve more people in your work, can communicate your interests and knowledge to an even greater range of people, and can orient your programs to serve in realistic and practical ways, I think you will be a nuch more effective research organization. But by sharing your knowledge and broadening the national awareness of the oceans you will also be helping to shape the kind of society we all want to live in.

As the land frontier defined our national character for years, let us use this new marine frontier and its vast potential to help create a new national sense of cooperation and involvement.

National Sea Grant Program: A Status Report

Robert B. Abel

Director, National Sea Grant Program

I hope this will be less of an oration than a message--an even half dozen messages, to be exact. I would like to invite your attention to a few of the past year's highlights, and to offer a couple of gratuitous comments on the state of the program generally.

First: This has been a good year for accomplishment, less so for growth. Significant progress has been reported by the institutions you represent, particularly in the areas of aquaculture, fisheries technology, and research relating to coastal zone management decisions. The engineers, lawyers, and technicians graduating from SG sponsored curricula continue to enter important posts, even to the point where some of our Sea Grant directors have recently found themselves negotiating with their own students. The Marine Advisory Service, in most cases, continues to earn accolades on all coasts.

Not only has progress been significant, but the reporting of it has improved markedly; and as I've insisted to the point of being tiresome, the written word is the fuel on which the bureaucracy runs.

On the other hand, growth continues nil; our aggregate number of newly negotiated grants in the past 4 years is still one, i.e., one addition to the Sea Grant network. As you'll note in a moment when budget is discussed, this total will have changed, neither a year from now, nor two years from now. In other words, it is unlikely that any substantive new grants will be awarded either this or next year.

Second: The budget picture, which appeared tolerable, if not rosy a month ago has suddenly turned dim. As you all know, the House of Representatives figure, which is normally the lowest Sea Grant expects, amounted to an increase of about $4.5 million. The President needs to balance the budget. As a result of his decisions for "recession" (the current euphemism for empoundment), very little of that increase is left (the precise amount is still not known, but I say with certainty that it's below cost of living).

I will give you our battle plan, and invite your comments. Clearly, to try to absorb the reductions through the grants yet remaining this fiscal year would be unfair and miserable business. I want to state clearly that Sea Grant directors whose grant years begin between now and June may expect precisely the same treatment as if the catastrophe hadn't occurred. However, we will, in some cases, make six-month grants, only; thus, in effect, taking a line on next year's budget. The outcome of this maneuver will, of course, depend on next year's budget, which is totally unpredictable; accordingly, all I can do is project the results of alternative budget levels.

If the secretary's budget request is honored, this year's loss can be absorbed, and its imoact on your grants won't be noticed. If it suffers what seems to be becoming Standard Operating Procedure, i.e., a severe cut, you may expect, at best, cost-of-living increases, and in some cases, reductions below your present levels. If we're level funded, your grants will be decreased, ranging to as much as 25%.

As in the past, my colleagues and I firmly decline the across-the-board reduction option. The actions on the individual grants will be highly selective and will range widely.

We in Sea Grant know our bosses in Commerce strongly support us, but if ever constituency action was needed, it is needed now.

The third item I wish to discuss concerns overall Sea Grant policy. As you know, our priorities are pretty well indicated in Ernie Greenwald's Tables. The semi-annual meeting of the Sea Grant Advisory Panel was held last week. This group's recommendation, in view of the budget cut, is to decrease emphasis in the socio-political area, such as coastal zone management, in favor or accentuation of resources R & D. We and our Panel acknowledge, however, the reality and value of the Sea Grant partnership, and recognize the institutions' natural inclination toward local issues, of which coastal zone management is most prominent.

Further, I believe close Sea Grant attention to coastal zone matters is consonant with NOAA policy.

Put another way. we could hardly expect any one grantee to bear the matching fund burden of a development, the effects of which would be less local than national in scope. This is often the case, however, and it is indeed gratifying.

To clarify, we are asked to increase emphasis in coastal and marine resources and their economic development. We also recognize and will honor our partnership function and our responsibilities to our grantees and their state government who are more concerned with coastal zone management.

Incidentally, our attitude toward the Sea Grant directors' flexibility and funding therefore, will not change. We feel that it's in our best interest to protect the directors' quick reaction capabilities wherever they've been demonstrated to be effective, and, if anything, will favor this more in the future.

A final bit of doctrine. It may be a tribute to Sea Grant's growing importance, but unfavorable sensitivity to some of our activities is increasing in certain quarters. I will explain. Technology is power. It is important that we keep the reins on this power by limiting Sea Grant to fact finding, i.e. provision of information to those who must make public decisions. Unless specifically requested, grantees are not supposed to take sides in issues; their actions should st stop short of advocacy.

Specifically, do not comment on the probably efficacy of proposed laws or regulations. Do not comment on the adequacies or inadequacies of public officials. Do not take sides in public debates, if you are representing Sea Grant at the time.

The fourth issue concerns possible Sea Grant-Land Grant relationships. As most of you know, next week, officials of Commerce and Agriculture will conclude a memorandum of agreement between the two departments respecting cooperation between our two extension services. Because of this, because of my increasing affiliation with the Aggies through certain extra curricular activities, and because of the various assessments I've seen of that department, I endorse enthusiastically any arrangements which are aimed at closer collaboration between Land Grant and Sea Grant. We can't help but benefit.

Fifth, Hugh McLellan is close to putting the final draft of the Five Year Plan to bed. We owe votes of thanks to all of you who participated in its construction, especially Steve Stevenson at Texas A & M, who synthesized the draft from your contributions. We all recognize that this is a statement of goals, rather than an executive planning document, with milestones laid out, according to various levels of budget projections. We'll essay that next. For this, however, we'll need the institutions' own plans, and not enough of these have been developed yet.

Professor Kildow completed the International Study gratifyingly close to the deadline, and the Secretary of Commerce has submitted it to the Congress with the promise of a follow-on report in a few months. To those of you who have expressed concern that this study could lead to activation of a program that might siphon off funds otherwise assigned to the domestic Sea Grant Program, I would like to say - NO. This simply will not happen.

You realize that I couldn't leave this platform without a note on communications, and this will be the final topic. As most of you know, Eddie Hull has been working for some time on an analytical description of the Sea Grant Program. In affirmation of my thesis that admiration for the Program is proportional to understanding of it, Eddie has offered certain observations well worth conveying to you: First, the Program has accomplished more than almost anyone realizes. Second, its potential is perceived by very few people. Third, neither of these facts is being conveyed properly and he isn't sure whether it's possible, in fact, to do so. Fourth, he's more than somewhat impressed with the competence of the Sea Grant directors with whom he's been corresponding. Eddie's analyses will be useful in the assessment of the Program recently ordered by the NOAA Administrators.

Pursuant to these remarks, it's probably unnecessary for me to say how pleased I am with the manner in which our Sea Grant communicators have picked up your incoming President Leatha Miloy's concepts, and under Linda Weimer's inspired and inspiring leadership, are translating these concepts into real action. We happen to be living in a fiercely competitive world, and, with all respect to Sea Grant's splendid scientists, engineers, lawyers, economists, and managers, our Program is going to grow only as fast as it can be sold; for its promise, and transferred to the consumers in terms of its products and services. In this connection, I would like to reiterate our long-standing request for joint grant institution-NOAA press releases whenever possible.

Let me close by first contratulating the Association for what it has accomplished already under Bill Gaither and his predecesors and second, by predicting a fine year ahead under your marvelous new president.

Senate Ocean Policy Study

Warren G. Magnuson

U.S. Senator, State of Washington

Speaker - James P. Walsh, Staff Counsel
U.S. Senate Commerce Committee

I am honored to appear this evening to discuss the progress of the Senate Ocean Policy Study with the Sea Grant Association. I wish to extend to you the regrets of Senator Magnuson for not being able to be here this evening. Although he has been one of the key supporters of the Sea Grant Program from its inception, and wanted to be here this evening, the campaign trail required him to be elsewhere.

Tonight, I would like to outline briefly what the Senate Ocean Policy Study *is* - and there has been considerable confusion about what it really is - and give you a report on what we've been up to so far. Finally, I'd also like to give some insight into what might be expected of the Policy Study in the coming Congress.

First, a little background. Over the past 15 years this nation has gradually come to realize that a good deal of mankind's future lies with the ocean. This has come about because of a greater appreciation of the ocean's value with its living and non-living resources, its maritime commerce, and with its potential for siting commercial, industrial and habitational developments along its land edge.

This realization is especially important today. There is a pressing need for the United States to utilize the resources of the ocean and coastal zone properly and to solve ocean-related problems adequately. This nation now knows that it is necessary to have a sound understanding of the ocean and create the technology to preserve, protect and promote the renewal of resources as development takes place.

Prior to today's increased interest in the oceans, several major attempts were made to obtain a national concern and focus on the sea and its resources.

A new awareness of the importance of the ocean to our national interest, and the serious discrepancy between the nation's need and the ocean's potential first arose in 1959. The Senate passed Senate Resolution 136 to focus attention on the

oceans. The Congress hammered away at this issue and gained the gratifying expression of interest of President Kennedy.

In 1966, Congress passed the Marine Resources and Engineering Development Act, an initiative that proved to be a major turning point in our nation's maritime history. The act focused high level attention on the peaceful uses of the sea as a highway for world trade, on the ocean as a source of protein, minerals and energy, on its contribution to recreation and esthetic enjoyment for a busy people and on its potential for international cooperation as a further step to world order.

Accordingly, the Congress mandated a policy "to develop, encourage, and maintain a coordinated, comprehensive, long-range national program in marine science for the benefit of mankind." To assist the President to assume this high level of leadership and responsibility, Congress provided him with a statutory National Council on Marine Resources and Engineering Development.

The Council moved rapidly forward to harmonize diverse goals, to orchestrate the federal bureaucracy and to identify marine priorities.

In addition, a statutory commision under Dr. Julius Stratton brought in persuasive recommendations for a still more influential and permanent organization, not only to centralize fragmented bureaus but to assume responsiblity for realizing the promise of the sea.

In 1970 a new National Oceanic and Atmospheric Administration was created in the Department of Commerce.

In 1972 the Congress passed a landmark piece of legislation dealing with coastal waters and their shorelands, the Coastal Zone Management Act of 1972.

On December 19, 1973, Senator Magnuson, with 60 cosponsors, introduced Senate Resolution 222 to authorize a National Oceans Policy Study. It was approved by the Senate early this year. The Resolution directs the Committee on Commerce to make a full and complete study of national oceans and policy and issue reports, along with recommended legislation, in a timely fashion. All members of the Committee on Commerce serve on the Study. In addition, two members have been appointed from each of the Committees on Appropriations, Interior and Insular Affairs, Public Works, Foreign Relations, Government Operations, Armed Services, and Labor and Public Welfare. The President Pro Tempore of the Senate as is required by the Resolution, has named three majority and three minority members to the Study who represent coastal states.

As Senator Magnuson pointed out in his introductory remarks, this was the third occasion in 15 years that the Congress has had to remind the people and the President of the nation's stake in the seaand of our unsteady response to that challenge. The challenges of the ocean are many and complex, and meeting them has not and will not be easy. But of necessity, we have had to look to the Federal government to meet random interests and motivation with a coherent sense of purpose, with a careful assessment of our many needs and priorities, and with a statement of goals and strategies. This is what the Congress had in mind in its two earlier initiatives, and this is what sparks the initiative contained in Senate Resolution 222.

At this point, the key question must be flashing in everyone's mind: just how does the creation of something called an Ocean Policy Study suddenly allow us to meet the "Challenge of the Ocean"? And just what is it about this new "Study" which would give those involved in Sea Grant anything but a strong feeling of skepticism? Let me try to clear away the clouds of skepticism which may be present.

Since the Ocean Policy Study is not like any other study which you in the academic community are familiar with, we must go back to the basics of how Congress, and, in particular, the Senate, really works.

The basic legislative work of the Congress is, as the most basic political science book says, divided up among various committees, each with its own mandate. Membership on these committees is restricted and a relatively few Senators serve on any one committee. Each committee's power over its subject matter is nearly plenary.

The implications this system creates for ocean policy are at least two: One, ocean issues, being relatively new, are handled on a disjointed basis and are not given singular consideration. Therefore, jurisdiction over ocean related policy questions is fractured. Ocean issues often do not attract broad attention, except in the aggregate or submerged in other larger issues. Consequently, rivalry between committees can slow action and lack of an over-all ocean focus can mean that many ocean issues languish on committee back-burners.

Secondly, if an interested Senator does not have membership on a committee handling ocean affairs, his talents and time are not brought to bear on the important ocean questions of the day. A good case in point is Senator Hubert Humphrey. Before the Senate Ocean Policy Study came into being, his long-time experience and interest were rarely used on ocean issues. His committee assignments have not allowed him to be in on the legislative policy-making at the ground level - in committee. This is also true with numerous other Senators who have had an abiding interest in the nation's relationship to the ocean and its resources.

The fundamental nature of the Ocean Policy Study is therefore *organizational*. With this study, almost all Senators with an interest in ocean policy are brought together into a functional unit. They can all give input and guidance, and can participate in policy decisions at the early formulative stage.

With this body Sea Grant issues, for example, will receive greater exposure, and with that exposure, we feel, will come understanding and support from the Senate as a whole. For successful policy-making in Congress, this is key. In a time of cutbacks in Federal programs at every level and for every government undertaking, competition for the scarce Federal dollar is fierce. This is true in the legislative as well as executive branch since Congress has cut the over-all recommended budget of the Executive in nearly every year since 1968.

It may sound funny but many Federal programs are cut in Congress simply because no one knows what they do or because there are no champions for them at budget slashing sessions. At this point, organization and understanding, as well as visibility, are crucial. It does not bode well if a high ranking Senator on the

Appropriations Committee asks, "what the hell is this Sea Grant Program". But I am afraid this has happened, although we are improving the situation. This is a problem we hope to eradicate through the Ocean Policy Study.

With the involvement of Senators representing other committees, needless committee rivalry is avoided. Participation in the Policy Study to date has been excellent and interest is growing. And one of the most enthusiastic is Senator Hubert Humphrey in addition to Senator Magnuson, and Senator Ernest Hollings, Chairman of the Study.

Let me digress at this point and describe briefly our staff and our procedures before moving on what we've been doing. Essentially, those of us who have worked for the Oceans and Atmosphere Subcommittee of the Commerce Committee double over as staff for the Policy Study. John Hussey serves as Director and I act as counsel. In addition, we have hired two other full-time people: Bob Lane, who was the Library of Congress' land use policy specialist before joining the Study, and Pamela Baldwin who recently was a part of the Ford Foundation's Energy Policy Project. I might also mention that David Freeman, head of that project, has also joined the regular Commerce Committee staff and will be available to us on energy-related ocean questions.

As added expertise we have a number of people detailed to us from Executive agencies, including some from NOAA, to give us close liaison with Federal departments, in particular those making ocean policy. We also can call upon expertise specially brought together in the Library of Congress, the General Accounting Office, and the newly created Congressional Office of Technology Assessment. The OTA has adopted the oceans as one of its major areas of concern, and will have a special staff to work with the Ocean Policy Study in preparing and conducting special policy studies. And as particular issues develop, we hope to also call upon expertise outside the government for added insight and criticism. Our goal is basic: Give Congress a strong, independent, and well-informed voice in national ocean policy-making.

Now, just how do we plan to go about translating all this organization and input into meaningful, concrete action? Well, much of our success will be subtle and not always visible to those away from the Washington scene. It will come as Congressional understanding and support. And it will come as greater exposure of ocean problems in the national forum. But most of all it will come as a better mechanism whereby medium and long-range policy choices can be debated and weighed in the Congress. It will *not* be a bound copy of "what if" discussions placed on a shelf for posterity. That is *not* Congress' job. The Ocean Policy Study is geared to taking action and influencing policy and not merely debating it. It should be remembered that ocean policy decisions are now being made daily - inaction is a decision but not a very constructive one.

So what have we got to show for our first few months of operation? Mainly we have been getting organized and mapping a course of salient and timely issues to explore and act on. Our first major effort has been to examine the energy potential of the Outer Continental Shelf and the impact of OCS oil and gas development on the coastal zone. The primary emphasis of this examination is that OCS development decision *must* be based on sound geological and environmental data and that

helter-skelter landslide growth must be prevented by close coordination with adjacent coastal states. We have conducted a series of hearings on this subject and were successful in adding amendments based on our findings to Senator Henry Jackson's OCS Development Bill which recently passed the Senate.

In addition, amendments were proposed and accepted to the Special Energy Research and Development Bill providing funds to reactivate three mothballed NOAA research vessels to aid in environmental baseline data collection in areas of proposed development on the OCS. A full report on our OCS investigations, together with policy recommendations, is now at the printer and should be available shortly.

One undertaking which will shortly be available should be of great interest to everyone active in ocean affairs. Soon to be published is a comprehensive study of the current and projected value to the United States of the ocean in all its uses, as a guide for legislative decision-making. The study, performed in early 1974 by Robert R. Nathan and Associates, estimates the economic value of ocean uses for the year 1972-73 and projects them to 1985 and 2000. This study marks the first systematic attempt to determine the real value of the oceans to the United States.

As a preview, I can say that the results are impressive, even to those who have been aware of the country's great stake in its marine resources. Measured in terms of gross product, the value of these various resources in 1972-73 was found to be over 27 billion dollars. These same resources are potentially capable of producing *3 or 4 times as much* in the year 2000 - between 80 and 100 billion dollars valued in 1973 prices and not reflecting price increases from now till then.

Fisheries is a matter of great interest, and concern, to the Senators on the Study. We still hope to begin hearings this year to examine the National Fisheries Plan currently being developed by NOAA. Through the good offices of Dr. White, we have enlisted the Ocean Policy Committee of the National Academy of Science's Ocean Policy Board to critique this plan for the Senate. Clearly, Congress must prepare itself for the chronic problems affecting our commercial fishing industry, principally the problem of management, if we are to be properly prepared for the inevitable 200-mile economic zone. Fisheries issues will gain greater attention next year.

We also plan early next year to take a fresh look at liability for ocean pollution and in particular oil pollution. In conjunction with this, we will be examining the status of scientific research into oil pollution damage on the ecology. A quantum leap in tanker size and plans for more oil and gas drilling on the OCS dictate that we examine this area in depth.

And, of course, we will not forget to worry about impending reorganization plans in the Ford Administration. Once again an effort is being readied to consolidate energy and resource agencies into a Department of Energy and Natural Resources. In this connection, one of the first things the Policy Study did was to commission a General Accounting Office audit and examination of all Federal agencies possessing ocean policy-making authority. The results are due early next year and should give us a better understanding of where the Federal Ocean Program really stands. I should note that several members of the Ocean Policy Study are watching very closely the development of the DENR proposal. Many view with

trepidation the creation of a new super-agency which might prove unresponsive to Congress or to the public interest. Government organization and reorganization will be a priority item for the Ocean Policy Study.

As you can see, we are not developing a Stratton Commission Report. What is being done is giving high level attention to marshalling support for a strong and forward looking national ocean policy. To date, we believe the Study has made a propitious beginning. Already there are plans to create a special ocean policy committee in the White House's Domestic Council. President Ford is taking note of the Senate's activities in this area as was evidenced by his recent meeting with Senator Magnuson on the fishing question.

We hope that you do not look upon the Policy Study as just more of the same from an unresponsive government. It isn't and we are making every effort to involve everyone in our legislative process. Senator Magnuson, Senator Hollings and many others are ready to provide the leadership needed. We hope you will give the support to make it work.

Marine Recreation and NOAA: Responsibilities and Responses

Philip M. Roedel

Coordinator, Marine Recreation Programs, NOAA

One benefit of modern society is the great increase in discretionary time that has come about in recent years.

This has in turn created new requirements for all sorts of recreational opportunities. Out-of-door recreation has always been a major component of the total recreation picture and we can expect the demand for it to continue to increase, and for the need for recreational areas, facilities, resources and services to increase in proportion.

The marine environment has received more than its share of this increase in recreational activity, but probably less than its share of attention from the Government officials who have responsibilities both to the marine environment and those who use it.

NOAA has since its inception recognized this gap, and it has always been clear that NOAA must give greater recognition to recreational problems and establish a coordinated NOAA-wide program in the framework of an explicit NOAA marine recreation policy if it was to discharge its responsibilities to recreational groups. It is now in the process of identifying its role and delineating a program.

Before looking at federal responsibilities in general and NOAA activities in particular, some definitions are in order. First, what is marine recreation? We are looking at it as the aggregate of recreational activities including aesthetic, scientific and educational aspects and the complex of services supporting them that depend on or impinge on the marine environment if they are to be successfully carried out.

Second, how do we define that portion of the marine environment with which we are concerned? As a working definition we are using this: "The marine environment includes the resources of the Great Lakes and other inland waters which fall within NOAA's purview, the ocean areas subject to U.S. jurisdiction, the contiguous zone and high seas when used for recreational purposes by U.S. citizens, and the coastal land areas closely associated with the sea."

Third, who are the people we are talking about? Their number is legion and they include fishermen, boatmen, swimmers, scubadivers, water skiers, sunbathers, picnickers, campers, sightseers, duck hunters, collectors, nature students, photographers.

This leads to a consideration of what we need in terms of supportive allocations that make marine recreation possible. We need marinas in which we can berth our boats or rent or charter boats, fishing boat landings, boat yards, fuel docks. We need living accomodations--hotels, motels, campsites. We need access most desperately, we need nature reserves both ashore and underwater, a variety of advisory services and informational materials. All of this has to be provided by someone. The fundamental question is WHO.

What does the federal government now do for the recreation-seekers, what should it be doing, what are its responsibilities? What are the responsibilities of state and local governments, and what are the responsibilities of the private sector?

The basic federal charter for outdoor recreation was adopted over a decade ago in 1963. It is PL 88-29, "An act to promote the coordination and development of effective programs relating to outdoor recreation, and for other purposes." It states this policy in section 1:

> That the Congress finds and declares it to be desirable that all American people of present and future generations be assured adequate outdoor recreation resources, and that it is desirable for all levels of government and private interests to take prompt and coordinated action to the extent practicable without diminishing or affecting their respective powers and functions to conserve, develop, and utilize such resources for the benefit and enjoyment of the American people.

It authorizes the Secretary of the Interior to perform certain functions in order to carry out the purposes of the Act, one of which is to formulate and maintain a national outdoor recreation plan, and another of which is to foster interdepartmental cooperation.

Thus, the United States is committed to assuring that its citizens have adequate outdoor recreation resources, with the Department of the Interior having general responsibility at the federal level. We feel it is NOAA's responsibility to cooperate with the Department of the Interior to insure that the marine aspects of the National Recreation Plan, prepared by the Department of the Interior pursuant to PL 88-29 and approved in late 1973 by the Administration, are properly carried out. The activities conducted by NOAA that are or can be made of interest to marine recreationists include a number of categories identified in the National Plan. These currently receive varying degrees of emphasis and support in NOAA and include:

Advisory services	Regulatory functions
Coordination	Research
Credit assistance	Resource management
Grants	Technical assistance
Information	Training

NOAA has not, is not and presumably will not be in the business of owning or operating facilities for marine recreation in the sense that agencies such as the National Park Service and the Forest Service do.

NOAA can and should, however, make maximum recreational use of land and facilities it now owns or manages.

NOAA is in the business of conducting research and providing services in a wide variety of activities, and, the research and service area is where emphasis will remain. It should continue and strengthen its role in policy development and decision-making whenever programs are proposed that impinge on the marine environment.

NOAA is already a major policy force in many areas affecting marine recreation. Its concern with coastal zone management is self-evident and NOAA's role in fulfilling its responsibilities under the terms of the Coastal Zone Management Act of 1972 will help set the tone for generations to come, not only for marine recreation, but for all other uses of the coastal zone.

NOAA does, or can and should, play a decisive part in policy development and implementation covering a wide variety of interests other than coastal zone management, some of which are self-evident and others of which may at first blush seem far afield.

NOAA can become a bureau of standards for the ocean, a repository of knowledge, an organization that develops national standards where such standards are necessary or appropriate, an organization with a built-in referee mechanism to help minimize or settle disputes. By so doing, it would render a great service to all users of the marine environment.

Within this framework, NOAA could, as examples:

- help insure that anthropological and archaeological sites are preserved,
- look at wetland use with special respect to water-fowl requirements,
- insure that recreational aspects of international affairs get full attention, not only in fisheries, but including concern for any problems that might face yachtsmen.

NOAA can take the lead in developing new and adapting old technologies for recreational uses. Ideas for NOAA-sponsored projects run across a wide spectrum and vary tremendously in complexity and costs. These topics are illustrative:

- Use of aircraft and satellites for real time and predictive meteorological and oceanographic data
- Techniques for beach renewal, conversion, or construction
- Feasibility of floating marinas and breakwaters
- Beneficial uses of heated effluent from power plants
- Value of artificial reefs for non-fishery recreational purposes.

NOAA is in a position to help resolve the chronic and serious problems of access through its own research, through sponsored research and through its role as a policy-maker and planner with respect to the marine environment. The access problem is many-faceted and cuts across a diversity of disciplines. Demographers point out that it is often the distribution of marine recreational areas in relation to the distribution of people that is the problem rather than the supply of such areas. The legal profession has a field day, for questions of land title and of private ownership vs. public rights of access are constantly before the courts. Sociologists note it is often a preference for the marine environment as a recreation site rather than the need for it that governs user choice. This raises a serious question that is asked more and more: Should part of a marine recreation program be designed to divert some of these users to a non-marine site?

Access implies there is something to go to, which leads to the equally serious subject of allocation. Allocation is fundamental, of course, and the whole matter of viable marine recreation depends on the allocation process taking appropriate cognizance of it. I have already suggested that NOAA could become a federal bureau of standards--the national marine conscience. Every allocation decision affects marine recreation so the need for a solid data base on recreational waters and uses is self-evident. The types of conflicts calling for decisions are myriad. The Economic and Social Council of the U.N. took note of potential conflicts, including recreational aspects, in a 1972 publication, "Uses of the Sea". Aside from the obvious conflicts between industrial and recreational demands, they comment on internal conflicts among recreationists, saying, "One of the greatest problems in preserving coasts and coastal waters for recreation, apart from the biological conservation aspect, is that of resolving conflicting social needs...", and "From an ecological point of view, organized tourism and holiday-making, with attendant casual picnicking, open-fishing, and litter dumping, are very destructive." And finally, "There is a need to educate sportsmen to respect the coastal environment, both on shore and under water."

There are, as one would expect, many areas of conflict of interest or potential conflict of interest between this vast army of recreationists and commercial users of the marine environment. One of the major problems in coastal zone allocation and development lies in this need to equate the recreational needs of the population with the need for rational economic development and use of the shoreline and inshore waters. The examples are many: Is it better to develop a given bay or estuary as an industrial harbor or as a recreational harbor, or should it be left in its natural state? Should a given species of fish taken by both sport and commercial fishermen be allocated to one group or the other, or divided between them? Is such offshore development as extraction of fluid hydrocarbons, sand, gravel, and marine minerals compatible with recreational uses in the same area? If not, which should take precedence? Problems of this nature face us on a day-to-day basis and will certainly increase in number over the next several decades. NOAA's Office of Coastal Zone Management faces a major challenge in meeting recreational needs when questions of allocation of coastal lands and waters arise.

In developing its role, I believe that NOAA must give high priority to scientific, aesthetic and educational values. We recognize that extractive uses (fishing and hunting) and such non-extractive uses as boating and swimming get the most attention and no doubt contribute the most to the economy. However, BOR in the Outdoor Recreation Plan lists picnicking as the most popular single summer recreational activity (marine and inland). It states further that during the summer of 1972, sightseeing, driving or walking for pleasure, and visiting zoos and aquaria had more adherents nationally (again marine plus inland) than did boating, swimming, fishing and hunting. Some reviewers of the plan take strong and I feel justified issue with the statistical base.

Be all that as it may, the scientific, aesthetic and educational facets of marine recreation generally depend on the most fragile components of the marine and coastal environment, and without quibbling over numbers are most deserving of full attention.

This leads to another aspect of marine recreation, the need for space. Sport fishermen on a party boat (in California) or a head boat (the same thing in North Carolina) may be jammed elbow to elbow, and beach-goers in urban areas put up with unbelievably crowded conditions. But many fishermen and many beach-goers will pay more or travel farther for a bit of lebensraum. It is solitude or semi-solitude that really fills their recreational need. Consequently, NOAA must recognize that low-density use is essential to certain types of marine recreation and that this must be taken into account. Further, many habitats are easily destroyed and many animals cannot or will not remain in a place subject to trampling by more than a very few passersby. Tide pools and marshland habitat are immediate candidates for protection from onrushing hordes. Low-density use is equally important here.

So far I have considered only a federal role and by omission may make marine recreation sound like another candidate for federal pre-emption. Far from it. If there is a recurrent theme in the public expressions I have heard it is to the effect that decisions should be made so far as possible at the local level, that the federal government should not involve itself in other than the establishment of broad guidelines--floors and ceilings perhaps--and in carrying out functions that have obvious interstate or international ramifications. No one wants to have a federal bureaucrat tell him how to zone his waterfront, but at the same time about everyone is willing to take federal money to help him plan his own zoning. In return, the federal establishment gets to tie some strings, how many and how strong depending on how good the negotiators are. This general philosophy carries over into the field of recreation, where it seems in everyone's interest to have decisions made at the most local level possible.

With that in mind, NOAA's plans call for it to engage only in activities that are appropriate responsibilities of the Federal Government. It encourages the cooperation and participation of other Federal agencies, the States, local governments, the academic community, the private sector and international bodies, and it definitely encourages them to assume responsibility for services and programs more appropriately theirs. At the same time, NOAA will cooperate with these other entities in developing and implementing policies and programs that are responsive to the needs of marine recreationists.

I want to turn to the question of what NOAA is doing that is of interest or concern to the marine recreationist. One of the first tasks that I undertook was to inventory just that--the NOAA programs either directly or indirectly (and sometimes unknowingly) related to marine recreation. Virtually every NOAA component is doing or plans to do something that will have at least peripheral impact on recreation.

Six of them have major projects planned or in progress that are oriented in whole or in part toward marine recreation. Not unexpectedly the programs conducted by the National Marine Fisheries Service form the largest block with migratory marine game fish research conducted pursuant to PL 86-359 making up the biggest component. Work is badly needed and is getting underway in the areas of marine sport fish statistics and the economics of recreational fisheries. Actually, a recreational impact is inherent in most of NMFS' activities, and any line drawn between those conducted for sportsmen and those conducted for commercial interests tends to be arbitrary. Despite the very real arguments between the two groups, their interests intermingle for both are concerned with the same environment and the same living resource. One man's sport fish may be the next man's livelihood.

Both the National Weather Service and the National Ocean Survey provide major services that are of particular value to marine recreationists: for example, special Weather Service forecasts and Ocean Survey charts designed for small boat operators. The Weather Service regards about two-thirds of its marine and Great Lakes program as recreation-oriented and about 20 percent of the NOS charting service is for small craft.

The Office of Coastal Environment will have a tremendous influence on the future of marine recreation as state plans for coastal zone management come in. The Office of Ecology and Environmental Conservation plays an obvious role as the central NOAA communication point in this area and as the focal point for NEPA reviews.

Finally, of those with a major role there is Sea Grant. At present, its contributions in the area of marine recreation form a small proportion of the total program. While there may often be recreational spinoff from non-recreational research, the projects with direct recreational interest are few, as are those we can identify as having peripheral or potential recreational interest. The numbers, as of September 1974 are these:

	No.	$ K
Projects concerned specifically with recreation	16	247
Projects with strong recreational interest	19	375
	35	622
Projects of peripheral or potential interest	9	297
TOTALS:	44	919

The 35 projects I define as recreational are divided among 15 institutions that fairly well blanket our coast and the Great Lakes. Over 40 percent of the federal funds are allocated to three institutions. SUNY has the largest federal grant: $110,000 in six projects. USC has the second-largest, $85,000 in two projects, while URI is third with $75,000 in three projects. Other participants have one to six projects funded at from $3,000 to $58,000.

It seems to me that with some exceptions the Sea Grant institutions are missing a bet. Marine recreation is a big field, a growing field, a field with a multitude of problems requiring both academic research and information transfer through an extension/advisory system. I'm sure that many projects I passed over in my review could easily and profitably be modified to be of interest or value to the recreation community. In fact some of them may be as they are, but you can't tell it from the write-up.

My hope, and I confess to a vested interest, is that Sea Grant will play an increasingly important role in marine recreation and that ultimately the recreational community will look to it as commercial fisheries do now.

Artisanal Fisheries Development in Chile: An Example of Social, Political and Technological Interaction

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In the past several years there has been an increasing awareness of the importance of technology transfer to the economic and social development of emerging countries. This year your Sea Grant Association, in recognition of its importance in the marine area, has devoted a session specifically to this subject. As a prelude to this discussion, the Association asked if we might share with you our experiences with a marine technology transfer experiment directed at the artisanal fishermen of Chile--and in particular, to emphasize some of the cultural, social and political problems in addition to the more classical technical problems involved in the information transfer processes in the developing countries.

Before I begin, although, I want to explain one organizational aspect of our talk which may be puzzling you. You will note that two of us will be giving the address--myself, representing the input of an American marine science institution and Ricardo Mendez, my Chilean counterpart, who represents the interests and viewpoint of the recipient nation. This is more than just coincidental. From the very beginning of our joint venture, we have subscribed to the operational philosophy that a true partnership arrangement between the transferers and the transferees must be established and maintained through *all aspects* of an international technology transfer project if it is to succeed.

In our presentation this afternoon, I will address the organizational aspects of the project and the subject of the artisanal fisheries in general. Ricardo will then follow with a discussion of the project execution, its impact and some of the unforeseen spin-offs which have occurred.

Artisanal Fishermen and Fisheries of Chile

As a way of background, I first want to give you a brief look at Chilean artisanal fishermen and fisheries, their importance to Chile and why we felt that they could benefit economically, socially and politically through the effective transfer of marine technology.

When speaking about artisanal fishermen, we are referring to that class of independent fishermen throughout the world who fish the inshore waters, lakes, and rivers, quite often from small boats or canoes, usually without the aid of mechanical power, and in much the same fashion as their forefathers. In this sense, they are classed as artisans as opposed to their industrial cousins, who fish the world's oceans with highly mechanized vessels and fishing systems.

By far the largest percentage of the world's commercial fishermen can be classed as artisans. In Chile these fishermen number almost 15,000 and represent more than 60 percent of the fishing population of the country. To facilitate their fishing activities, they have organized into about 188 syndicates and cooperatives which are distributed along the entire length of the country. Besides providing an infrastructure for fishing, these cooperatives are a way of life for thousands of fishing families, and form the backbone of numerous small coastal communities. The earnings of the artisanal fishermen directly benefit more than 100,000 people.

The artisanal fisheries, which produce some 90,000 tons of fish and shellfish annually, are very important to the food economy of Chile. Some 80 percent of the fresh fish and almost all of the shellfish consumed in Chile is produced by the artisanal fisheries. The wide geographic distribution of the cooperatives together with Chile's unique geography is responsible for fresh fish being distributed throughout much of the country.

Although industrial meal and oil fisheries account for the majority of fish landed in Chile, efficient artisanal fisheries will always have a privileged place. This stems from the fact that Chile has a long coast and abundant resources which because of their habits are best captured by dispersed small-boat fisheries. Even in Japan, which is a major industrial fishing nation, artisanal fisheries play a very important role in the fishing economy of the country.

In Chile, the demand for food fish--which is a valuable source of protein, is increasing. By 1980 the Food and Agriculture Organization of the United Nations estimates that this demand will rise some 75 percent to 245,000 tons annually. The artisanal sector of the Chilean fishing industry is in a favored position to satisfy this increasing demand for food fish, in that the present marketing and fish distribution system has formed around a dispersed, decentralized primary producer--the artisanal fishermen working collectively through cooperatives. Major alterations in the marketing system will be required if the more centralized industrial sector is to become a primary supplier of food fish. Such a radical change doesn't seem reasonable at this time in the evolution of the Chilean social structure due to high capital requirements (boats, fishery terminals, distribution facilities, ice and refrigeration plants, etc.), long time frame, Chilean geography and resource distribution, and negative social consequences.

Despite his importance to the country, the economic condition of the Chilean artisanal fisherman is not good. His average yearly salary is considerably below the minimum wage which the government considers as livable. Dependent upon resources which are distributed along the entire coast and working at some distance from major population centers, the artisans have not participated fully in the economic and social changes which have occurred in other segments of the Chilean economy.

This isolation and poor earnings capacity have had negative consequences on the health and education of the artisanal fisherman and his family.

Only a substantial increase in income will enable these deprived people to improve their social conditions and become a viable element in the Chilean economy. Technological innovation and education *within the present infrastructure* are the best mechanisms for bringing about a dramatic increase in earnings.

But changing the ways of the artisanal fisherman will not be easy. From experience we know that the fisherman, particularly the artisan, is a rugged individualist who resists change. He must be convinced in his own mind that the "new" is unequivocally better than the old, before he will change from his time-honored ways. He is also a follower who respects the judgment of the better fishermen. For these reasons, we feel that a comparative educational experience is required, which allows for direct participation by the fishermen themselves with the best fishermen or highliners becoming the disciples of change.

The character of the Chilean artisanal fisheries varies tremendously throughout the country due to differences in species availability, sea and shelf conditions and coastline exposure. In the north, gill netting for semipelagic species such as corvina, and harpooning of swordfish are important. In the central region, longlining and handlining for hake, cusk ell, and jack mackerel represent the principal fishing operations. Throughout the southern regions of the country, fisheries on sedentary shellfish species are of greater importance. Hardhat and hooka diving are the principal methods of harvesting these forms. In the Juan Fernandez Islands,of Robinson Crusoe fame, which lie some 350 miles off the coast pot fishing for spiny lobsters is the primary artisanal activity.

Vessels employed in the artisanal fisheries range in length from about 5 to 16 meters and number more than 6,000. Many are open, seaworthy boats of five to nine meters in length, which are designed to be rowed efficiently, and launched and retrieved from the beach. The basic design of these boats has changed little since they were first introduced by the Spaniards years ago. In recent years outboard motors in the 12 to 36 HP class have been used with increasing regulity for propulsion, but still only about 10 percent are outboard powered.

The other dominant class of vessel is the launch of 8 to 16 meters in length. These vessels are usually powered with small inboard motors and quite often have an enclosed cockpit. They are fished out of sheltered ports along the entire coast.

A wide range of fishing gears are employed by the artisanal fisheries with handlines, longlines, gillnets, and seines accounting for the largest share of the catch. By and large, most gears are fished by hand. Consequently, productivity (catch) per man in the artisanal fisheries is quite low, averaging about six tons per man per year.

The principal reason that productivity is low in that modern technology, with the exception of synthetic twines and motor propulsion, has not been utilized by the

artisans in their fishing operation. This absence of change and innovation is in contrast to some major technological improvements such as simple, mechanized fishing systems which are being employed with success in similar coastal fisheries in other countries. The recent Sea Grant Project of Oregon State University, which brought about a successful mechanization of the small-boat salmon troll fishery of the Oregon coast through the application of hydraulics is a case in point of the increase in productivity which can be realized through the simple mechanization of small-boat fishing systems.

The isolation of the various cooperatives together with Chile's long coastline has also prevented the active sharing of technology among the various cooperatives. It is interesting to note that much of the technology applied to powering and handling fishing craft in exposed ports has been borrowed from the dominant shoreside industry. For example, in the north where mining is the dominant industry, we find the artisanals using tracks and modified mining carts to transport their vessels to and from storage areas. By contrast, in the south where agriculture and logging are dominant, tractors and oxen are employed.

In light of the situation existing in the Chilean artisanal fisheries, it appeared to us that mechanization of fishing systems could substantially increase the productivity of these fisheries. Many of the craft are already equipped with propulsion motors with which to power the systems, and their number is being steadily increased. The traditional artisanal fishing systems are amenable to mechanization, and in fact, have been mechanized in many industrial-type fisheries. With the availability of an efficient and reliable source of power from the primary oropulsion unit, the applicability of other harvesting methods new to the artisanal fisheries become more feasible.

Simple mechanization of the artisanal fisheries is consistent with the level of technological skills existing in Chile. In this regard, Chile is at an advantage over other less developed emerging nations. Well equipped and professionally staffed machine shops can be found throughout the country, so that fabrication and repair of mechanized fishing systems can be readily facilitated.

Program Development and Structure

I would now like to say a few words about the project itself, and in particular, the kind of relationship between the counterpart participants which we found to be necessary to insure success. The project was conceived jointly by myself and Ricardo, while I was a visiting Professor at the Catholic University of Valparaiso. It is quite apparent to us that nothing meaningful could have been put together had the planning been done by mail; or even worse if I had dreamed up the project here in Seattle, and then transported the effort directly to Chile. This is an important consideration because too often in the past, well-meaning efforts of this type have failed, because the projects themselves were not conceived within the realities of the host country.

Before we discuss the project itself, it is important that you appreciate the political conditions which existed in Chile during the conceptual stages of this project, and how these affected its development. The time was late 1971, and the Allende government had been in power for almost a year. Chile was rapidly changing to a socialist state with the government exercising increasing controls

over all segments of the Chilean society. At the same time relationships with the United States, and in particular, government institutions and multinational corporations, were deteriorating. The Allende government had pledged to improve the plight of the lower classes through "a democratic road to socialism".The artisanal fishermen, though, represented an enigma in this regard in that they were organized into a de-centralized, market-oriented cooperative system. In order to gain control of this system, the government planned to organize the artisanal fisheries into a semi-industrial type of enterprise with a greater degree of centralized state control. This move was resisted by many of the artisans, in that it would have meant the loss of their independence, self-determination and present way of life. Also, the development of such a system would have increased the "class structure" already existing among the artisans by creating a more advantageous situation for those who could participate in the operation of the new semi-industrial type of boats planned.

Our approach to elevating the income level of the artisanal fishermen contrasted sharply with that of the government. We proposed to initiate an applied educational program to focus on the economic gains that the artisanal fishermen can realize through technological innovation and change *within their existing infrastructure*. Our primary aim was to demonstrate to INDAP, the government agency responsible for technological assistance to the artisanal fishermen, that simple, hydraulic-powered fishing systems were applicable to the existing conditions of their fisheries, since the systems envisioned did not represent new ideas but merely the transference and adaptation of existing technology which had proven successful in similar artisanal fisheries in other more developed countries.

Although our approach to technological development differed from that of the government, it was accepted in principle, because they saw it as a complimentary steo towards their goal of organizing the artisanal fishermen into semi-industrial enterprizes.

As might be expected, one of the largest hurdles we encountered was funding. Our need for hard currency in order to acquire certain equipment and system components made it necessary for us to seek outside financial assistance. Several International granting agencies, such as AID and the Interamerican Development Bank, were approached without success. It wasn't until we made contact with the Interamerican Foundation, that we were successful in acquiring the necessary funds to develop the program. Interamerican Foundation interest in our proposal was based primarily on the social spin-off, which would be realized by improving the economic conditions of this stagnated and neglected social class. Also, although the program was specifically aimed at the Chilean artisanal fishermen, they were interested in its high potential for replication throughout Latin America, and in other parts of the world where the small boat, inshore fishermen is economically deprived due to technological stagnation.

Although the problems encountered have been numerous and diverse, those which have required most attention have been of a non-technical nature. The idiosyncracisies and attitudes of the people involved required special considerations. The "machismo" attitude is a good case-in-point. "Machismo" is still very strong and deep among the artisanal fishermen. In fact, they are uncomfortable with the idea that mechanical devices might replace their muscle power. Thus,

we had to take special pains to insure that this attitude was accommodated during the project. This point is probably uncomfortable to some of you "women libbers" in the audience, but it is a fact of life which had to be taken into account if the project was to succeed.

Institutional bureaucracy on an international scale with resulting time delays is another factor deserving of special attention. In our case different standards of legal and monetary propriety between the granting agency in the U.S. and the recipient institution were particularly frustrating and time consuming.

Program Execution

The execution phase of the project, which was initiated in early 1973, is still in progress. A Chilean scientist from our school was sent to the U.S. under AID auspices to receive instruction in hydraulics and small-boat mechanization. Captain Barry Fisher, of the OSU Sea Grant Program, was very helpful in this regard.

In order to assure project success, it was important that the artisanal fisherman become directly involved and participate in the different phases of the project. Also, it was necessary to evaluate the various fisheries in situ due to the great variety of boats, gear and fishing methods used throughout the country.

These elements had two objectives in common:

1. Learn from the direct experience and knowledge of the fishermen themselves and evaluate their feelings and their aspirations regarding mechanization, and
2. "Spread the Gospel" about the advantages and conveniences of mechanizing their fishing operations, emphasizing the fact that hydraulic mechanization was a feasible alternative in small-boat fisheries.

This learning process and the involvement of the fishermen turned out to be highly rewarding later on, when we had to adapt and transform systems to suit the artisanal fishermen's particular needs.

After our evaluation of the artisanal fisheries, we concluded that those systems which were common to most regions of Chile should be mechanized first. Thus, longlining, purse seining, gillnetting and trap fishing became our primary concern. Secondarily, we elected to mechanize the limited line trolling fishery with the idea of extending it to new species. Due to the enormous variability found in boats and engines, we had to be particularly careful to incorporate sufficient design flexibility into the various mechanized systems, so that they would meet the needs of most situations.

We soon learned that the trolling system, as used in the Pacific Northwest salmon fishery, was not applicable to Chilean artisans; they found it too complex, expensive and unproductive when compared to their own system. It is obvious that a great deal of modification is going to be necessary before that system can be adopted by the artisanal fisherman.

During the initial steps of the project, we had another unsuccessful experience with technology transfer. This involved our attempts to introduce the Pacific City dory as a new prototype artisanal fishing craft. On paper this dory, which is highly successful here in the Pacific Northwest, appeared to have certain advantageous characteristics such as higher loading capability, speed and stability, that would have made it suitable for the artisanal fisherman.

As soon as the dory was built, it was transported to Valparaiso where it was immediately rejected by the artisanal fishermen "on sight". They felt that its large size would make it too awkward to launch and retrieve from their steep beaches, and its design left some doubt as to its seaworthiness. Several months of fishing trials substantiated their initial misgivings. Before any modifications could be made incorporating their ideas, the dory sunk during the first winter storm, further demonstrating the lack of suitable port infra-structure for vessels of this type.

These particular examples illustrate several important points:

1. Foreign technology must be adapted rather than applying it directly without modification to existing local conditions.
2. The technology transference process is received better when it involves a gradual progression of reasonable and understandable steps.
3. When involved in the improvement of indigenous technology, it is strongly recommended that efforts be focused on known systems rather than on the introduction of totally foreign technology.
4. It is absolutely necessary to maintain a great degree of flexibility during the planning and implementation phase. For example in our case, although the trolling system failed as originally conceived, we were able to successfully modify the hydraulic gurdies to mechanize a fishing system for vertical longlines.

Those programmatic aspects associated with mechanizing existing fishing systems to increase productivity and reduce manual labor have been well accepted by the artisans. The mechanized longlining and seining operations have worked extremely well. We expect similar successes with present attempts to mechanize gillnetting and pot hauling operations.

Project Spin-offs

Since the initiation of the project, several additional institutions have become involved which has turned out to be highly satisfactory and beneficial for several reasons:

1. Association with other institutions has allowed for "pooling" of facilities and resources which otherwise would not be available.
2. A multiplier effect is realized which increases the geographical scope of the project and facilitates the transference of "know-how" to the target audience.
3. The infra-structure for supporting activities such as training and education are implemented parallel with the increase in mechanization.

An additional spin-off from this project has been the implementation of other

programs designed to insure that the productivity gains in the artisanal fisheries are fully beneficial to the fisherman and the Chilean consumer. For example, production increases in the artisanal fisheries will not be totally effective unless we upgrade the quality of the products, and improve the distribution and marketing channels to make products readily available to the majority of the population.

Further indirect benefits from this project can be appreciated through the response of the various elements within the fishing community.

What can we say summarizing their responses:

1. The Fisherman: We saw that his participation and observation of the applicability of hydraulic mechanization to small artisanal craft brought about a "change of attitude" in his conservative nature, enabling him to accept future changes more easily.
2. Industrialists: Technology transfer brings about interest for new vestment, either in the manufacture of certain system components, or in the commercialization of this particular line of equipment.
3. Fisheries professionals: These individuals obtained an awareness of the artisanal fisheries development problem together with practical solutions to it. Also, they are now better able to educate others in the technology transfer process.
4. Government: The governmental agencies obtained scientific data necessary for allocating priorities and establishing national policies towards development of different areas of the fishing sector.
5. Education: Fishery schools have implemented study programs, incorporating new courses related to hydraulics and mechanization.

Finally, I would like to bring to your attention another aspect which I feel is important when establishing technological sharing arrangements. From our experience, it is quite apparent that the institutional stability and apolitical posture are of major importance. Despite the fact that during the past two years, Chile experienced drastic changes in economic, social and political conditions, our project has been reasonably successful. The same cannot be said for certain technological transfer projects which involved other countries and some Chilean governmental institutions which were immediately terminated with the political change that occurred in September of last year.

Conference Overview

Joel W. Hedgpeth

Professor of Oceanography

I was asked to come here and although I'm not sure whether I was asked to size up Sea Grant or this particular conference or both, I noticed in the public press that you have lots of work left to do. The Governor has asked that the Washington fishery be declared a disaster area--an interesting concept. And in another paper there was a bit about fishing folks out in Tallahassee who are getting a little desperate and can't afford to go catch fish anymore. The article does refer to that little sign which I think a lot of you have seen: "Eat Fish, Live Longer; Eat Oysters, Love Longer."

It reminds me of a meeting, held in Singapore a few years ago, by those concerned with endangered mammals. Some distinguished British establishment type got up and said, "Of course the rhinoceros must be strictly protected. All this nonsense about the aphrodisiac nature of the rhinoceros horn is bunk." And he railed on in this way for some minutes. The following day at the plenary session he got up, looking rather jaded, and said, "I would like to retract all that I said about rhinoceros horns." There are many versions of just what must have gone on between those two speeches!

Years ago, about 1945-47, I was in Texas--that other part of the world--and I was doing part of my war service (being too decrepit to be taken out and shot at) by helping our hungry folk eat more oysters. Believe it or not, I was engaged in an oyster raising project, and I refuse to comment on the therapeutic value of oysters on the grounds that it may incriminate me. Nevertheless, we had something called a committee on marine resources. We met every month, and we had fish lunches. Well, it's interesting to note the progress report for this last year from Texas A & M. It's full of all kinds of job categories to do with the sea, and it seemed to be mostly manned with folks that were war babies at the time we were holding these meetings. So maybe there's something to that little sign. There are a lot more of us, and so a need for all these jobs, and I'm glad to see they're finding them.

At any rate, the outgrowth of this committee was that some of the people who regularly went there formed the nucleus of Project IX, which is one of the things that set the state of Texas off in the big-time consulting and research foundation business. In some ways I think it had something to do with the beginning of

oceanography as a formally recognized discipline in Texas, at least at A & M. But I was connected with that other place that somebody referred to rather disdainfully. At any rate, I have been concerned for some time and now I see some concern that some of these people had better not forget about the sea but emphasize the coastal problems, or at least start a whole new phase of activity.

Well, having listened to a great deal of this, I've decided that this is more of a socio-economic approach than scientific. I don't think that's any surprise to you.

The ventilation in this building isn't too good, and I have become conscious of a rather heavy smell of roses permeating this mutual admiration society. So I've put most of my notes on rose-colored paper to keep in the mood. Speaking of that, this pad cost me 49¢, and looking at the great stack of soft paper I realize there's one thing that we've all got to solve, and that's how to say more on less paper. I think maybe that's what Congressman Pritchard was trying to tell us.

But this morning at the international session, there were some suggestions that we must go forth like missionaries and convert the heathens to unsuitable ways of life, perhaps. At least I thought there was some lack of balance there. We were going to send our technicians out to help them catch the fish whether they could eat those particular fish or not. They just might have religious or other scruples about them, you know.

It reminds me that some years ago I was a member of a meeting at Airly House in Virginia, a meeting between the conservation foundation and Barry Commoner's obstreperous organization. That time Russ Train ran the conservation foundation, and these two prima donnas locked horns. As a result, it was nearly five years before the proceedings got published. They're published in a very large book called A Careless Technology.

I think everybody here ought to take a look at the implications of sending out unbalanced teams to foreign lands and had better get in touch with the local gurus and historical experts and everyone else before they just go in and try to convert everybody to fish where they might be susceptible to worms.

Perhaps we don't have to worry about international problems. Yesterday morning's paper said Dixy Lee Ray is getting back in the swim. She's going to be taking over part of the State Department for oceans and scientific research. It doesn't sound like there's much left for anyone else to do here. It may be that Dixy can hack it. She surprised all of us the way she handled the Atomic Energy Commission. So good luck to her. But you fellows better watch out. They're planning to go abroad when the domestic funds get a little leaner. One of the things I suspect about the motivation of these organizations is a very acute sense of smell. Of course Dr. Abel pretty well uncorked that bottle. He'll let you know that money is going to get a bit scarcer, to say the least.

A number of words have been said about the title of this conference: Action Catalyst. Catalyst is supposed to be something that doesn't do anything. Just because it's there things happen. Now I know that you folks have been doing a lot of things; you're not inert. But then in the broader sense of the word I guess it's as good a word as you can think of.

Well, I'd like to say something else about the structure of the conference, though. This refers to all meetings I have attended. I didn't keep statistics; I don't believe in those things. But I have the feeling that most papers were from prepared texts. I think it should be a rule at all meetings that require advance papers to have a sergeant-at-arms go through everybody's briefcase and pull them out. I think this has something to do with communication. Congressman Pritchard, the most quoted man at the meeting who hasn't been here since he spoke, said that we weren't communicating with him. That may be one reason. It does put me to sleep to have people read and drone away with their notes in their texts. I hope that nobody who would do that is personally affronted, because I fastidiously avoided putting any names down, so be of good cheer. One might excuse people from other countries who read in English as a foreign language; however, I believe I heard one gentleman whose language was not English doing remarkably well without a piece of paper in his hand.

Well, I would like to share a few reminiscences with you. I was here in Seattle I think when Sea Grant was conceived. In 1962 I was a member of a site committee for the National Science Foundation, and we went out to Friday Harbor. Dixy happened to be one of the principal investigators who was telling us all how wonderful Friday Harbor was. (Of course, we knew that.)

At any rate, some of the remarks made during the site visit led to an interesting conversation in President Charles Odegaard's office. Athelstan Spilhaus said to Odegaard, "Charles, you've got a whole college of fisheries here, and they're not interested in fish." He went on to discuss the land grant analogy of improving agriculture and how perhaps ways should be found to improve our use of the sea and our yield from it in a similar manner. As you know, it wasn't very long after that before the Sea Grant idea got rolling. Of course everybody agrees Spilhaus was the founding angel of it.

Some of us, being academic idealists, have perhaps thought that a slightly different day would dawn. We had haped to see a bit more hard-core basic training. I attended the education workshop, and this, I thought, had just a little too much preoccupation with this veneer of technology. I have been personally annoyed about this business of technical training ever since I was told I could not be appointed in the Fish and Game Department back in God knows when, 1938 or so, because I hadn't had a course in fisheries (and there was no such course in the University of California system, which meant that only Stanford graduates were eligible in the state of California).

Fate dealt me a rather strange blow some years afterwards. I became a teaching assistant to a professor who freely and willingly confessed that all he knew about ichthyology was a few trout. Then he got up one day and lectured about the gill rakers of whales. That was when the auditing graduate students walked out and said to the teaching assistants, "So long fellows." So I had to sit down and write the syllabus for that course, and I'd never had ichthyology. But I always felt that good sound basic training would provide you with skill and what you need for unanticipated situations. Of course, if I had taken a course in ichthyology I guess I would have been better prepared. But I remember submitting this syllabus and being asked, "Who write this?" Well, I had to confess up.

Now, another gentleman who was thoroughly convinced that sound basic training was better than some other things was the late "Wib" Chapman. I miss him. He should be up here. Confound it, he was a gentleman who would have you all flattened out by now. I have some confidential papers in my files; in one he's railing at a certain fish and wildlife department who at that time did not require mathematics of its graduates in fisheries. I'll quote this paragraph:

> I feel so strongly about this, that if this frailty in the curriculum is not to be mended, I would recommend withdrawing all or most Sea Grant educational support from this department. There is no use turning out scientists who are crippled by not having the basic tools of the trade.

I think many of you also remember that Wib had a not too lively view of aquaculture. For one thing, he felt that all the scientific problems have really been solved. It was simply a matter of flippery or hatchery or whatever you want to call it. Wib thought that the conservation agency, like fish and game departments, ought to be in that business, as indeed they are. But there are many thorny problems, and a lot of them, I think, demand more attention than the fish and game departments can give them. Sooner or later we are going to get to the problem of eating oysters raised on sewage--it is done in some countries already and highly recommended. What the therapeutic value of those particular oysters will be I have no way of saying. But I would say, having eaten out around this town, that it does seem to me that aquaculture has already succeeded in Seattle. I don't see how that fish could have cost so much unless they'd raised them by hand.

Another thing that I felt about the educational panel--it wasn't their fault, but it's one of my pet King Charles' heads--is the shocking misunderstanding and misuse of ecological theory by many people including consultants, public hearing officers, and all else. The poor public hearing officers are stuck, but I think that every training course sponsored by anybody, including Sea Grant, ought to encourage people, instructors, to go rather thoroughly into some of this basic ecological matter at the beginning of the course and not wait until everybody has had everything and then have them left. I think that most people fail to realize that some of these ideas of stability and diversity indexes are ecology's glass bead game. I don't know how many of you have read the novel by Hermann Hesse Das Perlenspiel, but you should remember the man who became the greatest master of that game died prematurely in a very icy lake. There might be something to think about in that.

By the way, somebody said their responses to questionnaries were falling off. I don't know how many of you people have been guilty of sending out questionnaires. I have received an awful lot of questionnaires in my time, so I should have told him that his questionnaire was not the only litter on the beach but it's also a very poor way to get information. Though one time I saw a questionnaire that was so overstructured that each category, and each group of categories, ended with "other" at the end of which you could fill in. Then there was a summary category of categories, and it ended in"other", too. Therefore you had other others to think about.

Another thing I've heard around here is numerous comments in the elevators and lobbies and backrooms that something is going on here. (This is really not my affair, it's your association.) That there are serious deeds afoot at the crossroads around here or that there is some cabal out to abolish the whole thing. I really don't think you ought to do that. Every group of people needs their own mutual admiration society. I just think that perhaps you've said enough to each other on how good you are and now it's time to prove it, isn't it? But whatever the future of this organization is, I'm very pleased that you made that award to John Knauss the other night. Let's see, what is he called? Mr. Sea Grant of the Year, or Person Sea Grant of the Year?

By the way, did you know that in the state of California they have an initiative to go back and change every sexual reference, I mean every reference to "man" or "woman" in the state constitution to "person". This is dangerous meddling with the language. After all, I don't know what the chromosome count is on "person". Who has the extra Y in this case? Another person I miss is H.L. Mencken.

But let's get back to Johnny Knauss. I've known him, I realize, half his life--for twenty-five years. He first appeared in my viewing screen, should I say, at Scripps, when he must have just escaped from a fraternity somewhere. He was writing a skit for the annual party. Somehow I got cast as the bad man from Washington who was going to lift the mortgage on Scripps because they hadn't gotten in their ONR report. I have a rather dim memory of the other things, except the chief character was somebody who'd learn to yelp like a seal and yelps came in periodically.

Well, I survived that, but I do have a certain bone to pick with John, because one of his stunts somehow got implicated in importing a large object which I think came from an American Legion party or something--a Miss Mojave. It was a "pin-the-tail-on-the-donkey" kind of thing, but it wasn't tails we were pinning on the lady. They came in pairs. This monstrous object was stored away in the library stacks, and we all went in there and laughed at it. The librarian who was a rather dull fellow didn't know what was going on, but it finally occured to him that he ought to look in the stacks. Unfortunately, he reached the conclusion somehow that I'd been responsible for this, and afterwards I got rather lousy library service from that guy.

But in a more serious vein I must say that I'm glad to see John got the award. I helped him a bit by making it possible for him to try to teach oceanography. He did that a lot better than he did putting a Heathkit together that summer, as I recall. Some of us old professors don't have sense to see that we have somehow done some good in the world--at least somebody's come out a lot better than I expected him to. Of course, as you might know, I'm not sure I quite share his euphoric view of the future of ocean research. That's his privilege. I do know that we need a lot more, but everybody says that. That's like preaching God and motherhood, of course. I think we need also more imagination.

A little episode occurs to me. I think there's some difficulty supporting certain activities that don't really have too much to do with improving fish catching. I think one of them specifically was the study of sea urchins, and so this was

sort of hidden in the woodwork for a while. I think it's still hidden in the woodwork. The person doing it has now gone to Mexico to study sea urchins for his sabbatical. But all of a sudden within 2-1/2 years, we have an increase in the sea urchin fishery from 200 pounds to 3 million in California alone. It's all going to Japan. The moral of that is I hope you fellows will read something besides the soft papers so you'll be aware of things like this, and if possible, get ready for them and not suddenly wake up to "now what do we do?" The fish and game commission unfortunately had no idea and no control over this, no regulations or anything. It just exploded like a nova. What's going to explode like a nova next by increasing population's demand on the sea? If everybody develops a taste for palola worms and other polychetes the way the people in Samoa do, that might create quite a trend in the economy of the sea. There's this great problem of can we take what the whales used to eat or will that upset the system completely? Well, that's a pertinent question. So anyway, university research is essential. And you need a great deal more of it because pretty soon I have a feeling you're going to have talked out all this backlog of research, and you've got to have some more to talk about. You're the communicators, but you can't communicate just air.

I was a little puzzled, though, when Congressman Pritchard (that gentleman again) said that the people haven't told him what you're doing. And he's way up there and clear down through the hall and clear over to the back building on the other side there's this monstrous pile of soft paper--dozens and bushels of reports. Some of them are pretty good, actually. There's some good solid material there, though it's rather hard to find it. And so I think that what he really wanted to tell you was try to put things in one word and on one page. Bill Wick said he had a nice little report here, but it was stolen off that table. It happened, I think, to be the shortest report there. Maybe that was the idea. The basis of any of the sciences is communication, but it isn't anything unless you communicate it. This great story about whether a sound is made when the tree falls in the middle of Siberia and there's no one to hear it is one of those academic conumdrums. If you don't communicate what you do, why, it doesn't exist either, I guess. But I think the persons you really have to convince that you're doing things are the Congressmen, not me. I'm pretty sure you are. I've been encouraged by some of the things I've seen and heard. I just feel, though, that perhaps a little more open situation, a little less formality may get you a little further on in your business. I don't want to wish the University of Washington any ill, but I don't think they need part of the income generated from this meeting (you know they own this joint and the land it is on) as badly as you people need a more flexible situation and a less artificially structured conference.

So with those cheerful words, I think I will dash for the airport before this really sinks in.

National Sea Grant Award—1974

Presentation

William S. Gaither

President, Sea Grant Association

This year's Sea Grant Award recipient is a physical oceanographer, whose specialty is ocean currents and countercurrents. He continues to participate in basic scientific research on ocean circulation, and slips off to sea when he can to keep his hand in.

But honoring Dr. John Atkinson Knauss today with the Sea Grant Award recognizes his deep involvement in other marine currents besides watery ones. First, and most important from our point of view, there are the Sea Grant currents. Dr. Knauss, with Athelstan Spilhaus, Senator Claiborne Pell, and others, promoted the Sea Grant Act at the first Sea Grant Conference in 1965, and supported Senator Pell and Florida's Congressman Rogers in getting rapid legislative action on the bill. Dr. Knauss was the first Sea Grant Program administrator at the University of Rhode Island, which became one of the first Sea Grant colleges. Dr. Knauss proposed and propelled to fruition the concept of the Association of Sea Grant Program Institutions. He served for two years as the Association's first president, and has continued to host the Association's secretariat and treasury in Rhode Island.

Then there are the academic currents, for Dr. Knauss, as Dean of the University of Rhode Island's Graduate School of Oceanography and Provost for Marine Affairs, leads a diverse and exciting operation.

Dr. Knauss continues to play a major role in the currents of marine affairs, both nationally and internationally. He was a member of the Stratton Commission, appointed by the Johnson Administration to make recommendations for broad-based national ocean policy. Concerned primarily with environmental monitoring and with management and development of the coastal zone, Dr. Knauss steered recommendations which led to the introduction and passage of 1972's Coastal Zone Management Act. Working to ensure freedom of the seas for scientists, Dr. Knauss was one of the United States representatives on the United Nations research set up the Caracas Conference on the Law of the Sea. This past summer he served as the State Department's scientific advisor to the Caracas sessions.

Finally, Dr. Knauss believes in the necessary confluence of scientific, social, and political currents for the future of the oceans. His contributions to marine affairs have been based in large part on a conviction that ocean scientists, social scientists, and legal experts must work together, in the multidisciplinary team approach characteristic, for example, of so many Sea Grant projects, in the search for solutions to marine problems and for man's better use of the seas.

Response

John A. Knauss

University of Rhode Island

First, I want to tell you how delighted and pleased I am to receive the 1974 National Sea Grant Award. My fiftieth birthday comes this next year, and although it is an age where one can still look forward to many things ahead, I also find it a time of taking stock of where I have been. High on my list of achievements are the few contributions I have made in getting the Sea Grant program underway and starting this Association. For this reason it is particularly satisfactory to be honored by the Sea Grant Association.

We have heard a fair amount of gloomy talk today about the outlook for the near future. I would like to share with you some thoughts from the other side, because in my view the future of applied marine research is very bright; barring a catastrophic economic situation, ocean research is going to grow, and hopefully Sea Grant will grow with it.

I started in oceanography in 1947. At that time the only significant support for oceanography came from the military. Twelve years later came the 1959 NASCO Report (National Academy of Sciences, Committee on Oceanography) which most observers credit as the start of the major growth of oceanography. However, a careful reading of the NASCO Report shows that it is one of great expectations. In 1959 the major reason for support continued to be the military, although the way of the future could be seen in a growing offshore oil industry and the fact that some of the fishery problems were becoming stickier.

The Sea Grant idea came during this period of growth. I leave to some historian of science to trace the origin back to a letter from one colleague to another, a speech at a national meeting, or a discussion in a dark Florida bar. What I am sure of is that it was exactly nine years ago today (actually today and yesterday, since it was October 28 and 29, 1965) that we held the first Sea Grant Conference in Newport, Rhode Island. More than 200 attended that first conference

including several here tonight. It was an opportunity to bring Althelstan Spilhaus along with the late Wib Chapman and Benny Schaffer together with Senator Claiborne Pell. There was an excitement about that conference, which I at least still found in rereading the proceedings this past week. It was an excitement based on a good idea and a sense that we might succeed.

Progress after the 1965 Conference was almost breathtaking. The Pell-Rogers bill was passed the following year and when we called the second Sea Grant Conference three years after the first, it was 33 projects and five million dollars later. The discussion at the 1968 Conference was more on how to execute than to plan. I wrote in the summary of the proceedings, "Throughout the conference ran a consistent theme, how can we define and devise a sea grant program that will meet the challenge of the future, but not become so diverse and fragmented that it will be indistinguishable from other programs supporting marine science."

One must also recognize that the birth of Sea Grant came at an ideal time. The 1965-68 era was a time for ocean enthusiasts. Small oceanographic firms were amongst the darlings of the go-go stock funds. We thought we could feed the world on fish protein concentrate in one pound bags, and every marine laboratory, including my own, thought it was only a matter of time before we each had our own manned underwater habitat and research submarine. Many of the programs and ideas of this era have failed to prosper and with good reason. Sea Grant has not only survived but grown. It was a good idea and attracted competent people including those like Bob Abel and Art Alexiou who have administered Sea Grant in Washington.

I suppose each of us has our own special list of Sea Grant achievements. In my view the most important accomplishment of Sea Grant to date has been its work in the coastal zone where it has brought together a multidisciplinary approach to coastal zone problems calling on engineering and the natural and social science disciplines and combining it with an effective marine advisory service. I also admit to a bit of bias in this view since I believe the coastal zone problems are some of the most important facing us, and because I have worked hard to establish interest and legislation in this area. As noted in the introduction, I was a member of the Stratton Commission (the Commission on Marine Science Engineering and Resources) and was chairman of the panel that brought in the recommendations on coastal zone management, a recommendation that led to the 1972 Coastal Zone Management Act.

In the summary of the 1968 Sea Grant Conference I wrote, "I personally have come to believe that the problems of managing our coastal areas are so many and complex that there is need for a laboratory or laboratories affiliated with academic institutions in every one of the 30 coastal and Great Lakes states. These laboratories exist in most states, but in only a few does one find the breadth of interest necessary to mount a comprehensive attack on the problems of their area. I believe it is here that sea grant can make one of its most important and lasting contributions." Those of you familiar with the Stratton Commission report may find a certain similarity in this statement and one of our coastal zone recommendations. I still believe in what I wrote in 1968. I would only note that today I think most, if not all, states have universities with the requisite capabilities to develop coastal zone laboratories. I hope that somehow the NOAA Sea Grant and Coastal Zone offices can get together on joint ventures so that the full potential of the Sea Grant program in this area can be utilized.

Turning now from the past and present to the present and future, I think it is obvious that Sea Grant along with most other marine programs have been on something of a financial plateau in recent years. In my opinion, interest in marine problems is going to grow rapidly in the near future, and over the time scale of 10-20 years I think we are going to see major new developments in support of Sea Grant-like activities, a view shared by many of my colleagues outside the federal establishment. That some in Washington are not saying the same thing is due at least in part, in my opinion, to the fact that those in Washington spend much of their time in what can only be described as crisis management, and they seldom have the opportunity to draw a deep breath and examine long-term trends. My own perspective comes from recent involvement in law of the sea negotiations. It is difficult to observe the discussions revolving about these proceedings without concluding, first, that ocean activities are now, and will continue, to increase dramatically in the future, and, second, that there are rising expectations of the developing nations concerning their share in the use and development of the ocean and its resources. With this increase in ocean activities will come many problems and opportunities for Sea Grant-like activities. Let me, in the next few minutes, list a few.

Within two years we will have a 200 mile economic zone, either as agreed to by international treaty or by unilateral action if the law of the sea conference fails to reach agreement. For the first time each coastal nation will have an opportunity to exercise management jurisdiction over its coastal fisheries resources. I agree with those of my colleagues who argue that the major problems facing coastal fisheries today are so-called institutional problems related to the common property nature of the resource, but I am also of the opinion that these problems can be solved. Whether they are or not, however, it is only a matter of time before all coastal fisheries will be fished at the level of maximum sustainable yeild and the more I learn about fisheries dynamics, the more I dispair of successfully managing fisheries. I understand that wildlife managers still use a statistical counting process to determine the number of deer that can be killed each year without depleting the stock. We know much less about the ecological relationships of Georges Banks than we do about those in a Maine woods, but we do know that many commercial species undergo large natural fluctuations. I think we can also assume that the political clout of a highly capitalized fishing fleet in search of economically important fish is greater than that of the deer and other wildlife hunters of this world. The role of future fisheries' managers is not for the faint of heart or the thin-skinned, and if we do not increase our knowledge of fisheries dynamics in the next few years a difficult job is going to be made even more difficult.

We have all seen the problems of multiple use along the shoreline and we are beginning to see similar pressures develop offshore. The combined problems of floating nuclear power plants, deep water ports and offshore oil exploitation being discussed for the Delaware-New Jersey offshore may be more development than many areas will experience immediately, but this is the future, and with these developments come a number of technical and social problems.

I could spend many minutes talking about the problems related to deep sea dumping and marine pollution, but let me note only one--the problem of nuclear waste. Many assume that in a nuclear economy the U.S. can find a non-marine solution for its nuclear wastes. Whether we can or not, I doubt that such countries as the Netherlands, Belgium, or Singapore believe they can find a land solution.

In fact, I am of the opinion that most countries in Western Europe cannot.

The first attempt at commercial mining of manganese nodules will begin in a very few years with or without a law of the sea convention. How fast it grows will depend upon its initial success, but some believe it will grow rapidly.

There is increasing talk of extracting energy directly from the ocean. Those who have made the calculations believe that tides and currents can contribute relatively little but that the ocean could be a large source of energy using either surface waves or driving a low efficiency heat engine based on the temperature difference of warm tropical surface water and cold deep water. The British have started research on the former and we on the latter.

Nor should one overlook the possibliity of using the ocean to collect solar energy directly. Using a presently realized efficiency of 10% for converting solar power to electricity, the *entire* power requirements of the U.S. could be met by covering the surface of Florida with solar collectors. Although such a solution might appeal to a number of non-Floridians, it is likely that wiser heads will prevail. Floating such solar collectors offshore, however, may be a solution for the future.

We have recently seen the economic repercussions associated with a few bad grain harvests and two bad years for the anchoveta fishery. As we increase the stresses on our planet by a growing population and growing requirements for food and resources we can expect increasingly to see economic dislocations resulting from perturbations in our yearly weather patterns. Most scientists believe that the year-to-year variation in climate is controlled by the oceans as distinguished from the day-to-day variations in weather in which the ocean role is essentially passive.

Finally, let me mention a problem which I think should rank near the top of everyone's list--what to do about the growing income gap between the developed and much of the developing world. It is a complex, many-faceted problem and those who work in Sea Grant can contribute only marginally. But it is clear from developments at the law of the sea conference that many developing countries expect to use the resources of their economic zones to help solve local food and foreign exchange problems, and they expect to participate in the development of the resources of the deep sea--the common heritage of mankind. How we can contribute meaningfully in this area is less clear, but I believe we should consider all options very carefully, because I am convinced that finding a solution, assuming one exists, is one of the most important problems facing us today.

These, then, are some of the reasons why I, and many of my colleagues, believe that applied and basic research in the oceans will grow, and grow rapidly. We have come a long way since 1947 when the only economic justification for most oceanographers was the Navy. I hope it is obvious to this audience that all of the areas mentioned could and should be of interest to Sea Grant and to NOAA and I think one should consider encouraging Sea Grant to move into all of them.

A very strong case can be made for the proposition that the U.S. leadership role in oceanography is based on the development of strong research and teaching centers in a number of universities. This growth has been possible because of the

enlightened role of first ONR and now NSF in providing long-term continuing support in a defacto partnership with the universities. In the relatively short time of Sea Grant's existence the academic community has demonstrated that it is quite capable of expanding its marine expertise in a number of ways. The Stratton Commission recommended that NOAA should provide the leadership role in non-military development of the ocean. It was also the suggestion of the Stratton Commission that NOAA provide, through Sea Grant or otherwise, a balanced program of continuing university support in these areas. Except for a very limited growth of the Sea Grant program this has not occurred. In my view, if Sea Grant and/or NOAA does not develop this role some other federal agency will since it has been my experience that where there is a need, there is always at least one agency prepared to fulfill the function.

I am firmly convinced that Sea Grant has done magnificently in the nine years since the first conference in 1965, but I also think it is time to take stock and perhaps set our sights higher. But whether Sea Grant does or not, it has been a good program and it continues to be a good program. I am proud of my role in helping in its development and I am particularly proud of being the recipient of this award.

Sea Grant's Framework for Local and State Action

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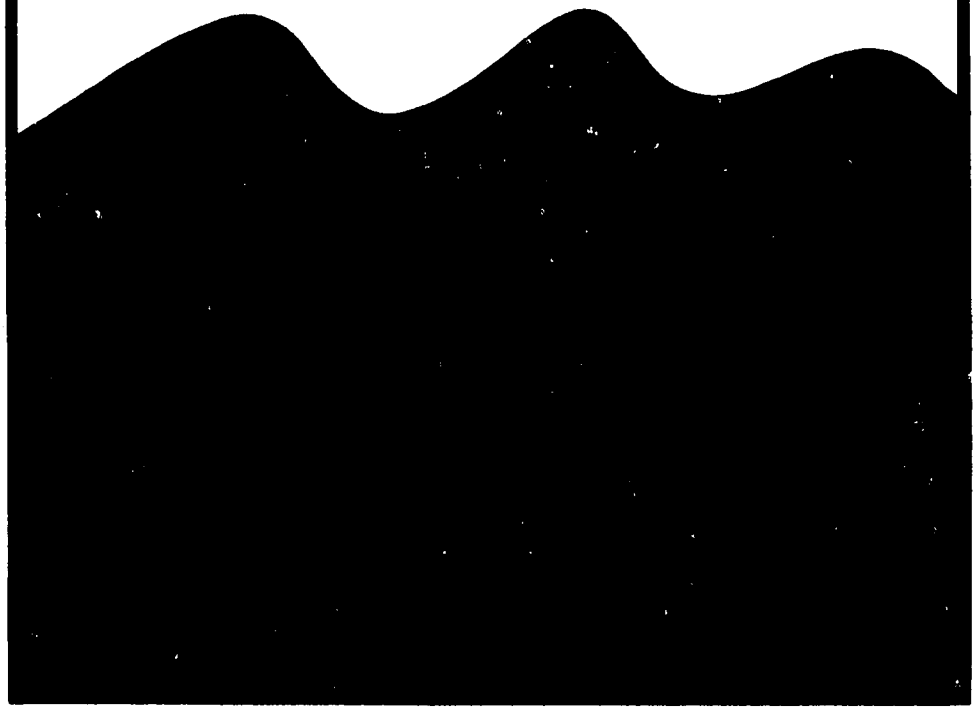

Using Marine Advisory Services To Stimulate Two-Way Action

Walter J. Gray
University of Rhode Island

A fisherman of Galilee, Rhode Island, quoted in one of our recent publications in the URI Sea Grant Program, indicates tne feeling he derives from his occupation in comparison to other types of work in these words: "It's more of a challenge, like a game of chance. No humdrum existence like shop or office. Like a good poker game--you're always looking for that big trip."

Those of us who are responsible for Sea Grant marine advisory services share a kinship of sorts with that fisherman because, like him, we also live in anticipation of a big trip. In our case, it's being on the lookout for situations where knowledge can be generated by Sea Grant and applied to expressed needs, resulting in increased profits, savings, job opportunities, measurable efficiencies or other benefits to the marine sector.

Using marine advisory services as the link to stimulate two-way action between the Sea Grant university and the marine community quite obviously assumes that Sea Grant projects do not or should not be developed in an academic or administrative vacuum. Admittedly, however, some projects are still submitted from time to time by potential investigators who are excited about a solution for [illegible]h there is no problem. In other words, the research activity proposed would [illegible]ably generate information for which there are apt to be no discernable users. [illegible]this point, I would direct your attention to an observation made by an unimpeachable but anonymous source in the National Sea Grant Office. In effect, this person said that engineers have a poor reputation nationally for these kinds of unimaginative proposals while biologists and economists rank pretty high in proposals that have resulted in productive and applicable research results. I find it ironic that engineers, who are recognized for their close association with industry research and development programs as consultants on real world problems, should not seek a higher status when it comes to Sea Grant proposals addressed to marine user audience needs and problems.

As many of you are aware, one of the three major responsibilities specified in the National Sea Grant College and Program Act of 1966 calls for the imparting of "useful information to persons currently employed or interested in the various fields related to the development of marine resources, the scientific community, and the general public." The marine advisory service should be tne primary, formal link between the institution, or the source of the useful information, and those in the marine community who need or want it. Sometimes, institutional arrangements or opportunities will dictate the use of other people or supplemental vehicles for this information transfer process. For example, a university

investigator may be highly adept in dealing directly with a certain target audience so that an intermediary or middleman is unnecessary or even counterproductive. When this condition prevails, I think it is a decided plus for the local advisory service and should be encouraged.

In a paper entitled Introduction to Marine Advisory Services, Dr. Daniel A. Panshin of Oregon State University has this to say about advisory services, and I quote:

> A marine advisory program cannot [illegible] lation. Advisory services by their nature require the establ[illegible]tenance of many different contacts.
>
> First and foremost, a marine advis[illegible]gram supported by Sea Grant must be an integral part of the overall Sea Grant program to which it belongs. It is essential that Sea Grant program administrators understand the nature and purpose of advisory services. There also need to be strong ties and two-way communications with researchers so that they assist with the educational projects of the marine advisory program and are receptive to feedback of user needs. (Emphasis added.)
>
> Other contacts that a marine advisory program needs to pursue actively include: parent university, other colleges and universities in the area having marine competence, NOAA components, other federal agencies, state and local government, other marine advisory programs in the region, and industrial associations.
>
> Maintaining such a large number of relationships may seem unrealistic or impossible, but such contacts are necessary for an effective marine advisory program. A key role of advisory services is that of middleman, of serving as intermediary between the sources of knowledge and the users of knowledge.

It is to this middleman's role in advisory services that I want to address my remarks today, emphasizing the part advisory services do play, or can play, in identifying marine resource problems and opportunities and in seeking to effect solutions to them. I hope my comments will establish that two-way action can indeed be stimulated when there is a deliberate and honest mutual effort to achieve some desired goal.

Depending on your particular Sea Grant program, advisory services can involve these areas of activity: aquaculture, commercial fisheries, seafood technology, marine mining, marine recreation, marine science education, coastal zone management, marine transportation and port development. In Rhode Island, advisory programs are conducted on an intensive scale in commercial fisheries, coastal management, marine science education and marine recreation. Seafood technology is a recent and growing area of specialization because of opportunities opening up for the exploitation of underutilized species. For each of these major areas of activity, there are specific, identifiable user audiences that can be reached for the purpose of discussing their needs, problems and ideas. For example, a handful of skippers may constitute a user audience as can the entire membership of a fishermen's cooperative or a processor's association. In coastal management,

the user audience can be the general public, the schools, planning and conservation groups, state and local agencies, builders, developers, and so on.

Because there are limits to the availability of money and manpower, advisory services will usually place a great deal of emphasis on those real problems and opportunities identified in collaboration with members of the user audience to which the Sea Grant school can make a real response. It is in this context that I want to offer a few brief examples of advisory activities we have undertaken in the Rhode Island Sea Grant program which were initiated in partnership with members of user audiences and which I feel owe their successful conclusion or progress to that relationship.

The first involves coastal zone management, an advisory project conducted at the University of Rhode Island through the Coastal Resources Center. Back in 1969, the Governor of Rhode Island appointed a technical committee on Narragansett Bay and the coastal zone for the stated purpose of providing the people of the state with a mechanism to insure that their interests in Narragansett Bay and the coastal waters were realized.

In March of 1970, the committee submitted its report to the Governor, and the General Assembly received legislation establishing a Coastal Zone Council. The legislation failed of passage, primarily because it contained too many implicit and explicit threats to existing political and commercial interests in the coastal zone, and because the original committee had not been sufficiently representative of the various coastal jurisdictions. Shortly after the legislative session ended, the Governor moved quickly to reaffirm his interest in a coastal management council and re-constituted the technical committee by expanding it from seven to 65 members representative of every city and town and every imaginable group concerned with the marine waters of the state. A person who had been active in providing advice and counsel to the first committee on an informal, rather ad hoc basis was Stuart O. Hale, then assistant to the Dean of the Graduate School of Oceanography at URI.

As a former reporter and editor of the state's principal newspaper, Mr. Hale is widely known and respected among the natural resource organizations of Rhode Island. He knows key people in every branch of the state government and, equally important, he is a known quantity to them. Mr. Hale worked with the new technical committee in an advisory capacity and, despite its size and diversity of opinion, the committee was able to recommend legislation to the 1971 session of the General Assembly which was approved and which created a Coastal Resources Management Council, one of the first of its kind in the country.

Following establishment of the Management Council but preceding appointments to membership, Mr. Hale urged the establishment of a Coastal Resources Center at URI. This was done with the Governor's concurrence and some of his cash. The Center's mission, under Mr. Hale's direction, was to carry out and coordinate the planning effort of the new Management Council in cooperation with the chief of the Statewide Planning Office, a unit of the state government's Department of Administration. It's important to note that otherwise the new and potentially powerful council was without any fulltime help and welcomed this urgently needed assistance.

With Sea Grant support, the URI Coastal Resources Center assumed the responsibility for coastal management advisory services to the Management Council. Based on problems and priorities identified by the former governor's technical committee and by the members of the new Coastal Council, and because of a suddenly-emerged controversy over housing construction on some barrier beaches, the URI Center was almost from its first day heavily involved with various agencies of state and local government and with the public. The interaction was intensive, frequently complex and always delicate.

The state management council in September of 1972 called for a moratorium on barrier beach development pending a detailed plan to regulate and manage such areas. The Coastal Resources Center prepared background information and recommendations and submitted them to a committee of representatives of communities having barrier beaches. This committee's charge was to provide a "serious, hard-headed and realistic" examination of the issues. The citizen's committee formed by the Coastal Resources Center did not consist of local officials but rather individuals designated by local governing bodies who were "familiar with local problems and the attitudes and aspirations" of their fellow citizens. Working papers and special expertise were made available to the committee.

One of the major conclusions reached by the citizen's committee, which is somewhat relevant to my subject, was this: "Without a continuing two-way open communication between government and citizens, any government-initiated plan, no matter how well conceived, runs the risk of being viewed with suspicion as an attempt to diminish the position of local government to respond to local problems." The barrier beach management plan was eventually adopted by the state's Coastal Resources Management Council and there was general agreement that citizen involvement in the planning process had facilitated its approval because it gave the Coastal Resources Center and the state management council extensive and valuable advance notice of local concerns that would ultimately surface at public hearings.

The Coastal Resources Center is currently involved in many studies and projects for the state management council but I mention its initial activity with barrier beaches as being a successful one for these reasons: (1) the timing was propitious in terms of the Center emerging simultaneously with a new and underfunded state agency; (2) the key man in the Coastal Resources Center, Stuart Hale, was personally acquainted with many of the principals in the various state agencies so that the inevitable concern with credibility did not constitute the hurdle that it frequently does in university-community relationships, and (3) there was broad interaction among state and local agencies, business and conservation interests. To my way of thinking, there probably isn't any Sea Grant activity as politically volatile as coastal management but it is worth suggesting that personal proximity to the decision-making process, for programs and individuals with good credentials, can be a lot more productive in influencing that process than any number of computer printouts, information bulletins or workshops and conferences ever will be.

A second example of advisory services I want to discuss involves our relationship with the Rhode Island Marine Trade Association, a group which comprises the owners and managers of the leading marinas and boat yards in the state. When we

decided to invest some advisory service time and effort in this direction, it was with the understanding that the trade association constituted a significant sector as far as marine recreation is concerned and that it had not previously been the beneficiary of much advisory-type assistance from any particular source, a situation which suggested to us that we could initially make some very modest contributions in staff time without worrying about longer range commitments. A solid link that did exist with the trade people was Dr. Niels Rorholm, a URI marine economist who has done several economic impact studies of marinas since the 1960's and continues to do so while serving as URI's Sea Grant Coordinator.

Neil Ross, a former Peace Corpsman who was used to improvising, was our newly-designated marine recreation agent, and he was given the job of establishing the relationship with the trade association. Since many of these kinds of groups don't have paid staffs of their own, Mr. Ross began by helping the association arrange programs for its monthly meetings. Then he expanded our role by setting up workshops and small conferences based on concerns expressed at the meetings and during personal visits to the various marinas and boat yards. Gradually, the feedback gates started to open. A common problem facing marina owners was their image as polluters of the marine environment. They didn't believe it but they were unable to offer any evidence to the contrary. Mr. Ross contacted a biological oceanographer who was then completing a report on a salt marsh study and together they worked with the trade association officers and other marina operators in laying out the scope of a research project.

A yacht marina area and a salt marsh cove were considered as ecological systems and compared to evaluate biological populations and magnitudes of production and respiration, among other things. A team of biological oceanographers and their graduate students spent eight months conducting the studies, with help in the form of equipment and field support from the state Department of Natural Resources and EPA's National Marine Water Quality Laboratory. Eight marina owners were cooperators in the project. The advisory agent and the head of the trade association provided liaison with the marinas. The results of the investigation, widely disseminated at state and regional meetings and in the media, indicated that in most respects the marina cove and the marsh cove appeared to be not only similar, but also compatible ecological systems. City and town planners, lawyers, environmentalists--and marina operators, of course--have made extensive use of the study in a wide variety of forums.

Another feedback study originating within the trade association concerns the protection of marinas against winter storm wave damage where the water is too deep or the bottom silt too thick to make solid breakwaters or bulkheads economically feasible. "What about utilizing scrap tires?" some marina owners asked. What could be cheaper? After all, we as a nation deposit something like 180 million tires a year in junk yards, dumps and landfills. On the basis of these discussions, Mr. Ross solicited the interest of a URI ocean engineer and they contacted the research division of the Goodyear Tire and Rubber Co. The company supplied a small grant and a large number of scrap tires and testing is now underway at marinas in Providence and Newport.

If they work as hoped, the scrap tire floating breakwaters could be a substantial benefit to marinas. It is estimated that the only maintenance required would be

the periodic repair or replacement of the securing hardware. Life expectancy, controlled by the life of the rope and hardware, is figured to be about ten years. I think this particular advisory activity has a great many desirable ingredients: it was conceived and developed in collaboration with marina operators who are also participating in the research; it has strong cost/benefit possibilities; user feedback attracted the interest of a faculty researcher; the project has industry participation from Goodyear, and it has prompted some excellent publicity because of the possibility of re-cycling a product which is otherwise an environmental nuisance. Because of our interest in the scrap tire breakwaters and because of breakwater studies already underway at the University of Washington, our two schools combined to sponsor a national floating breakwater conference last April. It was obvious from the remarks of participants that there is a great deal of user feedback available and yet to come from marine interests with deep water and nearshore breakwater problems.

Before leaving this example of our advisory agent's "middleman" working relationship with the trade association, I should mention that it has also stimulated regional recreation conferences, a regional marina economic impact study, a marina insurance study, a boat show economic impact survey and a great deal of visibility for Sea Grant among the marine trade groups in New England and the marine trade and boating magazines nationally. User feedback, user participation in project planning and user financial support have given these activities their justification and their value in the marketplace.

A third example of two-way action stimulated by advisory services relates to work we have done in marine science education at the elementary and secondary school level where our efforts have been directed almost exclusively at school teachers rather than students. We were given an opportunity to go public in 1972 when the URI 4-H leader offered us television time already available to him on a commercial TV station serving Southeastern New England. The idea was for us to produce 16 half-hour programs dealing with such topics as oceanography, commercial fishing, the marine food chain, pollution, arts of the sea, evolution of the coast, and so on. The 4-H organizations in Rhode Island and nearby Bristol County in Massachusetts were to handle the promotion while all of the production was to be the responsibility of our marine education agent, Thayer Shafer. An important part of the project was a teacher/student guide designed to complement and supplement each of the program subjects. To compile the guide, we enlisted the help of four talented and experienced science teachers from Massachusetts high schools who had been in the forefront of efforts to introduce marine science material into the curriculum of schools in the region. In addition, we recruited two URI graduate students, one in the marine affairs program and the other in education. The seventh member of the writing team was a representative of the education department of The New England Aquarium.

The purpose of the guide was to give the classroom teacher enough material so he or she would be able to discuss important points of the TV series without reference to other sources; to provide enough references to enable the teacher to build a unit on each aspect of the marine environment, and to offer enough activities to enrich both individual and class study. These goals, established by teachers themselves, suggest the pragmatic needs that only working members of a

user group could identify in preparing a document that could find ready application in the classroom.

The TV series--our first venture in television--turned out to be a qualified success. Since it was a public service activity of the TV station, it wasn't run at the best possible hour. Not that it ran opposite the Saturday morning cartoons or on Sunday mornings opposite the religious programs. No, the series was presented on Sunday afternoons from September through January--opposite the National Football League. Subsequent Nielson polls showed that the series came in third, far behind pro football and slightly behind reruns of Gilligan's Island. The average audience for our 2 p.m. Sunday segment was about 7,000 persons. One lady from Cape Cod wrote to us and said it was refreshing to her to watch something on TV that was so natural. We decided to take that as a compliment.

So, while the audience was not mass the experience was invaluable. Based on the feedback we got from viewers and the 4-H people, along with our own appraisals, we contacted the state-operated educational television station in Rhode Island with a suggestion to develop a new series utilizing their professional staff and production facilities. We are currently seeking national funding through 4-H for a series that would be available through every land grant university and which we think might help to build a long term marine constituency. The guide written by the teachers has its own identity and we have sold several thousand copies since it was first produced.

The fourth and last example of two-way action involves our advisory work in commercial fisheries, perhaps the most elusive and yet enjoyable user audience we deal with. To get at some of the issues confronting the fishermen, we use a variety of approaches including an annual Fishermen's Forum and loosely constructed group meetings to outline URI Sea Grant fisheries projects and to solicit suggestions for projects. However, the primary contact is the advisory agent, Bob Taber, who is in daily contact on a person-to-person basis with the skippers, administrators and processors at the port of Point Judith and, to a lesser extent, the port of Newport. Sometimes offered off the cuff, sometimes offered with considerable emphasis and passion--ideas brought forth during these face-to-face meetings have been the basis for some of our most sharply-focussed and worthwhile commercial fisheries projects. I'd like to add that we are currently enjoying a new period of mutual cooperation with the fishermen and processors based mainly on the fact that the university's efforts through the Sea Grant program now reflect significantly the fishermen's problems and concerns rather than those that might have been identified unilaterally by various university investigators in the past. The key, the vital link in this relationship, has been the middleman, Bob Taber, whose ability, patience, understanding and unassuming approach have brought him the respect and confidence of the fishermen.

In our fisheries advisory work, we were able to help introduce two-boat midwater trawling for herring, with highly favorable benefit/cost results, because a few skippers were willing to give up several days of a guaranteed catch using traditional methods in order to experiment with this new technique and to satisfy their desire and curiosity. This is, incidentally, a greater sacrifice than

many people realize because there are literally thousands of dollars at stake in lost fishing time while the skippers are trying out new methods and techniques.

For this project, in addition to the expertise we provided through the advisory service, we brought over a couple of prominent skippers from Scotland who had extensive experience with the two-boat method. These skippers spent long days and nights guiding, encouraging and reassuring the Point Judith fisnermen. As an aside, it is interesting to mention the part that dumb luck can play in advisory work. The first day of the two-boat trials was marred by a succession of frustrations and mistakes that appeared to have given the skippers cause to wonder why the hell they ever got involved in the project. The skippers would have gone their separate ways if high winds had not arisen early on the second day and forced most of the fleet to remain in port. This one-day hiatus gave the advisory agent, the skippers and the Scottish visitors a chance to go over the problems encountered during the initial go-around and the discussions prompted a willingness to give it another try. The two-boat method eventually increased herring landings at Point Judith to 5.2 million pounds in 1972--more than three times the previous year's catch, and up to 10 million pounds last year, an increase valued locally at nearly $200,000.

This year, taking up a suggestion made by the president of the Point Judith Fishermen's Cooperative, the Canadian pair seining technique was explored by Mr. Taber and subsequently introduced as a demonstration project with several skippers donating their time, vessels and crews. Another project now under way, also based on feedback from fishermen, is a consequence of these pair trawling activities. The large mesh trawls necessary for the fleet are now being purchased from Germany and Holland at a time when the cost of nylon, if it is available at all, is increasing substantially. A Rhode Island firm, Engineered Yarns, Inc., was contacted by Mr. Taber and agreed to produce a yarn filament which will be knit on their looms. The completed trawls will be assembled and then seatested along with existing trawls. For the fishermen, the successful application of this new trawl would mean considerable savings in the cost of trawls and in their high import duty costs; for Engineered Yarns, it would mean an expanded domestic market and, for the U.S. Government, it could represent a plus in the balance of payments picture. Two-way action at work; identification of problems and opportunities by the user group, and a positive response by the Sea Grant university facilitating the application of knowledge by the user group.

I have offered these few examples of our involvement with state agencies, with fishermen, with educators and with marine trade groups to suggest that some of the most productive and promising research and advisory projects have originated with people in our user audience, in cooperation with our middlemen, the advisory agents. Your two-way flow of communication does indeed result in two-way action when all of the pieces fit together. It is my contention that any Sea Grant program of whatever size and scope, can review the sum of the projects it has conducted to date and come to the general conclusion that those investigations and advisory activities undertaken by scientists and engineers who have had wide exposure to the real needs and problems of the user group involved have been the most responsive to Sea Grant's mandate, the most productive, and the most likely to find application in the marine community.

Conversely, those investigations and projects with the least input from marine interest groups can generally be considered the least likely to find application in the marine community and may, instead, result only in some inscrutable publication or report whose sole recognition in life may be the accession number it gets from NTIS.

We in advisory services, as the field representatives or middlemen for the Sea Grant university, have the responsibility of initiating contacts in the marine community, of establishing credible working relationships, of helping to identify problems and opportunities which could become subjects for applied research projects, of locating willing investigators capable of doing the research and then, ultimately, of broadcasting the results as widely and as intensively as possible.

Advisory services do not, of course, restrict themselves to knowledge existing within their own institutions when they seek to impart useful information to the marine community. There is help for this, as was noted, from federal, regional and state agencies, from other institutions, from business and industry and frequently from the public. But it does seem to me that the fulfillment of the highest and best purposes of Sea Grant's applied mission are achieved when the linkage of the Sea Grant institution with the marine community stimulates the interaction which produces knowledge that can be put to work in the gainful use of our marine resources.

Sea Grant: A Catalyst for Legislative Action

James B. Rucker*
Mississippi Marine Resources Council

Introduction

The Mississippi Marine Resources Council established a Seafood Task Force in September of 1973, and empowered it to initiate a study of the economics and laws pertaining to the seafood industry and the Marine Conservation Commission. The following month the Governor, Chairman of the Council, expressed his concern and interest regarding the seafood industry and asked that the study be completed in time to provide recommendations regarding any necessary legislative changes in time for action during the 1974 legislative session. The purpose of this report is to document the role that the Mississippi Sea Grant Program played in developing the study which served as a catalyst for legislative action.

This Seafood Task Force, created by the Council, was composed of the Marine Conservation Commission Biologist, the Director of the Gulf State Marine Fisheries Commission, the Director of the Gulf Coast Research Laboratory, the Director of the Mississippi-Alabama Sea Grant Consortium, and the Director of the Mississippi Marine Resources Council. This Task Force prepared a preliminary work statement, and in late October held a briefing to define the scope of the proposed study with the legislative delegation from the three coastal counties to finalize the objectives of the study. The major objectives, defined by the Seafood Task Force and legislators present were: 1) An economic study of Mississippi seafood industry, 2) An evaluation of laws pertaining to the seafood industry to better understand existing legislative controls, and 3) Recommendations for streamlining the laws that affected the Mississippi seafood industry.

The Seafood Task Force of the Mississippi Marine Resources Council in implementing the study, delegated various tasks to State agencies and institutions that had expertise in individual segments of the study. A substantial amount of this expertise in the educational institutions had been nurtured through the Mississippi Sea Grant Program. Investigators from four Institutions of Higher Learning participated in the study. The Chief Fisheries Statistician for the Gulf Coast Research Laboratory developed historical data on the economics of the Mississippi seafood industry. A Research Economist at Mississippi State University compiled data on State tax revenues, employment, and wages generated by the Mississippi

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seafood industry from 1968 to 1973. The Bureau of Business Research, University of Southern Mississippi, developed a product flow model and estimated the economic impact of the Mississippi seafood industry for 1971 and 1972. The Mississippi Sea Grant Advisory Services, at the request of the Mississippi Marine Resources Council, conducted a survey of public attitudes concerning management of the seafood industry. Those individuals surveyed were dependent on the industry for their livelihood. The head of the Sea Grant Legal Program at the University of Mississippi Law School reviewed legislation pertaining to the organization, regulation, and management of marine resources in other coastal states of the Southeastern United States. A model ordinance recommending an improved management strategy for the Mississippi seafood industry was prepared.

Study Results

The Seafood Task Force Study showed that:

1. Mississippi's seafood industry has grown considerably in the past two decades. The number of fishing craft and fishermen has increased twofold. At the same time, production from traditional (established) fisheries has remained essentially constant. Newly established fisheries, employing relatively few people, have contributed to an overall increase in fish landings within the State. Even with this apparent growth, Mississippi has lagged behind the other Gulf states in the rate of growth of its marine fisheries when compared to the increases in value of dockside landings in neighboring states.

2. The seafood industry contributes to the employment and economy of the state in many ways beyond direct commercial landings. The industry generates employment in a wide range of other industries and initiates a flow of money throughout the State as these fishery products travel to the consumer. From a dockside value of approximately $11 million in 1972, the seafood industry contributed more than $55 million to the economy of the State.

3. The primary responsibility for managing Mississippi's marine fisheries was vested in the Marine Conservation Commission. Formed in 1960, the Commission was empowered to regulate only the harvesting and processing of shrimp, oysters, and crabs. Although other fisheries are harvested in substantial quantities, they were not regulated by the Commission or any other State agency. The mission of the Commission had not been legislatively modified since its formation. Thus it had not been able to respond to changing markets, fisheries, or technology.

4. The survey of the attitudes of the commercial fishing industry revealed that as a whole, they would prefer to see the Marine Conservation Commission modified for a variety of reasons. Among the most frequent criticisms was the poor balance and inadequate representation of the industry on the Commission. This was related to the method of selecting members. Outside interference, lack of central authority, and employment practices were also criticized.

5. The results of the investigation of the laws of other states taken with the other findings resulted in a draft of a legislative bill. This draft recommended

the abolishment of the MMCC in its existing form and the creation of a new agency with increased jurisdiction and authority.

The Seafood Task Force study was completed on schedule in January of 1974, at the beginning of the legislative session. This experience in Mississippi illustrates the ability of the Sea Grant Program to focus its expertise promptly on identified state needs. However, it is useful to further describe the Mississippi experience for it provides insight into some important consequences of participating in a study that recommends legislative reform.

The Democratic Process

The Council held a briefing on the results of the seafood study on January 14, 1974 in the State Capitol in Jackson, Mississippi. A majority of the coastal legislative delegation was in attendance with representation from the Marine Conservation Commission. The study and attendant legislative recommendations were explained, and legislators were given the opportunity to question various aspects of the study. A spokesman for the Marine Conservation Commission stated the view that legislative reformation was neither necessary nor desirable and indicated a more detailed written critique would be submitted in the near future.

The following day the seafood study was discussed at a regular meeting of the Mississippi Marine Resources Council. At this meeting a council member expressed the view that: 1) The study and its recommended legislation was an attempt to change a Commission that had adequately managed the fisheries since 1960 and that the fisheries in Mississippi were in fairly good shape. 2) That fluctuations in catch were the result of pollution and climatological phenomena and that problems of the Commission were not in management but in economics. 3) That the study was preliminary and inadequate due to the short time frame in which the study was conducted, and, 4) That any legislative recommendations should be withheld until the study had been completed. Substantial debate followed this rather sharp and surprising critique of the study. It should be noted that the critique supported the status quo.

Nevertheless, the Council resolved to recommend to the legislators that they consider the proposed draft legislation as a vehicle from which a bill could be written to reorganize the Marine Conservation Commission. The Council further resolved that the study be referred back to the Task Force for further study and completion, and that it be reported back to the Council at a later date.

The Gulf States Marine Fisheries Commission met in New Orleans in March, 1974. At this meeting the Commission passed a resolution with reference to Sea Grant. It probably was no coincidence that the resolution had been drafted and introduced by a member of the Commission representing Mississippi. The resolution stated that on certain occasions individuals in the Sea Grant Advisory Services have been involved in fisheries matters which have worked against better fishery management practices and the State Conservation Agency in charge of marine fisheries.

In spite of the resolution and other opposition, bills embodying the study recommendations were filed in both the Mississippi House of Representatives and the Senate. Legislators met with fishermen and other members of the seafood industry and drafted a joint committee substitute bill to reorganize the Mississippi Marine Conservation Commission. This bill was passed by both the House and Senate and signed into law by the Governor in April of 1974.

Summary

This experience in Mississippi fully demonstrates the utility of employing talent through the Sea Grant Program and the Sea Grant Advisory Services to respond rapidly to specific needs identified by the State. However, it should be recognized that state government is not a monolithic institution. Between agencies within a single state, attitudes, policies, and goals differ greatly. When the Director of a State Sea Grant Program commits resources to address an issue identified by a state agency, other agencies that may feel threatened by any proposed change of the status quo may vigorously criticize the study and challenge the Sea Grant Program purview. Political pressure may be brought to bear on the Sea Grant Program at both the state and federal level.

This is not to suggest that the Sea Grant Program avoid participating in studies that are politically sensitive or may stimulate legislative action; on the contrary, action of this type is one of the fundamental purposes for which the program was established. However, Sea Grant managers at both the state and federal levels must be prepared for severe criticism, especially if the study serves as a catalyst for legislative action.

The Pacific Sea Grant Advisory Program: Eleven Compelling Reasons for Regional Cooperation

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there were problems: clients that moved, a talent base that varied both in numbers and specialties, limited Sea Grant funding, questions that would not recognize political boundaries, varying philosophical commitments to personal contact extension education, and a friendly suspicion of one another. The solution did not spring fully developed into bloom. There were times when we became discouraged--realizing that each had a responsibility at home that wasn't being adequately served. But gradually it all led to the establishment and successful operation of the Pacific Sea Grant Advisory Program (PASGAP).

In 1969, that hazy early spring season for Sea Grant, few of the programs had an active advisory element--fewer still felt comfortable, confident, or competent to establish one. Yet, as Sea Grant institutions, we were committed to put marine information to work with those who could use it and feed back the needs of marine clients to the research and education base of the universities and agencies. A few marine advisory pioneers had discovered each other. Graham Drew, University of British Columbia (UBC), and John Doyle, University of Alaska (UA), had commiserated about their lonely existence over a few beers. The late Don Harriman, Maine Sea and Shore Fisheries, and I had corresponded and met. Bob Jacobson, Oregon State University (OSU), was trying to cover the entire Oregon coastline by himself. We had found many opportunities to conduct an aggressive and useful marine extension program but there were few practitioners.

Cooperation is a worthy goal that requires a compelling need and supposes a sharing partnership. When marine advisory agents found that their clients may have just sailed from Monterey enroute to Kodiak, both a compelling need and a marine advisory maxim were identified: agricultural extension agents can be reasonably sure that the farm will remain stationary although the farmer may travel; but a fisherman's work platform is seldom steady or stationary. After all, how are you "gonna keep em" down on the farm--once they've seen the Pacific? Thus the compelling need was an advisory mechanism to serve clients wherever they might roam in the Northeast Pacific. The partnership was provided through the sharing of advisory talent bases of varying dimensions.

In the summer of 1969, two meetings, in Seattle and Juneau, led to the formation of PASGAP. On the basis of a telephone call, Alaska, Washington, and Oregon State Sea Grant advisory people met in Seattle to share information. The result was an expressed desire to pool resources and work together. The Juneau meeting brought representatives from California, British Columbia, and Hawaii together with the other three and the National Marine Fisheries Service (NMFS) indicated

an interest in cooperative extension programming. These pre-PASGAP pioneers included extension program veterans and some distinguished research engineers, oceanographers, and food technologists--from UA: Don Hood, Jim Matthews, John Doyle; UBC: Graham Drew; Washington (UW): Stan Murphy, John Dermody, George Pigott, Bob Harris; OSU: Joe Cox, Bill Wick; California (UC): Maynard Cummings; Hawaii (UH): Charles Bretschneider; and, NMFS: Harvey Moore.

We all seemed to recognize a need for cooperative programming but stumbled on the questions of match funding across state and even national boundaries and how to administer a potential fiscal and programming nightmare. Agreeing to carry a regionally cooperative marine advisory program "on the hip" until possible grant funding could be arranged, we established a simple program philosophy and selected program functions which remain valid in 1974--five years later.

PASGAP is designed to be subservient to the marine advisory programs of individual members--a foundation rather than a topside umbrella. In function, we agreed to share our talents, jointly publish and communicate, pool talent to produce regional workshops, and conduct problem identification and program planning workshops relating to the variety of industrial, environmental, and governmental interests in the Pacific ocean region.

Think a moment about the possible strengths and potential advantages in regional cooperation:
--the opportunity to borrow the most qualified marine advisory specialist or agent on the Pacific coast, for the subject matter that your clients require.
--lowered unit costs of publications through larger press runs and, perhaps more talented authors.
--grouping of subject matter specialists from several schools or agencies to organize and present traveling workshops.
--regular, organized counsel with your peers to find methods for approaching difficult problems.
--recognition by clients that they can tap the expertise of a region by contacting a local marine extension agent.
--continuous regional extension training opportunities.

Using leftover funds from a number of sources, we tested the system with a traveling workshop "Sanitation-70" during the fall and winter of 1969-70. This effort was aimed at improving fishing boat and processing plant sanitation--a subject of universal concern in the Pacific Northwest.

During 1970, the budgeting and grantsmanship experience of Charles Bretschneider and others resulted in a Sea Grant project proposal that all hands could generally agree on. Recognize the complexity of the task. Not only must the entrepreneurially minded advisory people agree on the procedure but also the university administrators needed to understand and approve of the concept. Above all of this hung the cloud of mutual distrust. In time, this cloud disappeared as the results of cooperation became evident.

Selection of a name and a logo were early orders of business. Contests were authorized. A UBC artist created the logo. Several claim creation of the PASGAP name. One of the more intriguing entries was SEa eXtension.

The PASGAP region was originally defined as an area of similar fish species and fishing methods from northern California to the Arctic ocean. The idea became bi-national realizing that British Columbia presents a long coastline between Alaska and Washington. Hawaii, in a more tropical oceanic regime, was 2,500 lonely miles out in the Pacific and envisioned a benefit from joining the group. The Southern California area felt a kinship also. Thus, PASGAP has grown to include eight marine universities, seven with Sea Grant College, institutional, or coherent grants, plus UBC. In addition, extension programs of the three western regions of the NMFS--Alaska, Northwest, and Southwest--became active members. NMFS, responsible for marine fisheries research and management in NOAA, brought valuable federal inputs to PASGAP.

The policy for membership requires that affiliates must operate a marine advisory program funded and administered independently. Membership may soon expand to meet marine advisory needs in areas such as Guam, American Samoa, and Mexico.

PASGAP has evolved through four phases of project planning and funding:

1969--February, 1971--Phase 0. Information cooperation and proposal generation. No project funds.

March, 1971--August, 1972--Phase I. Members: UA, UBC, UC, UH, OSU, UW, NMFS.

September, 1972--June, 1974--Phase II. Members added: University of Southern California (USC), Humboldt State University (HSU).

June, 1974 to date--Phase III.

Oregon State University administered Phases I and II. The University of California administers Phase III.

PASGAP is governed by a Coordination Committee composed of an advisory program delegate from each member university or agency. This Committee is responsible for developing policies, selecting program emphasis, acting on membership applications, appointing special project committees, and electing a PASGAP Coordinator. The Coordinator administers the program and is supported by the grant at .25 full-time equivalent (FTE). The Office of Sea Grant contracts with the Coordinator's university for conduct of PASGAP. The position of Coordinator and that of Communications Committee chairman normally shifts at the conclusion of each grant period. Direct program costs to member universities are reimbursed through sub-contracts, purchase orders, or expense vouchers. Each member institution contributes a share of the required matching funds. Other matching funds are provided by cooperating marine industries and through state or local agency participation.

The Coordination Committee meets twice each year, alternating meeting sites among the member institutions. Only one meeting is designated as official with reimbursed travel costs. One meeting is geographically central. The other may be in exotic places such as Kodiak or Kona. The meetings generally accomplish three functions: (1) develop a six-month plan for talent sharing, workshops, conferences, and communications projects; (2) conduct a field study of marine

advisory programs, conditions, and problems in the meeting area; and (3) convene a meeting with local industry and governmental leaders.

The Communications Committee is the only other active permanent committee although ad hoc committees are established for special purposes, and a standing Education Committee is authorized. Believing that communication is the essence of the Sea Grant marine advisory program, PASGAP places great emphasis on the work of this Committee. Those with a serious interest in a refined regional Communications Committee charter are referred to Appendix D in the Phase III PASGAP proposal. The Chairman of Communications is elected by Communications Committee members and serves also as a member of the Coordination Committee. The Communications Chairman is supported by the grant at .25 FTE.

Ad hoc committees are established to develop regional workshop projects or to serve special needs. Examples include committees on hot-process smoked fish, vocational fisheries education, marine safety, fisheries export, and processing plant and vessel sanitation.

Working on a regional Pacific basis is a guaranteed way to become involved with the entire Pacific Basin as a resource management and utilization unit. As the word of PASGAP spread across the Pacific, we have received inquiries and indications of cooperative interest from a number of countries in the oceanic and western Pacific. To establish the relevance of this interest and to develop personal communications, a Pacific International Marine Advisory Program Survey was conducted during Phase II. A two-man team, Graham Drew (UBC) and Bill Wick (OSU), augmented by John Doyle (UA) in Japan, visited marine advisory educators in Japan, Hongkong, Singapore, Australia, and New Zealand. A report of this consultative visit may be found in "Marine Advisory Programs for Pacific Rim Countries" Wick and Drew. For Phase III a position of Pan-Pacific Program Manager has been established in PASGAP at the rate of .17 FTE. John Ball (UH) is appointed to that position and will discuss international opportunities in a paper at this conference.

So much for the idea of a regional advisory program, the throes of establishment, and the basic mechanics. Business managers often say "show me the bottom line." Are we showing a profit? Did anything happen? Has anyone learned anything? Is anyone better off, financially or otherwise, than he was before? What do we have to show for five years of effort--besides the gray hair, bald head and the wrinkled brow of the Coordinator?

First let's consider the activities as related to program objectives:

1. Provide support for development, activation and refinement of marine advisory programs within member universities and agencies: In staff size, marine advisory programs in the PASGAP region since 1971 have more than tripled in numbers of personnel. This has resulted in greatly expanded educational programs and services. PASGAP has provided talent to help individual programs and constituents define needs and select advisory personnel to help solve those needs.

2. Make specialized expertise available to members through sharing of talent: Talent sharing, which we define as the mutual use of specialized staff, is perhaps the most successful aspect of PASGAP. More than 250 days of sharing have occurred. Fisheries subjects such as business management, gear development, sanitation, processing methods, and electronics lead the list. Other major blocks of talent sharing time were devoted to coastal zone management, international advisory projects, science and environmental education, advisory administration and program development, museum and aquarium problems, communications, ocean engineering safety, and port development. Under talent sharing, the loaning institution makes the talent available at no cost. The grant pays travel costs. The borrowing institution arranges local schedules and provides logistical support. In practice, both the loaner and the borrower benefit through the broadening of staff experience and by obtaining the particular expertise which is needed for problem solution. The overuse of any one staff member is kept under control through an agreement to limit yearly sharing by individuals to ten days or so.

3. Systematically assess the need for and develop publications and other media materials to support regional programs and problem solving: Nearly 100,000 copies of bulletins and leaflets have been printed and distributed to further the communications effort of PASGAP--and the pace is increasing. We select for publication those subjects of region wide application. The two main areas of concentration thus far are: (1) fisheries--from several volumes on emergency services in the PASGAP region to the concept of limited entry and fishermen first aid--and (2) marine science education--an inventory of marine resources publications and files, and a bulletin on careers in ocean-related occupations. The Communications Committee chairman edits a regular newsletter for internal use and plans to broaden out with radio spots and international activities.

4. Conduct, in association with the Pacific marine community, program input conferences: Critical to the success of any advisory program is dialogue with the variety of client groups so that projects relate closely to priority needs. A total of eight major and four small-scale program input conferences have been held. In these sessions, about 300 marine leaders representing commodity, industrial, agency, recreational, and environmental interests have joined in free-swinging discussions of problems and opportunities. Summaries of the sessions were printed and disseminated locally, regionally and nationally. These blueprints for progress in marine resource development in the Northeastern Pacific have become the basis for PASGAP educational programs.

5. Develop and conduct workshops in response to identified needs: Organized regional workshops provide another method to share talent by combining the best expertise from several institutions to plan and present a single subject workshop at one or several locations. Our workshops have been largely oriented toward the fishing industry and have covered plant and boat sanitation, hot process smoked fish, fisheries export, shipboard electronics, fishing business management, vocational fisheries education, and limited entry concepts.

6. Provide training opportunities in extension educational techniques anplicable to marine advisory programs: PASGAP members helped to design and sent most advisory staff members to the two workshops in marine extension methods sponsored

by Oregon State University. Specific subject workshops in fishing business management, gear development, and communications have been held for members. Others are planned.

Now let's look at some responses from clients. The Kodiak paper of June 19, 1974, welcomed the PASGAP Coordination Committee as a "distinguished group of scientists and educators--concerned with development of marine resources of the Northeastern Pacific." One fisherman wrote to us after a session on batteries aboard fishing boats--"If this is ever held again, I would drive a thousand miles to attend it." The idea of cooperation across state and even national boundaries seems to be well accepted by marine industry--who sometimes become annoyed at seemingly artificial political boundaries. Political figures also seem genuinely interested in the project. Governor McCall of Oregon has been a supporter of the idea of a Pacific rim community of nations and enthusiastically endorsed the international survey in 1973. Legislators participated vigorously in the series of program input meetings.

Hopefully I have not implied that a small regional advisory program like PASGAP is a "bowl of cherries" or an "end all." In a sense it may raise more problems than it answers. And it is not without problems. A few are worthy of mention.

1. It is an administrative nightmare--paying bills among institutions--reimbursing direct to contributors--recording match--and leaving a clear auditable trail----these all require a great amount of trust. As Coordinator, I trusted all participants.

2. All members must participate--not all equally perhaps, but the relationship must be symbiotic or synergistic rather than parasitic--to the best of our consolidated abilities.

3. Our homework comes first, and well it should, but a 1/4 time Coordinator can't do the whole job--even with a first-class program assistant.

4. Distances make efficient communication difficult and costly.

Nevertheless, the real and implied advantages outweigh the problems.

1. We discovered new friends who faced mutual challenges in extension program delivery. As a group, we are probably as close as colleagues ever become.

2. Our cooperating marine advisory programs are much stronger and more efficient than any single program acting on its own would be.

3. An air of mutual trust has developed among the member institutions that is leading toward regional research and education proposals. In some instances, we are proposing joint staffing between two institutions.

The Office of Sea Grant has been of substantial help in making the PASGAP idea work. Robert Wildman, Project Grants Director, is an enthusiastic supporter of the project and has provided continuing counsel on management. Charles Miller has aided on tough budget questions. Howard Eckles provided support and liaison

on advisory and international projects. The Regional Directors of the National Marine Fisheries Service, Harry Rietze, Alaska; Don Johnson, Northwest; and Gerald Howard, Southwest, provided excellent cooperation in sharing extension and program staff.

Since some may wish to emulate PASGAP, you will want to know if we would do it again.

Yes.

But yes does not convey the sense of urgency that I feel. Marine advisory programs in Sea Grant are at the action edge of marine science and technology. This junction of knowledge and utilization is what Sea Grant is all about. Regional marine advisory programs, such as PASGAP, bring a distillation of talent to focus on the tough problems--and with a minimum of duplication and overlap. This is the seventh year for Sea Grant. Our clients expect action in response to their problems. Let's provide this action through two marine advisory thrusts: (1) a strong local program, and (2) a regional collegium to augment our local strengths and minimize our weaknesses.

Political and Technical Interdependencies In the Green Bay Estuary: A Preliminary Analysis

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Introduction

Water quality in lower Green Bay and in the southern end of Lake Michigan has long been recognized as seriously degraded. Both of these regions are adjacent to heavily populated areas containing communities and industries which have made significant contributions to the cleanup effort in recent years. Complex problems still remain, however, and are likely to exist for several years in the future. Green Bay has received special attention due to the confined shape of the estuary and increased hope of understanding and managing this smaller segment of Lake Michigan.

The waters of the Green Bay estuary continue to be politically and economically important today as they have been since the early seventeenth century when French fur traders began using the waterway to link the lower Mississippi to Quebec. Future possibilities for wise management of the water and related land resources of the region will depend heavily on knowledge of and sensitivity to this long heritage as well as the complex and interesting hydrodynamic, biologic and meteorologic characteristics of the ecosystem. Accordingly, a brief physical and historical description of the area seems appropriate prior to a report on current activities.

Waters flowing into the Green Bay estuary (5500 cfs mean discharge) represent the largest single contribution to Lake Michigan (25%), and the Fox River contributes 80% of that amount. The Fox-Wolf River system drains 6500 square miles extending west to within portage distance (1-1/2 miles) of the Wisconsin River and north to within 20 miles of the Michigan upper peninsula. As is evident from Figure 1, the watershed is divided into three distinct areas:
(1) Upper Fox River - A region of gentle slope (the river falls at a rate of about one foot per mile), many wetlands and small drainage area. Approximately one and one-half miles of marshland separate headwaters of the Fox from the Wisconsin River, which flows into the Mississippi. This area, called Portage, was of strategic military and economic value and was designated as a fortified site when the vast Northwest Territory was established in 1787. During periods of high flow, basin interflows occurred naturally at Portage prior to construction of a levee and associated control structures during the mid-nineteenth century.

(2) Wolf River - The larger drainage area supplying water to Lake Winnebago and the lower Fox, this river has been identified as an ideal logging stream. Fast flowing due to a rather steep slope (five feet per mile), the Wolf River is surrounded for many miles by a magnificent stand of pine forest which served as the raw material of the regional industrial base for over 50 years and established Northeastern Wisconsin as an industrial area.

(3) Lake Winnebago and the Lower Fox River - Lake Winnebago serves as the junction for the river system. It is the natural reservoir (215 square miles) receiving water from both the Upper Fox and the Wolf Rivers, as well as the flow regulator for the Lower Fox. The average depth of the lake is only 15 feet, and it is utilized primarily for recreational activity. The Lower Fox River is a short (40 miles) stream with a steep slope (average four feet per mile). Most of the elevation change (140 feet) occurs at three former rapids, ideal dam sites for water power to serve industry. These locations, when coupled with a highly regulated river flow, provided the original power requirements to support a high concentration of industry, initially lumber-based and later, paper-based.

Since the natural resources of the Lower Fox River attracted the attention of early industrialists, families seeking new employment opportunities in the factories were thus also drawn into the area. New citizens moving to Wisconsin during the early developmental period 1835-1850 came primarily either from New York, Ohio, the states of New England, or from Western Europe[1]. The leadership of the developing industrial valley, usually of New England heritage, naturally maintained the traditions of culture, industry, government, and education. European immigrants brought with them a strong ethnic loyalty which served as a base for community development and specialist skills in the mills. These qualities continue to dominate life in the region today. During the past 50 years paper has replaced lumber as the primary industry; concurrently an increased stress on water quality in the river and the lower bay has developed. A very stable, moderately growing regional economy, coupled with a generally recognized high quality of life, has encouraged many young people to remain in their home communities; therefore many provincial attitudes prevail. Strong, honest local and county governments exist. There is little support for regional government of any kind, since such organizations are seen as an erosion of local rule. In recent years as river and bay water quality has diminished, a group of business, community and governmental leaders has suggested the need for a coordinated regional effort to understand, correct and manage the estuary. Advances in technical knowledge have contributed to the growing awareness of this need.

Recent Advances

Both technological and institutional positive changes have occurred during the past decade which symbolize a new perception by local citizens of their life in the watershed and along the estuary.

The following comments are intended to emphasize a sample of the progress achieved.

I. Technological Changes

Computer models of the river system have emphasized the limitations of the river as a resource. Earlier studies of the river and bay were primarily focused on the collection of physical and biological data to indicate the degree of water quality degradation[2,3]. Later these data were used along with dissolved oxygen, stream models to simulate the lower Fox River under different hydrologic, municipal and industrial organic loadings[4]. More recently the State of Wisconsin installed a series of five water quality monitoring stations at appropriate locations along the lower Fox River which automatically measure and transmit hourly, via telephone to a computer storage unit, values for temperature, turbidity, conductivity, pH and dissolved oxygen.

During this same period, approximately the past ten years, major investments in waste water treatment facilities have occurred. These investments have been motivated by a combination of new laws, public subsidies and increased awareness of corporate responsibility. New facilities have, with few exceptions, been provided to treat waste waters from a single plant or single municipality.

University of Wisconsin Sea Grant supported projects have already made significant contributions to knowledge of the local aquatic ecosystem, with particular emphasis on nutrients in the system, and they can be expected to play a role in the identification and evaluation of regional water management alternatives. Contributions to the knowledge of chemical, physical and biological aspects of nutrients in waters of the region have been made by a number of UW Sea Grant investigators including Burris, Keeney and McIntosh, Lee, Sager and Wiersma[5]. Two investigations recently completed or in the process of completion bear special mention due to their future possible importance: real time regional water quality management and improved modeling of the estuary.

A. Real time regional water quality management - One area of endeavor focuses on the massive amount of basic water quality data accumulating due to the five monitoring stations installed by the State of Wisconsin and located at Menasha, Appleton, Rapid Croche, De Pere, and Green Bay. They have been furnishing reliable hourly records since May 1971. This source of information is undoubtedly the largest single data bank on the river and its utility can probably be extended far beyond current use of the gathered information. Three distinct studies of this data bank have been or will soon be completed.

1. System performance investigation[6] - The system consists of a sensor, amplifier, and transmitter at the monitoring station, a telephone transmission circuit, and a receiver at the computer file. Questions addressed in this study were: How does this combination of hardware and software perform as a system? What types of failures exist? Are they dispersed or clustered? Does the sensor give an accurate reading when compared to independent surveys? Do the readings reflect spatially averaged or singular river conditions?

Conclusions reached were quite positive. The system was judged to perform very well. Data collected did represent local river conditions. Failures were clus-

tered and generally easy to identify, and they were shown to diminish significantly since initiation of the system.

2. System data statistical analyses[7] - Monitoring station data recorded during the period May 1971 to September 1973 were analyzed to identify typical statistical indicators of a central tendency (mean, median, mode, geometric and harmonic means) and of dispersion (range, maximum, minimum variance, standard deviation and coefficient of variation). Histograms and time duration curves for all stations and parameters were prepared. Example plots are shown in Figures 2 and 3. These plots are useful in comparing water quality conditions at various locations along the river as well as with established water quality standards, especially in relation to evaluating the efficiency of a water quality management policy.

3. Regional management application[8] - Use of the data as the nucleus of a real-time management system for use by a possible regional authority is underway. Three corrective measures for which operating policies will be applicable in the basin have been identified (i.e., control variables available in "real-time"): flow regulation, in-stream aeration, and effluent attenuation. Procedures for prescribing immediate short-term changes in these quality control variables are being developed by means of feedback control equations. It is only the advent of real-time monitoring that has made possible the study of real-time control; progress is encouraging to date and will be reported in the near future.

B. Modeling improvements for the estuary - Mathematical modeling of the Green Bay estuarial system has depended until recently on use of steady state approximations of the river and bay dynamics. Several reports have been produced describing use of the modified Streeter-Phelps equation to predict dissolved oxygen levels under a variety of flow conditions and effluent loadings[4,9]. A recent state-of-the-art report on limnological systems analysis of the Great Lakes identifies Green Bay as desirable for additional detailed modeling[10]. An unsteady state, two-dimensional mathematical model of the lower bay has been developed within the past year to predict water depths and velocities in a discretized approximation of the bay. Using the basic concepts developed by Leendertse and demonstrated in the Jamaica Bay study, Lee has replaced the tide with the wind as the primary driving force[11]. Recently he has also included the necessary additional equations to approximate the temporal and spatial variations of dissolved oxygen, DO, and biochemical oxygen demand, BOD. This model, when coupled with an improved approximation of the river system presently under development, will provide much of the additional insight necessary to understand the estuary essential to a possible regional water quality management authority.

Concurrent with the effort to improve understanding of the estuarial aquatic ecosystem, a massive wastewater treatment plant construction program has been underway in the region. Capital funds in excess of $100 million have been or are about to be invested in the lower Fox River in new and expanded municipal and industrial sewage treatment facilities. Included is a $70 million combined industrial-municipal treatment plant for sulphite pulp mill as well as municipal wastes scheduled for completion in Green Bay during the spring of 1975. Most of

this construction is, of course, heavily subsidized through both Federal and State grants.

II. Institutional Changes

Significant institutional changes associated with the water resources of the estuary have occurred during the past few years and some evidence exists to suggest that even greater changes will occur in the period 1975-80. New legislation, both state and federal, passed in recent years has been the prime mover in this regard. Two laws bear special attention: Sections 66-20 to 66-26 of Chapter 276, Wisconsin Laws of 1971 and Public Law 92-500, U.S. Congress. The Wisconsin law provided for the creation of metropolitan sewerage districts encompassing several municipalities. These districts represent one step toward the regional view. One group in the watershed, Kaukauna, Combined Locks and Little Chute, has already created a sewerage district to realize the economies of scale associated with a larger sewage treatment plant. The law also provides for expansion of existing districts, a particularly important feature for the Green Bay Metropolitan Sewerage District, which had legally not been able to receive petitions for annexation since 1969 when the 1931 law used to create the District was declared unconstitutional. Four petitions for enlargement of the District through annexation have been received since enactment of the new law.

Public Law 92-500, the 1972 Federal Water Pollution Control Amendments, has had a major impact on municipalities of the watershed and estuary, particularly Section 208 of the Law. Section 208 calls for:

1. The identification of urban industrial regions that require a regionally-oriented solution.
2. The identification of a single authority or agency capable of both conducting a feasibility study of alternative regional water quality management plans and implementing the selected plan as an operating regional authority.

Environmental Protection Agency administrative guidelines for implementing Section 208 call for all critical municipalities within a designated region to endorse the study and thereby implicitly agree to participate in the creation of a regional authority before the evidence supporting the need for such a new agency is available. The proposed area in the lower Fox River valley for such a designation is shown in Figure 4[12]. A major effort will be required in the lower Fox River valley to convince representatives of several municipalities to provide this endorsement. Section 201 of the law treats the provisions for Federal subsidy of new treatment plant construction, and Section 209 provides funds for a comprehensive basin-wide inventory of water and water related resources, thereby encouraging a regional view.

Increasing citizen awareness of the key role played by sewerage systems in community growth patterns has accelerated the trend towards a regional perspective. Within the past year a new multi-municipal coordinating committee of sewerage interests has been formed in the Green Bay area. Named the Metropolitan Sewerage Advisory Committee (MSAC), it is made up of three members each from the two public bodies with major treatment plants in Brown County and one member from the Green Bay-Brown County Planning Commission. The general objectives of MSAC,

as formally adopted by all three parent organizations, indicate the level of cooperation aspired to[15].

1. The improvement of water quality in the lower Fox River through the abatement of municipal and industrial wastes.

2. The promotion and fostering of economic efficiencies which may be obtained through coordination and cooperation between the Green Bay Metropolitan Sewerage District and the City of DePere in the operation of their respective treatment plants and supportive sewerage systems.

3. The support and promotion of orderly development (through the use of sound planning practices) within the urban and suburban areas.

Other evidence of increasing regional awareness is also apparent. Examples include:

1. The continued existence and periodic meeting of an ad hoc citizen group representing the major metropolitan areas in the lower Fox River. Including elected and appointed officials from both the Appleton and Green Bay area, business leaders and University of Wisconsin faculty, this committee has served to create an informal forum for discussion of regional water quality issues since it was formed in early 1971.

2. The creation of a metropolitan sewerage district in the Kaukauna Area as described earlier.

Conclusions

Two conclusions can be reached as a result of the investigations described.

1. The Green Bay estuary and related water system upstream to and including Lake Winnebago will likely continue to be a problem area of the Lake Michigan basin for at least another decade. This conclusion is based on the following considerations:

(a) Citizen awareness of the need to focus on the region rather than local areas is just developing. Key problems that must be solved, such as reduction of the heavy BOD loadings entering the lower Fox River as algae from Lake Winnebago during warm summer months when the river flow is low, will likely depend upon a regional effort. Studies funded through Section 208 of PL 92-500 will help materially to identify the need for a regional view. They may also set the stage for public debate on the creation of a regional water management authority.

(b) Knowledge of the aquatic ecosystem in the estuary is just beginning to be integrated. A real-time management of water quality in the river and bay will depend upon better use of the existing monitoring system as well as additional data on the physical and biological processes in Green Bay.

(c) Increasing costs and the general lack of public funds for these environmental concerns will probably delay implementation of acceptable programs.

2. Pressure, both public and private, will continue to be exerted for reduction of the pollution in the river and estuary. Attention can be expected to shift from municipal and industrial wastewaters to urban wet weather flows (storm sewer flows and infiltration ground water to sanitary sewers), and rural non-point sources. The rural problem, often due to surface runoff, will naturally lead to consideration of land management practices and zoning, a very sensitive and controversial subject.

The greatest challenge to this important section of the Lake Michigan basin during the decade ahead is unquestionably institutional rather than technical, even though the scientific and technical challenges are great.

The Sea Grant Program has served as a catalyst during this era of rapid change. Often the contributions of Sea Grant faculty participants have been subtle and unpublicized, nevertheless the catalytic effect has occurred. A continued role of the Sea Grant program in the future can be expected to assist substantially in coming to grips with these complex problems.

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Show and Tell: A Method for All Reasons

Rose T. Pfund
University of Hawaii

A dense black cloud hung over the University of Hawaii in April, 1973 when the 1973 session of the State Legislature adjourned with a $7 million cut in the University's operating budget, most of which was leveled at the budget of the main campus in Manoa valley. It seemed, indeed, that the dream for greatness in the development of a "first class" university had come to a screeching halt.

At the same time in the marine-related areas, the heady accent to a place of importance also suddenly seemed to hit ceiling or even seemed to be in jeopardy. In 1970, acting on the recommendation of the much touted plan for oceanographic research and development, Hawaii and the Sea, the Office of Marine Affairs Coordinator was established by the State Legislature in the Office of the Governor. In 1973, the office was barely alive with no new funds for research projects and only minimal funding to keep staff on the payroll.

As a new member of the Sea Grant College Program staff at the University of Hawaii, I monitored the proceedings and activities at the 1973 State Legislature and saw the tragic drama played out to its inevitable end. Finances in 1973 hit an all-time low in the state and the lack of funds was largely responsible for the wholesale cuts at the university and for research. However, the university, which is the prime recipient for research funding, did little but react to proposed legislation, and much of the testimonies presented were without decisiveness, even when it concerned the university directly, e.g., the Waikiki Aquarium, and too often they contradicted each other.

Another factor that soon became blatantly obvious was the nearly total ignorance of legislative processes on the part of researchers, be they faculty or staff. Not knowing who the legislators were or what the steps were in the procedure for enactment of a bill before it passed the legislature, most of them were at a complete loss as to what they should be doing when bills covering their particular areas of interest were heard by the various legislative committees.

There was also some confusion on the part of legislators and even complete lack of information about Sea Grant programs. In the eyes of many of the legislators, Sea Grant programs somehow were a part of the State's Office of Marine Affairs Coordinator. The mistake was partly caused by the fact that both the Marine Affairs Coordinator and the Dean of Marine Programs at the University of Hawaii is the same person.

The first problem, that of lack of information about legislative processes, was resolved by a workshop I coordinated for Sea Grant principal investigators. Eighteen Sea Grant researchers met face-to-face with four very articulate legislators, two senators and two representatives. For four hours, there was a lively exchange of ideas. Most of the researchers had never had an opportunity to speak to legislators and voice their frustrations on not being heard, but if heard, not knowing what the impact of their statements was. Did it make a difference? They wanted to know.

On the other hand legislators, too, had frustrations. Who was really giving the correct information when conflicting testimonies were presented? Whom should they believe? When they ask for information, they want just facts, not emotionalism or personal biases. They made it abundantly clear that once a testifier lost credibility, he was finished. Even with factionalism in the Legislature, it was still a tight-knit organization. It is all too easy to sever the fragile communication link and become *persona non grata*. Even high administration heads have found this out, all too well and too soon.

As the first step in the interaction with the State Legislature, the workshop was a resounding success. Both legislators and researchers went away with new found respect for each other. To Sea Grant's credit, there were now four legislators who saw and applauded the efforts being made in marine research at the University of Hawaii. One foot was in the door.

Show and tell: or a tour of marine research facilities

When it was discovered that most legislators had not been on campus for years or had actually seen the university's marine research effort, a facilities tour for legislators evolved as a natural answer.

The list of facilities which had been or were involved in Sea Grant funded projects was compiled and included the following: Waikiki Aquarium, Look Laboratory of Ocean Engineering, the hyperbaric facility, *R/V Kana Keoki*, Hawaii Institute of Geophysics, the laboratories of the Physiology Department, and the Hawaii Institute of Marine Biology. I called the director of each facility to inquire whether they would cooperate in setting up presentations if I could convince legislators to come on a tour. Although most of them were pessimistic about any legislator coming to the facility, they agreed. (Apparently they had held "open houses" which had failed to attract any legislator.)

I put together information packets on Sea Grant projects and activities and sent them to the Speaker of the House and the President of the Senate as required by legislative protocol. I was informed that the Senate had an interim committee drawn from the whole of the Senate and therefore there were not enough Senators who were responsible for marine programs and authorized to make official site visits. The House on the other hand, had authorized the convening of the total Committee on Finance to meet and operate as an interim committee. As in any other venture, persistence finally paid off. The chairman of the Committee agreed to schedule a tour back-to-back with an official meeting and the tour itself was to be an official function of the Committee.

Success! How sweet it was. The most formidable obstacle had been overcome. Now how to take the eight hours of precious time I had for scheduling and obtain optimum benefit for Sea Grant and marine programs as a whole? I developed the tour itinerary starting at the facility located at the most extreme point and progressed in one direction without backtracking. The extremely tight schedule that emerged was as follows:

Tour Itinerary

9:00 - 9:40a.m.	Waikiki Aquarium. Host: Charles DeLuca
9:40 - 10:00a.m.	Travel time to Look Lab at Kewalo Basin
10:00 - 10:15a.m.	Mini-bell hyperbaric facility. Host: Richard Strauss
10:15 - 10:45a.m.	Look Lab. Host: Tom O'Brien (Coffee break)
10:45 - 10:55a.m.	Travel time to Pier 18
10:55 - 11:45a.m.	Kana Keoki. Hosts: Don Hussong, Chris Cooper, Dave Hurd, Frisbee Campbell
11:45 - 12:05p.m.	Travel time to UH campus
12:05 - 12:45p.m.	Hawaii Institute of Geophysics. Host: George Woollard
12:45 - 1:15p.m.	Travel time to Hawaii Institute of Marine Biology dock in Kaneohe
1:15 - 2:00p.m.	Lunch
2:00 - 4:00p.m.	Tour of facilities on Coconut Island (Hawaii Institute of Marine Biology) Host: Phil Helfrich

The minute-by-minute time schedule is important and even more important is that the tour coordinator force the participants, speakers and tour participants, to adhere to the schedule. It is very easy to become lax. But to lose control of time is an injustice to all concerned, not just to the individuals who are touring but also to those who are making the presentations.

Let me pass on a few words of advice on protocol which I think will hold just as true for Albany, New York, or Seattle, Washington, as it does for Honolulu, Hawaii. Once an official group such as the state House Finance Committee has agreed to tour the facilities you want them to see, you are not at liberty to "add on" other individuals. This constitutes a breach in protocol. I invited the Speaker of the House and the Chairman of the House Committee on Higher Education, but only after clearance with the office of the Chairman of the Finance Committee. Do not even think about mixing the two houses. If you are inviting

county officials to go on a tour, group only congenial counties together. If you don't know what the relationship is between counties, don't take a chance and mix them.

Successful tours depend on meticulous attention to detail which can range from the method of doing the briefing, avoiding things that can irritate or harass the participants, being cognizant of their attention span and hunger pangs, and providing for parking.

The following method should ensure successful tours:

Pre-D Day: It is important to first solicit the cooperation of all participants who will be showcased by the tour. They need to be briefed on who will be on the tour, what they should focus on (for example, legislators are moved by their constituents, therefore, what is important or beneficial to their constituents will be important and beneficial to them; hence, the programs and activities of each facility should be presented in the context of statewide applications and benefits), what they should not focus on, the time the group will arrive at their facility and the exact time you have allotted for them to make their pitch. It is also important that several persons participate in the briefing to maximize attention span. Don't let the head of the facility do all the talking. Tell him tactfully that the worker engaged in the activity he wishes to showcase can really sell the project better than his second-hand presentation. The tour coordinator should know or know of the persons who will be making the tour. It may be worthwhile to discuss with the head of the facility what he is planning to highlight and give him guidance. (See Appendix A: Memo to Facility Hosts.)

If transportation is by private cars, it is important that parking stalls are set aside for the tour participants, especially if the facility is in a congested area.

Plan the lunch stop at a convenient facility which has a pleasant site for lunch, preferably a beach location. The Hawaii Sea Grant has never paid for lunch for anyone on these tours. The participants were told ahead of time that lunch was "dutch treat" but cold drinks were provided at the lunch site.

D-Day. Arrive at the starting site ahead of the tour participants. As they arrive, do the normal introductions to the facility staff. Have name tags available if the group is larger than ten. Start on time and keep the tour active and diversified. Keep things moving at a rapid pace, not only in the verbal presentations, but in the walking tour of the facility. Cut off at the agreed time and move on to the next facility.

Since physiological functions are uncontrollable, you need to be cognizant of rest stops and that all important coffee break. It is crucial that they be told, even if it shows on their itinerary, that lunch will be delayed if such is the case (as it was with the tour I put together), and encourage them to stave off starvation during the coffee break. Nothing cuts off communication reception

more effectively than unrequited gastric juices or the need to answer that all-important call to relieve an overfilled bladder.

If you have planned well, there should be no major problems other than getting the facility personnel to quit talking. Alert the speaker that he has "three minutes to wind up his presentation" and cut him off after three minutes. The tour coordinator has to be the "bad guy" and push the group along. You need to keep on schedule or you're in for logistic problems as the time lag increases exponentially, not arithmetically.

Benefits resulting from the tour

The glowing letter written by Chairman Jack Suwa (See Appendix B) was a feather in the cap for Sea Grant. However, it was, at that point, a matter of speculation as to whether members of the State Legislature would put their money where their mouths were and deem Sea Grant Programs important enough to the State to provide special funding.

The 1974 Session provided the opportunity to put the moral support we had been given to a test. Companion bills, House Bill 2285-74 and Senate Bill 1528-74, were introduced in the State Legislature by interested legislators. The bills requested $260,000 in state matching funds for Sea Grant. In sorting out the funding request proposed through the Marine Affairs Coordinator's (MAC) office, it was discovered that there were areas of overlap. Thus the final request for matching funds was reduced to $120,000 with the difference in matching funds being provided by the MAC office.

In reporting out the Sea Grant bill the Senate Committee on Higher Education stated in part:

"The significance of retaining Sea Grant College status for the University of Hawaii is quite substantial. In addition to gaining $2 of Federal money for each State dollar (actually the state will receive 6 Federal dollars for each dollar appropriated in this Bill), the marine programs which are sponsored by Sea Grant funds are critical to the economy and welfare of Hawaii. Sea Grant has responded to urgent problems in the State, such as environmental problems in our coastal waters; it has provided the research to spawn new industries, such as intensified aquaculture and fish and prawn 'farming'; and it has assisted in the expansion of existing industries, such as the three-year precious coral program, which has provided the basis of expansion for the coral jewelry business from a $2.5 million business annually to $8 million, resulting in an expansion in employment and an increase in tax revenues of approximately $1.5 million annually.

"Your Committee has been a strong advocate of the creation of 'selective excellence' for the University of Hawaii system, and has recognized that our marine programs are so critical to the State that they must necessarily fall within this category singled out for emphasis. Your Committee sees the benefits of the Sea Grant College designation of the University of Hawaii to be key to the development of excellence in this area, and your Committee recognizes that this

is one area in which Hawaii cannot afford to settle for second best. The matching funds which are required to maintain our existing Sea Grant status are an investment in the future of our island State, and are especially well spent in that they generate two Federal dollars for each State dollar to be expended in our behalf.

"Your Committee on Higher Education is in accord with the intent and purpose of S.B. No. 1528-74, and recommends its passage on Second Reading and its referral to your Committee on Ways and Means for further consideration."

House Bill 2285 was incorporated in the House Omnibus Bill on Higher Education and carried a note that funds will be "forthcoming from anticipated appropriations from the Marine Affairs Coordinator. Thus your committee (House Higher Education Committee) is appropriating $120,000 for fiscal year 1974-75."

The House Committee on Higher Education included in its report on the Omnibus Bill the observation that "Hawaii's unique location in the Pacific Ocean makes it inevitable that the University of Hawaii be one of the leading institutions in the ocean sciences."

Further support for Sea Grant was expressed in the amendment written into the MAC appropriation bill by the Senate Committee on Economic Development, to-wit: "and in particular, special attention should be given to matching funds of the Federal Sea Grant Program."

When the dust settled after the 1974 Session of the State Legislature was adjourned on April 11, 1974, the $120,000 appropriation, earmarked as "funding of the Hawaii Sea Grant Program," was finally lodged in HB No. 2374-74 and signed into law by the Acting Governor. The State's Office of Budget and Finance currently has the University's request for release of the funds.

Besides acting as the catalyst which activated the chain of events that precipitated the appropriation of $120.000, the facility tour also opened the way for the House Committee on Higher Education to tour other academic facilities on the Manoa Campus. Subsequently, I coordinated tours for county administrators and the Board of Regents. As a final note, the county administrator's tour prompted a request from the County of Hawaii to Sea Grant for support in obtaining data to enable them to make rational management decisions affecting the nearly virgin west coast of the island of Hawaii.

APPENDIX A: MEMO TO FACILITY HOSTS

UNIVERSITY OF HAWAII

Marine Programs
Sea Grant Programs

MEMORANDUM

July 13, 1973

TO: Legislative Tour Facility Hosts

FROM: Rose Pfund, Tour Coordinator

Attached please find the time blocks for the tour I spoke to you about. As you can see the schedule is very tight. Please stay within the time blocks. We may have some problems with the travel time, but will hope for the best.

The following will be on the tour:

Members of the House Finance Committee:

Jack Suwa, Chairman	Keo Nakama
Clarence Akizaki, Vice-chairman	Jann Yuen
Anson Chong	Alvin Amaral
Tetsuaki Kishinami	Ralph Ajifu
Ronald Kondo	Wing Kong Chong
Tony Kunimura	Andrew Poepoe
Ted Morioka	

Tadao Beppu, Speaker of the House
Robert Kimura, Chairman, House Committee on Higher Education

The latter two will join us somewhere along the tour route.

Also on the tour:

Phil Helfrich
Dewey Kim
Stuart Brown
Fujio Matsuda
Rose Pfund

General comments and free advice: Be down to earth. Relate things and activities to Hawaii (remember all of the legislators are conscious of their constituencies). Don't be bashful about detailing what problems you face. The last thing they want to hear is a glossy, rosy story which is obviously not true. If there were wrong judgments made somewhere along the way, don't be afraid to admit them, no matter who made the mistake(s)--yourdepartment, or the UH administration, or whoever. The main thing to keep in mind is absolute honesty. The University does not have a very high level of credibility at the State Legislature as you are all aware. Please look upon this tour as the first step in establishing a firm and honest relation with members of the State Legislature.

APPENDIX B : LETTER OF APPRECIATION FROM CHAIRMAN JACK SUWA

HOUSE OF REPRESENTATIVES
THE SEVENTH LEGISLATURE
STATE OF HAWAII
STATE CAPITOL
HONOLULU, HAWAII 96813

July 18, 1973

Ms. Rose Pfund
University of Hawaii
Office of Sea Grant
2540 Maile Way
Spaulding 255
Honolulu, Hawaii 96822

Dear Rose:

This is to thank you and all of those who made possible the Finance Committee's field inspection of the various marine research facilities yesterday.

The Finance Members got a better insight into your operational requirements and staff needs. Let me also say that the members felt pleased with the frank and open discussion of your financial plight in contrast to some less productive approaches that could have been used. I feel that the tour was an auspicious beginning in improving dialogue and mutual understanding between the University and the Legislature.

On behalf of Speaker Beppu, Higher Education Chairman Kimura, and the Finance Committee, please accept my thanks for a job well done. Could you also convey my appreciation to Dr. Brown, Dr. Matsuda, Dewey Kim, Charles Deluca, Phil Helfrich, the Look Lab staff, the crew of the Kana Keoki, George Woollard, and all the rest who made our visit most enjoyable.

Mahalo.

Sincerely,

Jack K. Suwa

Jack K. Suwa, Chairman
Committee on Finance

cc: Honorable Tadao Beppu, Speaker
Honorable Robert Kimura, Chairman,
Committee on Higher Education

Intra-University Management and Development Of Sea Grant Institutional Programs: Comments on the Louisiana Experience

Jack R. Van Lopik and Ronald E. Becker
Louisiana State University

Introduction

Administration of university Sea Grant programs involves a wide variety of management and development problems. Challenges posed by programs encompassing a multiplicity of disciplines and functions are well known and all too numerous. They are compounded by requirements to provide programmatic focus and direction for--and performance assessment of--numerous individuals and organizational entities over which the director often has little administrative control. They often involve cutting across the grain of traditional academic policies, values, and territorial preserves. These challenges and requirements must be met with admittedly inadequate funds and within a framework of goals and objectives determined by careful evaluation of often-conflicting local, regional and national needs. In addition, program accomplishments must be widely publicized through effective utilization of scientific-community and public communications media with acknowledgment given the appropriate principal investigator, university official, politician, and sponsor--preferably in a manner that will permit each to claim full credit for the achievement.

Maintenance of program thrust requires dealing effectively with intra-university problems, conducting university liaison with "external" entities, and assisting in definition and focus of the national Sea Grant program. Many intra-university activities involve "people-to-people" situations. For example, directors must interact, motivate and communicate persuasively with high-level university officials; deans, directors and department chairmen; individual researchers; program administrative and technical services personnel; and specially-created advisory bodies (Figure 1). Liaison or interface problems include program and/or university relations with other universities, business and industry, and a spectrum of political entities. The university/federal government interface is particularly critical. How should the university-based program interface effectively with NOAA, congressional delegations, Office of Management and Budget, and science-based federal agencies? University/state government relations are also vitally important. How can the university program best interact with various legislative bodies, state agencies, and organizational units in the governor's office? the university/industry interface involves relations and cooperative efforts with individual companies and industrial or commercial associations. The university/public interface involves relations with media service personnel, school teachers, environmentalists, alumni, etc. In multi-institutional programs there are university/university interface problems that usually require individual attention. Aspects of the university's relationship with the Sea Grant Association can also be included in this category.

I. INTRA-UNIVERSITY PROBLEMS

- A. High-level University Officials
- B. Deans, Directors and Department Chairmen
- C. Individual Investigators
- D. Administrative and Technical Services Personnel
- E. Advisory Groups (Internal)

II. LIAISON AND INTERFACE PROBLEMS

- A. University/Federal Government Interface
- B. University/State Government Interface
- C. University/Industry Interface
- D. University/Public Interface
- E. University/University Interface
- F. Advisory Groups

III. NATIONAL PROGRAM PROBLEMS

- A. Priorities and Policies
- B. Goals, Objectives and Milestones
- C. Response to National Needs
- D. Need for International Programs
- E. Congressional/OMB Liaison
- F. Relations with Other Federal Agencies
- G. Building a Constituency and Favorable Public Image

Figure 1. Sea Grant Programs Problem Categorization.

Problems associated with national program development are somewhat more difficult to categorize, but they essentially involve organizing the total Sea Grant system--or selected parts of it--to address issues of national significance. Mechanisms must be developed to (a) formulate policies and priorities, (b) define program goals, objectives and milestones, (c) respond to specific national needs, (d) permit effective total program liaison with Congress, OMB and other federal agencies, and (e) build a constituency and favorable public image. The national Office of Sea Grant should assume the leadership role in this effort, but university participation must be assured. The ongoing preparation of a five-year plan recognizes many programmatic and involvement needs.

The attention focused on each problem area will vary considerably among university Sea Grant programs. However, specific problems in each area must be addressed if dynamic local and national programs are to evolve. This paper deals primarily with intra-university problems, as perceived from our experience at LSU, but the need for concurrent action in areas related to liaison and national program development should be fully recognized.

Intra-University Problems

Effective development of a university Sea Grant program can be thwarted by organizational shortcomings and faculty attitudes. As the primary role of the university is teaching, most institutions are structured to serve this function. Public service and, to some extent, research functions are as yet ill-defined, uncoordinated, and department- or discipline-based. This situation limits the capability of a particular university to respond to problems within a user-dictated time frame and to implement interdisciplinary efforts. It also perpetuates a reward structure based almost exclusively on individual excellence with little recognition of team performance capabilities. As a consequence, the team player is hard to find and the instructional function is the only one that can be programmatically described as systematic or ordered. Discipline-based peer group evaluation--both within the university and the scientific community--further discourages interdisciplinary activities and glorifies "ivory tower," "search for truth," and "basic research" endeavors. Highly specialized basic research must certainly be continued, but the need for applied and public service activities is becoming increasingly apparent. Unfortunately, long compliance with discipline-based research and peer group standards often creates major problems for individuals who venture outside the ivory tower. Many are apparently highly susceptible to social movements of a "true believer" or advocacy nature that ignore scientific and objective evaluation of problems and conditions.

The university faces a major challenge in maintaining its conventional teaching and discipline-based basic research efforts while expanding its applied and public service activities. A university cannot--and should not--make or advocate specific social decisions; it can--and should--document needs and provide capabilities that will assist spokesmen for appropriate governmental, industrial and citizen organizations to implement programs essential for the optimum development of our lands and resources--both natural and human. The university and individual faculty members must preserve respect for dispassionate analysis

and scholarly judgment while conducting applied and public service activities. This respect should also accommodate external review and criticism--some of which may not be truly objective--in assessing university performance of its functions. The ability of universities to dispassionately accept and evaluate such criticism--and systematically generate self-criticism--is surprisingly limited.

The university cannot, however, assume a passive public service role. Problems of special concern should be sought out and attempts made to address them. Continuity of pertinent research is essential to effective public service, and it cannot be supported solely by short-term grants and contracts. The Sea Grant program is extremely timely and appropriate to aid universities in developing additional applied research and public service capabilities of a continuing nature. Establishment of endowed chairs or professorships can also assist, but the university must make a positive commitment of its own resources and energies if public service activities are to be successful.

Most of the above-mentioned concepts are not universally endorsed by university administrators and faculties, and the differing attitudes within a university hinder Sea Grant program development. In the following section the attitudes and motivations of several university groups are discussed. As is true of any generalization, there are exceptions. Such exceptions, however, can be important clues for a Sea Grant director to recognize and fully develop to the advantage of the program.

High-level University Officials

Although chancellors and presidents can and do lend moral support to programs that offer added prestige to their institutions, their assistance in obtaining the monetary and human resources needed to make a program succeed is necessarily limited. Many constraints and pressures imposed by other elements within and without the university limit the extent of real control they exercise in these matters. Indeed much of a university's budget consists of dedicated funds, so committed for tenured faculty, operations and maintenance, etc. First call on the modest funding increases that are secured from state sources is necessarily for faculty promotions and incremental costs of inflation.

These individuals can assist the director in several important, albeit subtle, ways. They can be instrumental in securing needed cooperation from the university's business and service operations. They can assist in publicizing the program state-wide, and they can lend at least tacit support for efforts to obtain special legislative appropriations.

Factors that motivate high-level support are the possibilities of enhancing university prestige in the scientific community, increasing ability to attract students and research dollars, and increasing alumni support and regard for the university. The public service functions that Sea Grant promotes are potentially useful for enlarging the statewide constituency, and in turn enlisting

legislative support for the university's total program. Without such public service and research involvement, there is a serious question whether present budget levels can be justified on the basis of student enrollment alone.

Conversely, there is an ever present concern that expansion of research and public services may over-extend available manpower, physical plant and support services, with consequent weakening of the instructional program. "Soft money" is a perennial bugaboo, insofar as it may lead to staffing levels above those that more secure funds can absorb. Matching fund requirements necessarily limit the level of institutional commitment. Caution may be encountered in gaining approval for public service activities that could result in controversial positions and advocacy role-taking by faculty.

In summary, support of university officials at the top level is vital to the success of a new program, but is not apt to be unreservedly provided. These officials cannot give you total dedication or anywhere near full-time attention. They expect you to make the program a success--that's why you have the job.

Deans, Directors and Department Chairmen

This group can be extremely difficult to deal with, not because the individuals are inherently perverse, but because their jobs/objectives are apt to conflict with programs that cut across the established compartmental boundaries and discipline-based hierarchies of the university. The need for their support varies directly with the control they exercise over their organizational units. If they run a highly structured, monolithic and tightly controlled unit, their sanction will be essential for harmonious participation of their faculty members in Sea Grant work.

Members of this group are motivated by funds and faculty positions, especially those that involve long-term commitments. Even so, they are invariably convinced that they have a highly prestigious organization which can only be weakened unless they control hiring of new faculty and the quality of research. Accommodations may be difficult to achieve for the kind of people needed to participate in team efforts and react to external needs.

An alternative to providing Sea Grant support for new faculty in academic departments is recruiting of needed specialties by the Sea Grant office. This understandably threatens the discipline-based establishment, since it raises the specter of competition for funds, duplication of effort, and weakened quality of research--which might prove to be a source of embarrassment. Undeniably, Sea Grant activity detracts from the "search for truth" basic research emphasis which many scientists defend as essential for scholarly excellence.

In summary, support from members of this group may be slow to materialize; when it does, one should be extremely appreciative. Department chairmen can be very helpful in achieving Sea Grant goals and objectives, but can only be expected to provide wholehearted support when the objectives coincide with their own. Departments are the bulwarks of the university power structure, and it seems very unlikely that they will modify their discipline-based orientation substantially

regardless of inducements offered for participation in applied, multidisciplinary, socially relevant programs.

Individual Investigators

The faculty scientists who serve as principal investigators are the backbone of Sea Grant effort; their participation is vital to achieving anything of lasting merit. Their enthusiastic support of Sea Grant ideals can be a powerful force for enlisting participation of their colleagues and influencing opinions of deans, directors, and chairmen.

Faculty researchers are readily motivated by opportunities to participate in new fields of endeavor, especially when such opportunities are accompanied by funds for graduate assistantships, discretionary travel and expense monies, student wages, and the like. However, well-established scholars have usually developed other funding sources to sustain their research, and may be fully committed. To win them over requires patience, persistence, and the lure of assured summer appointments over several years.

The most promising young scholars entering the job market, with greatest potential for long-term commitment to Sea Grant goals, are all too often "turned off" by the "soft money" aspect. Frequently they express a strong desire to teach, whereas such involvement cannot be supported by available funds. On the other hand, the established staff member may bridle at what he perceives to be overmanagement and applied activities that detract from his basic research pursuits. Indeed, Sea Grant involves serving two masters, but departmental reward criteria may not recognize Sea Grant accomplishments.

For many, the tangible rewards from private consulting are more attractive than salaried participation in applied research and applications. The investigator who tries to do both risks conflicts of interest that may damage both himself and the university, especially when his Sea Grant involvement has a strong public service orientation.

Careful planning is a vital prelude to enlisting productive faculty investigators. The director should have a well-defined program need in mind before enlisting participation; inviting across-the-board submission of proposals can reduce a well-planned program to shambles and destroy program credibility. The types of research project funding--directed, cooperative, and exploratory--should be spelled out to prospective participants, and advisory service responsibilities should be made clear. Finally, recruit team players--try to avoid the academic huckster who does his own thing under a rationalized guise of Sea Grant relevance.

Administrative and Technical Services Personnel

University personnel in the contracts, purchasing, printing, information services, accounting, and operations/maintenance fields can play a very significant

role in assuring program success. They represent a significant resource of the university that can be partially harnessed to support Sea Grant activities.

The director who has not had previous experience in working with these groups will be at a disadvantage because he will not understand their internal policies and procedures. For the most part, there is no valid reason to expect more than routine support from them, unless a high-level administrator has requested special consideration.

Service personnel are usually paid entirely from the basic university operating budget, and many are classified employees. Many research and public service programs sponsored by the federal government create additional amounts of paperwork for these individuals with no compensating increase in salary, assistance or recognition. In most service areas, it is not practical or especially desirable to compensate for services by providing funds for student labor, supplies and expenses, travel, etc. An exception to this is the university information office, where student labor can be utilized productively. Some activities, e.g., printing and operations and maintenance, bill for their services anyway. Optimum results are achieved by developing good working-level relationships. Avoid requests for rush service unless absolutely necessary, and be appreciative when it is given. (A vengeful printer is a real force to be reckoned with, and his mistakes cost a lot more than hurt feelings.)

In short, try to conform with procedures established for these activities. Get to know key individuals on a face-to-face basis. Be reasonable in requests for service out of the ordinary, and take the time to express your appreciation when special services are rendered.

Advisory Groups (Internal)

Advisory bodies composed of university personnel usually fall into one of two categories, i.e., overview or technical. Internal overview groups should be comprised of scholars with no empire to defend or enlarge, and the scope of their involvement should relate only to technical overview. Advisory bodies concerned with particular program areas or specialities should preferably be ad hoc groups called together for advice on specific technical questions.

The sole motivation of an internal advisory group should be to assure program quality and progress. Scholars with a grasp of several disciplines and/or awareness of activities in several parts of the university are especially suited for this role.

Unless the scope of the technical advisory function is clearly defined, conflicts with the Sea Grant director may ensue. On the other hand, if such involvement is totally divorced from operational decision-making, neither the participants nor their department heads may deem it worth the trouble.

If you must name internal advisory groups, try to avoid involvement of university administrators; regardless of their technical competence, they will invariably be looking out for their own interests. Limit the involvement of such

bodies to advice on technical matters, and only convene them when their counsel is desired.

Program Design and Management

Successful program design and management requires that a director be cognizant of problems and constraints posed by the philosophies and attitudes characteristic of his institution. His own attitudes and concepts concerning program development should be sufficiently well defined to permit taking firm and defensible--but not inflexible--positions on a variety of issues. He should have definite ideas regarding the optimal mix of program effort to be expended in (a) understanding state problems and natural phenomena, (b) developing predictive capabilities regarding natural processes and man's impact on nature, and (c) developing operational response capabilities to directly serve organizations and the public.

The proposed programmatic balance should be supplemented by conceptual definitions of what is needed in each of the three areas. For example, the operational response area should not be thought of as an applied research activity that produces scientific reports on relevant problems. The distinction between applied research and the application of research should be clearly recognized and the importance of the latter stressed. This area is truly the interface between knowledge and action and deserves high priority in any Sea Grant program. It is where barriers of language, psychology and social/personal values come into play, and stereotype concepts of extension and/or consulting services must not be blindly employed in efforts to generate program acceptance by state agencies and the public. Effective operational response involves much more than a cooperative study of a problem. The process actually requires joint identification of a problem, cooperative study and solution, and cooperative implementation of a solution. Furthermore, these actions must be accomplished within a user-dictated time frame. Such demands are usually not faced or satisfied by universities.

The Sea Grant program director who wishes to extend university capabilities in this direction must, therefore, soon address the problem of establishing an organizational structure--acceptable to the university--that can conduct needed research and educational activities and can be mobilized for quick response to operational needs of various agencies and publics. It is inevitable that he will devote considerable effort to formal planning activities that will crystallize and document a blueprint for future program growth and development. He must ask what is the size and composition of a core group staff required to meet these needs? Can needs be met through existing organizational units, and if so, can the director maintain adequate control of the program elements? What is the best organizational framework to assure growth, development and continuity for quick response capabilities? These and many other questions are important elements in program design and development and must be addressed in building a philosophical basis for each university Sea Grant program.

During the early stages, the program organization is apt to reflect the kinds of talent and interests that are readily available within the university. The

director's greatest challenge is to shape these talents, and others that can be recruited to the cause, into an effective, mission-oriented team. This requires a certain level of organizational and management skill; but more specifically, it requires a plan to elaborate the kinds of missions and activities in which the team will engage. To be useful and meaningful, the plan must reflect the particular circumstances and resources of the host state. It must be sufficiently specific to incorporate the talents and interests of available team members, yet sufficiently general to address comprehensively broad fields of application. Multidisciplinary representation within each specified program area is needed to surmount the limitations of discipline-based scientific specializations, which are not usually congruent with the information needs of user groups and organizations. At LSU, the development of each major program area and, in effect, the total university Sea Grant activity involves consideration of five program design factors (Figure 2):

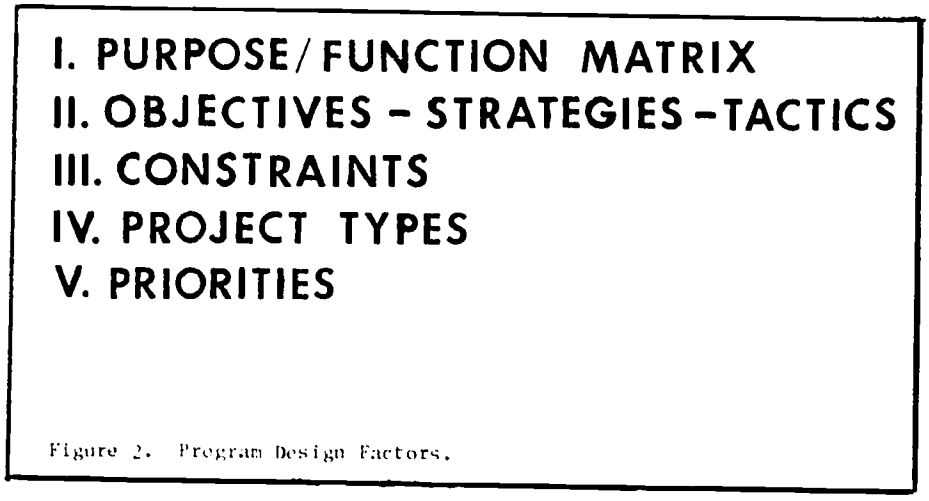

Figure 2. Program Design Factors.

Although each factor will be discussed individually, effective program design requires their consideration in concert and careful assessment of inter-factor tradeoffs.

Purpose/Function Matrix

Sea Grant functions of research, education and advisory service are well known and widely employed in program design. Less attention has been given the identification and definition of broad purposes these functions are to achieve. A simple and useful categorization of purpose is *comprehension*, *prediction* and *operational response*.

Comprehension identifies those activities or projects designed to achieve better understanding of a particular situation, condition, need or phenomenon. This

might involve investigation of ecosystems, educational needs at specific levels or in selected fields, or study of institutional problems or functions associated with a specific agency or public. Such projects occupy the basic research or problem definition end of the Sea Grant spectrum of activities.

The [illegible] category includes projects or activities conducted to develop a capability to forecast the occurrence and variability of natural phenomena or the impact of specific actions on a system or subject of interest. Predictive techniques might be sought to permit forecasting the effect of increased rainfall on the total biological or commercial productivity of an estuary, the effect of training specified numbers of boat operators on the offshore supply industry, the impact of a specific construction project on environmental or ecosystem stability of a region, or the economic significance of introducing new technology in a specific fishery. The development of predictive capabilities is essential if knowledge is to be effectively utilized in the management of human and natural resources.

[illegible] is the capability to provide "quick fix" services to various agencies and publics. The ability to provide these services in a satisfactory manner--be they of a research, educational, or advisory service nature--is dependent upon the knowledge and predictive capabilities available to the program, the effectiveness of its organizational/management structure, and adequate funding.

The simply-derived purpose/function matrix provides a useful guide for the design and evaluation of specialized program areas (Figure 3). For example, a Sea Grant systems ecology program would ideally contain projects or activities that fit not only in the research-comprehension element of the matrix, but in many other elements as well. This is not meant to imply that Sea Grant should support activities in each element of the matrix, but the director or program coordinator should know where required inputs can be obtained, and at least weigh the desirability of initiating projects in these elements versus others. Whereas it is the usual university tendency to design programs that are skewed toward the research-comprehension corner of the matrix, serious program imbalance can also occur if advisory service-operational response activities receive emphasis inconsistent with the existing knowledge-predictive capability base. This has been succinctly described as "peddling from an empty cart."

In analyzing a program area, the three purpose categories can also be viewed schematically as three concentric rings. The core represents *comprehension;* the next ring, *prediction;* and the outer ring, *operational response* (Figure 4). Within a specific program there are always more candidate activities (or sources of information) in each ring than the available resources can accommodate. Consequently, planners should attempt to design a program wherein at least some of the active elements in each ring are aligned from the core (comprehension) across the outer ring (operational response). This alignment of elements or activities is one of the essential factors in producing a truly responsive and effective program. Special attention must also be given the problems associated with the science/management interfaces that occur between rings as well as identification of significant problems within each ring.

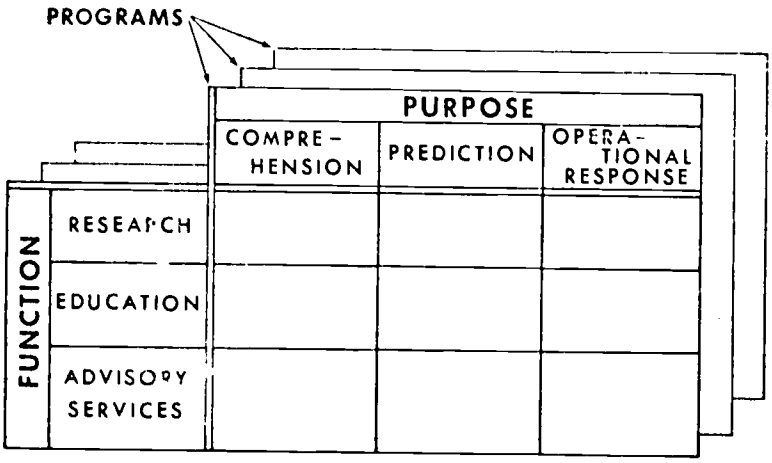

Figure 3. Purpose/Function Matrix.

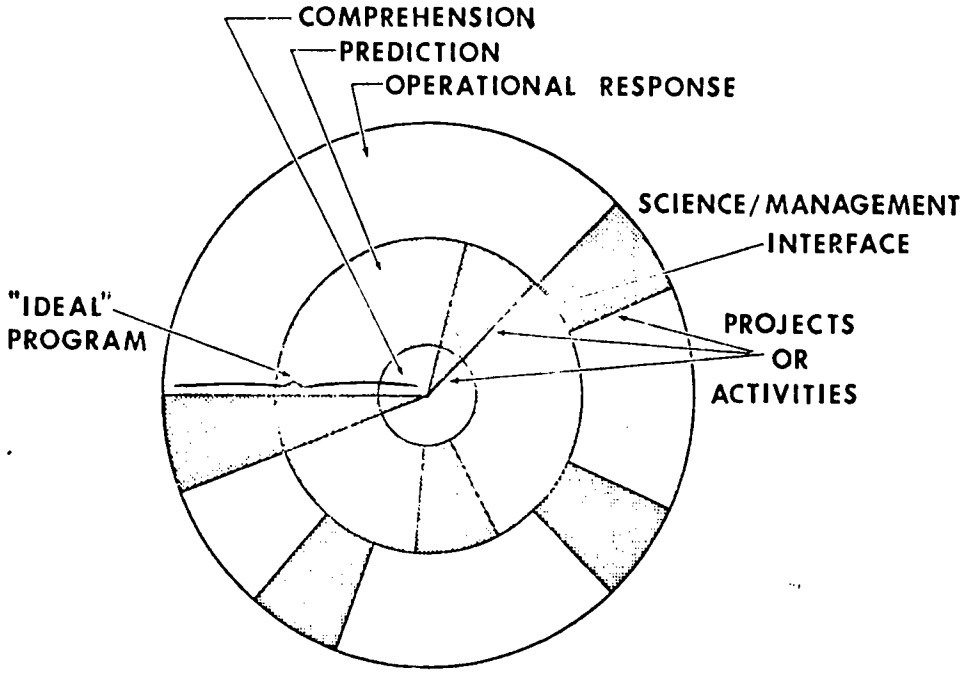

Figure 4. Purpose Relationships and Program Design.

Although the purpose/function matrix has obvious utility as a tool for designing and evaluating specialized program areas (e.g., systems ecology, fisheries technology, ocean engineering), several matrices comprising a third dimension must be studied simultaneously when considering a complete university Sea Grant program. This illustrates the importance of designating individual program coordinators for each specialized program and the functional areas of research, education, and advisory service. If research, education and advisory service projects are being conducted that do not fall within any of the designated program areas, the reasons for their conduct should be examined in terms of program design elements discussed in the following pages. This is not to imply that there may not be valid reasons for such projects and activities, but the fact that they do not fit into "main stream" programs should be recognized and justified.

The organizational scheme that results from examination of specialized program and function relations embodies matrix management in its simplest form. At LSU we designate coordinators for the functional areas of research, education, and advisory service, and for each specialized program area. The latter includes systems ecology, waste effects, fisheries and seafood technology, coastal zone planning and development, and law and socio-economics. The number of projects included in each program or functional area usually dictates the amount of time each coordinator must devote to management activities. In principle, program coordinators have primary responsibility for achieving programmatic objectives and maintaining balance and alignment among projects or activities in the [illegible] and [illegible] categories. Functional coordinators have an overview that spans all the program areas, and are also primarily responsible for projects and activities that do not fall in specialized program areas. They assure that appropriate elements of research, education and advisory service are incorporated in the specialized programs. They also perform the synthesis and overview functions required to maintain total program direction and thrust. As goals and objectives of the programmatic areas become better defined, and available personnel mature in the use of management skills, the program and functional coordinators can effectively act as a management team for the total program.

Objectives, Strategies, Tactics

In developing individual Sea Grant project proposals, considerable attention is accorded establishment of objectives, identification of users, formulation of an investigative plan or approach to the problem, and specification of milestones. Unfortunately, simply aggregating these aspects of individual projects does not create a dynamic program. Comparable attention must also be given programmatic definition of goals or objectives and the general courses of action or activity necessary to achieve these goals. It should also be noted that achieving research, education or advisory service goals within specialized areas is often highly dependent upon astute marketing and management strategies and tactics. Such management and marketing actions must be carefully identified, planned, scheduled and implemented--and the development of their associated objectives, strategies and tactics is an essential element of program design.

University Sea Grant programs are subject to a wide variety of constraints, and failure to appreciate their importance or significance can adversely affect program development. The most obvious constraint is insufficient funding and its direct curtailment of program development is easily recognized. Adjusting budgets is a routine, if painful, management activity. There are, however, indirect effects related to "rising expectations" of participants that are not so easily recognized or handled. If hoped-for increases do not materialize or severe fluctuations occur, a director can lose credibility and the support and interest of investigators. Physical constraints relating to the availability of space, facilities and equipment can restrict program growth and lead to serious morale problems. Lack of human resources or technical capabilities in selected scientific or technical fields limit a program. It is, however, better to recognize these inadequacies and correct or work around them than to be lulled into a short-lived sense of progress with incompetent or inadequate personnel. Closely related to this is the need to fully appreciate state-of-the-art limitations that cannot be rapidly overcome regardless of the excellence of your investigators.

Constraints imposed on individuals and the program by psychological and attitudinal factors must also be recognized. Personality conflicts can be expected when individuals, accustomed to working alone or in complete charge of a small group of students, are required to work cooperatively with a group of like individuals. Some people will not be able to work effectively with others and programmatic modifications will be necessary. As discipline-based peer group recognition is not usually accorded multidisciplinary researchers, it serves to discourage participation of otherwise capable persons and mechanisms must be devised to compensate for this fact. The reward structure of the university, which is usually geared to discipline-based or departmental evaluations, also serves as a deterrent to participation. In many universities there is discouragingly little incentive for the individual faculty member to engage in research activities within the framework of the institution's grant/contract administrative framework.

The long lead time between submission of a proposal and possible funding deters many researchers from Sea Grant participation. So does the need to provide frequent progress reports and research results in formats that are inconsistent with accepted peer group publication standards. The power structure and organizational barriers to multidisciplinary participation must also be carefully considered in program development. All of these constraints must be recognized and appropriate action taken or accommodations made to minimize or mitigate their effects. Advantages of association with Sea Grant activities must be repeatedly emphasized.

The advantages and rewards available to investigators for participation in the Sea Grant work beyond those conventionally associated with university employment are of several types. The most straightforward of these relates to the power of the paycheck. Opportunities to do summer work attract many faculty on academic year appointments, but continuity of work during the academic year must be assured if summer funding is to be productive. In some situations, individuals may

be employed full-time on Sea Grant funds. This arrangement, when it involves personnel in departments over which the director has no control, can eventually pose a burden both to the individual and the director. Unless the employment period for which Sea Grant is willing to assume total responsibility is clearly specified at the outset, administrative motivation to secure permanent funding and to fully integrate the individual into regular departmental standing may not be volunteered or forthcoming.

A significant reservoir of latent interest has been uncovered among faculty investigators whose research in the marine/estuarine environment has been limited by operational constraints. In such cases, modest logistical support, including use of boats, camp facilities and sampling gear can be a powerful incentive for participation. Another powerful tool for eliciting cooperation and good will involves Sea Grant public information resources; we are able to publicize researchers' accomplishments and support their publication efforts by a variety of means that are not usually available to university researchers. Through these devices, the information dissemination and logistics support functions become important extensions of the director's management capability.

Project Types

Categorizing projects on the basis of the amount of control that can be exerted over their definition and conduct has proved to be a useful aid in program design. We classify projects as directed, cooperative and exploratory. Directed projects include those that can be very tightly controlled by the Sea Grant Director. This may be possible for a variety of reasons, e.g., the project principal investigator is under the direct administrative control of the director, Sea Grant is the only available funding source concerned with activities of primary interest to the investigator, highly specific milestones and schedules permit simple monitoring of project progress, the principal investigator is highly motivated, reliable and dedicated to Sea Grant concepts. For whatever reason or combination of reasons, the director exerts considerable influence over establishing goals and schedules for a directed project and is reasonably confident that they will be met. The director has considerably less influence and control over the goals and schedules of a cooperative project--even though he may be confident that "good things" will be produced within a reasonable period of time. Cooperative projects are typified by cases where Sea Grant is providing supplementary funds for ongoing work or "seed money" to initiate activities that will be rapidly incorporated in other, non-Sea Grant, marine-related programs. In these cases we are facilitating the work, but are not key elements in its formulation and performance. Exploratory projects usually concern ideas or concepts of sufficient merit to justify funding an attempt to establish finite objectives and schedules. Although discretionary funds can ideally be utilized--if available--to implement projects of this type, more complex conceptualizations may require a full-year effort and deserve true project status. If an exploratory project does not advance out of this category within one year, it is probably not Sea Grant material.

It is obvious from the preceding discussion that a program must contain several cooperative and exploratory projects if involvement of the desired variety of

departments, organizations and universities is to be achieved. It also seems apparent that a lack of directed projects could well result in programmatic disaster. Here again a mix and balance must be maintained through careful consideration of all program design factors.

Priorities

Assignment of appropriate emphasis within several program design factors is an integral part of establishing total-program priorities. Such emphasis is usually dictated by various intra-university constraints and/or guidelines provided by the National Sea Grant Office, state agencies, industrial organizations, citizen groups, and program advisory bodies. From the standpoint of the purpose/function matrix, it is obvious that most Sea Grant programs place greatest emphasis on research and advisory efforts and on activities that support the development of predictive and operational response capabilities. The mix of project types varies greatly among Sea Grant programs. Here the need for pervasiveness within the university and state must be balanced by recognition of the need for maintaining program thrust and control. Similarly, several specialized program areas can be identified and associated objectives, strategies and tactics formulated, but they may not all deserve equal emphasis and attention. The relative emphasis given aquaculture, superport development, coastal zone management and other program areas will largely determine the Sea Grant image in a particular state. The importance of doing a good job on the right problem at the right time cannot be overemphasized--and the judicious assignment of a variety of programmatic and management priorities is the key to meeting this challenge.

Summary and Conclusions

There is no right or wrong way to design and conduct a university Sea Grant program. The formulation of universal rules is precluded by the wide variation in needs, attitudes, resources and power structures within different universities and states. There are, however, several design factors that should be carefully considered in program development. A major problem associated with development of Sea Grant activities involves providing effective integration of research, education and service functions to achieve program objectives or purposes. Purposes can be categorized as desires to achieve capabilities for *comprehension*, *prediction*, and *operational response*. A simply-derived purpose/function matrix provides a useful basis for program design and evaluation when employed in concert with appropriate recognition of program priorities, needed management/development actions, differences in project type, and constraints or pacing elements. Such simplistic approaches to management are well suited to present-day university research and service activities. This is true because most faculty members are not ready to attempt understanding of--or accept introduction of--complex management and control systems. However, communication and understanding of basic factors involved in program design and development greatly increase the probability of cooperation and success.

Washington Sea Grant: Interaction with State and Local Agencies*

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University of Washington

Sea Grant's appearance on the scene at the University of Washington just preceded an increased interest in marine systems that are under the management jurisdiction of Washington's state and local agencies. In the beginning, cooperation between Sea Grant and the state agencies was limited because of several factors:

- State agencies did not have a clear concept of their role in increasing their activity in the marine area.
- The basic intent of Sea Grant was not understood by university researchers.
- An uncooperative atmosphere had arisen between the agencies and the University resulting from previous contacts.

The gradual development of Washington's Sea Grant programs led to the production of information that was seen to be of value to the agencies in their planning for the marine system and a new relationship developed between "town and gown." Little by little those involved in Sea Grant found they could contribute to mission-oriented research and not sacrifice their research interest and freedom, while those in agency management began to recognize that the repository of information in the University could be tapped to their benefit. Over the past 6 years the "town and gown" relationship has flourished so that in some areas there is close cooperation and programs are being mutually supported.

This paper will describe ways this cooperative relationship has been developed by Washington Sea Grant and personnel in Washington's state and local agencies.

The interaction between state and local civic agencies and the Washington Sea Grant Program most assuredly is as recent as Sea Grant, but because Sea Grant has its roots in the state university system, the groundwork for mutual cooperation in the marine area developed some time ago.

Here in Washington, as I suppose elsewhere, the thrust has been over the years to build an ever increasing industrial base. Resources were used to render both a profit and an increased tax base with little thought given to their non-renewable aspect. The marine area did not escape. The State of Washington sold intertidal lands or executed long-term leases to fund State buildings, while city

*or *How to Get Your Foot in the Door and Keep It There to the Mutual Benefit of State and Local Agencies and Sea Grant*

and county governments and industries laid claim to valuable coastal land without consideration of its worth or usefulness for other purposes or of its role in the ecology of the area.

At some point in the process it was recognized that the marine area had a cash value in terms of fisheries and shellfish. State agencies developed to regulate and manage these particular marine industries. It is probably here that a valuable relationship developed between academia and the State. This almost had to happen as a considerable number of those working in these fields at the state level undertook their training at the University.

Research into disease, rearing, stream management, and management of harvesting was cooperative between "town and gown" while other areas of marine interest under study at the University had little to exchange. Marine biology and chemistry, which had early academic strength, contributed little to the State except for the work associated with fish and shellfish. Occasionally specific studies were conducted in the area of pollution as related to fisheries, where chemical and biological expertise available at the University was needed.

I have always been struck by a feeling that those in civic agencies and in the fishing industry looked upon those in academia as non-practical types and regarded them as incapable of solving problems that were significant from the State's viewpoint. Even to this day the research facility at Friday Harbor which is dedicated to marine research is considered by the locals as the Bug Station even though few bugs live in the sea or have ever been studied at this facility. I suppose there also was another viewpoint that radiated outward from the University.

Apparently the attitude toward those pursuing research at the University was not entirely without foundation. One still hears tales of disappointing relationships where those in academia used State funds to investigate an applied practical problem for the State and arrived at results that were not germane to the problem but supportive of the researcher's own interests.

However, something has happened that is healing old wounds, dispelling the concept of ivory-towered remoteness in academia, and putting together new relationships between "town and gown." Part of this change arises from the fact that the character of the university person has been changing. More of us have been willing to speak out and become actively involved in issues that heretofore were neglected. For those of us in the natural sciences the focal point of our concern became the question - "Hey man, what cha doin' screwing up the environment?"

Personal concern led many of us to the realization that the destiny of our environment was being set in the political arena - an arena with which we had little familiarity, but much frustration. Some of us saw that one way to help was to try and educate those setting the fate of our natural resources and to hopefully provide them with tools that would sharpen the political decision-making process, thus allowing a more rational use of our resources.

Members of academia entered this process slowly, by stealing time and energy from their private lives and their academic pursuits. The chief reward was the occasional feeling of personal satisfaction and accomplishment. Gradually we learned how to use the specialized knowledge of our fields and further how to apply it in practical ways that could be interpreted and used by others.

In the marine area the State and other civic agencies started to take a new look at their policies and practices. Some of this arose from their increasing concern for natural resources and from the public will which was becoming more manifest and imposed upon them. Use policies changed rapidly, but this necessitated new plans for utilization of public lands, marine and otherwise.

It is at this point Sea Grant entered and lent an extremely valuable helping hand in fostering applied research that would have direct impact on practical problem solving and offer a legitimate base within the University from which applied research and service could be conducted. At first, not all those in the academic arena were able to accept the concepts that make Sea Grant what it is. Instead Sea Grant was viewed as another source of funds to support research. Gradually a number of programs developed with applied research emphasis which showed the others that indeed, research could be done which was significant, self-satisfying, and usable for graduate training even though it was applied.

The prime area for this accomplishment was again in fisheries. However, since Sea Grant had a wide scope of projects, the Program acted as a mechanism for bringing individuals with diverse backgrounds into contact with each other, required that they review programs from other disciplines, and gradually generated interdisciplinary teams working within the program. This aspect of Sea Grant, which can easily be overlooked, I believe to be one of the major factors which has given Sea Grant strength as a program.

Suddenly a flurry of projects reaching across the boundaries of academic disciplines and agencies became visible. Physicists and engineers working on underwater acoustical devices teamed with fisheries personnel to develop instruments capable of quantitatively measuring in situ fish stocks -- something which before was inadequately done with difficult-to-use, non-quantitative trawl methods. This project brought together federal and state groups who have the problem of fisheries management and are dependent on evaluating standing stocks of fish.

Computer types conversant with management techniques devised programs under NORFISH that were of use in controlling both high seas and inshore fisheries. NMFS working with high-density, captive-fish rearing opened the door to salmonid aquaculture. State agencies became interested in aquaculture, since it was an activity that could be conducted over state-controlled marine lands and make them commercially productive. However, little was known regarding the areas within the Puget Sound region that could meet the requirements for this activity, and no thought had been given to assigning use priorities to regions of Puget Sound that were under State control. At this point the mass of baseline data which had been collected to type the environment of Puget Sound was synthesized with Sea Grant support and made available to all interested. This allowed one

to delineate the sites appropriate to aquaculture and aided in the State's effort to produce a use atlas for the state-controlled coastal and inland waters.

Information and idea sharing grew rapidly under the Sea Grant umbrella. The in-hand availability of environmental data at the academic institutions which had been gathered over the years for more esoteric reasons allowed the University to respond rapidly and inexpensively to the State and local agencies. This placed the University in the unique position of being able to be sensitive to the agencies' needs and very cost effective in the eyes of those needing the information. An atmosphere was created along many fronts that showed the academic types not to be such bad guys after all.

It seems that all those in Sea Grant assumed a dual role: (1) they had a prime responsibility to their particular projects, (2) automatically they became part of the force that could be tapped as advisors in marine matters.

The interdependency between groups strengthened as it became more evident that environmental research required a many-faceted approach and knowledge of pre-existing conditions. Now, one can scarcely find a study committee that is not composed of persons representing a wide scope of federal, state, civic, and academic units. A distinct effort is made by these groups to capitalize on cooperative programs and to remove unnecessary redundancy of effort. Program planning is executed in the attempt to get the best combination of efforts required for understanding the marine area. The spirit of cooperation that prevails at present seems to far outweigh the problems that can occur between groups that could be competitive.

The diversity of interactions between Sea Grant oriented efforts and other governmental units or individuals is impressive.

Bridges have been built between Sea Grant and other NOAA units such as NMFS and the MESA programs. Interactions between State agencies such as Department of Natural Resources, Department of Ecology, and the Department of Fisheries, and the Oceanographic Commission of Washington have grown in the areas of marine land management and resource development and utilization. County and city planners have used Sea Grant programs and advisors to assist them in developing rational use plans as required under shorelands management. Even combined county groups as represented by the Puget Sound Governmental Conference have sought aid and been responded to. Municipal units such as METRO, which is vitally interested in sewage impact on Puget Sound, are working closely with us. A full listing would be insufferably long. In the industrial area, Sea Grant aids in food processing, seafood harvesting, product and technique development.

Individuals with problems have not been overlooked. Whenever possible, the advisory capability of Sea Grant has responded to citizen groups or to those parties who have had legitimate requests for assistance. Those of us in Sea Grant often see clearly when there is a need for broadly disseminated information. This need is cared for under our publications program which produces literature designed for a wide spectrum of uses. Our communications effort has fostered

cooperative publications with state agencies, other federal groups, the City of Seattle, the University of Washington Press, other Pacific Sea Grant institutions and local groups such as People Power and the National Federation of Fishermen.

When literature is not sufficient, information is transferred by other media including workshops which are taken to the people under our Advisory Service program -- frequently with the help of the Cooperative Extension Service at Washington State University. This effort is extremely important in making Sea Grant visible as a viable living organization composed of real people who are knowledgeable but can put aside the aura of the University and discuss topics at the level required.

Contact with the public at the educational level has not been neglected. Advice and assistance have been given to school districts and to special programs in marine education. These programs in part stress the importance of our marine resources and how to use and enjoy them without undue damage. Reaching the parents through their children is an effective means of communication. The Washington Sea Grant program has within it direct support to education both at the vocational level in community colleges and at the university level where new curricula have been created.

The issue at hand is that Sea Grant, with its concepts and attitudes, encouraged us at the University to reorient our approach to applied problems and enabled us to appear responsive to those dealing with these problems. The initial success stimulated increased activity in this effort. Thus, we got our foot in the door. Keeping it there requires that Sea Grant and those directly or indirectly associated with it maintain the sensitivity, responsiveness and ability to communicate to the public and their agencies. We have to be real and tangible but not infallible.

Sea Grant:
Catalyst for University Consortia in Mississippi

J. Chester McKee
Mississippi State University

How is an atmosphere of cooperation rather than competition created among neighboring universities in the area of research grants and contracts? This important question has been answered at least partially, for the universities in Mississippi and the Sea Grant Program is the vehicle that initiated the action.

Begun in 1969, the Mississippi Sea Grant Consortium is now firmly established, funded by state appropriation and grant funds. It has produced noteworthy results for the state, region and nation. The participating universities, University of Mississippi, Mississippi State University, University of Southern Mississippi, and the Gulf Coast Research Laboratory, have each prospered and grown in research, whereas alone, it is doubtful that significant research would have been done. The likelihood of coherent program funding from Sea Grant is remote without this cooperation.

Genesis of the consortium was at a meeting of the governing board, the same board for all public institutions in Mississippi at which Mr. Hal Goodwin, known to us all, suggested a togetherness approach. Institutional heads of the universities and GCRL (Gulf Coast Research Laboratory) asked their graduate deans and the lab director to meet and suggest an organization. A charter for the Consortium was considered and approved by the Board in June, 1969. Without going into the sequence of events in the Consortium development, several points may be of interest relative to this experience in the development of an interdisciplinary/multi-institutional program.

I. People and Commitment

An organizational chart with neat boxes is only as effective as the personalities of the people named in those boxes. Fortunately, the people involved were determined to be flexible enough, with an attitude of giving, to make the proposition work. Naturally sharp discussions ensued but an ability to disagree without being disagreeable, of placing priority on the overall program rather than on a single institution, and the background knowledge that separately we were dead, kept the program on track.

The concept of a Management Committee was used with the three deans and the director composing the committee. Regular monthly meetings have been scheduled providing for orderly and expeditious conduct of business. As just mentioned, the dedication and ability of the management Committee to work through problems

has been a strength of the total program.

II. Togetherness

A mechanism for getting working individuals together, having their input in planning as well as action in research, is mandatory. Four initial program areas were chosen and the opportunities presented to the entire faculties of participating institutions. At this stage the Management Committee member at each school, being the Graduate Dean, was able to get cooperation of his faculty and to insure the participation of the needed disciplines. Initially biologists, economists, engineers, technologists, lawyers, wildlife ecologists, oceanographers, chemists, and extension specialists were brought into the program. Workshop sessions were utilized for specific program planning to bring people from each campus together for team formation. At these sessions, leaders emerged and teams were formed for the various tasks of the research program. The program itself was planned and priorities established on the tasks identified.

III. Incentive

There must be an incentive for faculty to work on interdisciplinary programs with assurance their positions of tenure, promotion, and raises in the home departments are not jeopardized. Likewise, it is helpful to provide incentives to the departments. Policies were established at the institutions recognizing participation in the Sea Grant projects as beneficial to the department and institution. In the case of research indirect costs, arrangements were made to share with participating departments on a pro rata basis, staff time being used as the cost unit. In reality, it was soon discovered that there was ample staff anxious to be involved with Sea Grant. Many found it to be not only a stimulating way to get their work accomplished but also to participate in a program coupled with the development of the marine resource of the state.

IV. Strong Directorate

A central directorate and fiscal operation is vital. Though a Management Committee is necessary for policy determination and for on-campus relations, a strong director with authority to deal directly with team leaders and team members is a must. He should have an excellent fiscal operation to provide accounting management information on all programs and projects within programs. His office is a necessity for proposal preparation, negotiation, and grant operation.

V. Monetary Commitment

Each participating institution must put up a share of "hard" dollars to undergird the operation of the director's office, travel for teams, etc., this being in addition to the required matching funds. Such commitment on the part of the institution provides assurance to faculties of the sincerity of the universities

to the program. Also, it is most helpful for the required matching to be "hard" dollar appropriated funds. With such undergirding and commitment, a program is greatly enhanced and success insured.

Having looked at the five points learned in the organizing of an interdisciplinary/multi-institutional program, we may note several ways that Sea Grant has served.

1. Administrators and research coordinators from the several institutions were brought together to develop clearly defined programs.

2. Specific goals within a program were defined and teams developed to attack them.

3. Methods discussed earlier for conducting interdisciplinary/multi-institutional research programs, i.e., finances, administrative coordination, communication, incentives, travel, etc., were evolved.

4. Finally and probably most important, interaction of specialists in a given discipline from various institutions was developed. Normally, these people only meet at professional meetings. Additionally, specialists in various disciplines were brought together--a group which would never meet otherwise.

Results

As a result of the four catalytic actions mentioned, several important new conditions have developed within the institutions.

1. There is a hitherto unheard-of element of trust among institutions. Previously, each thought the other was out to do him in and devious ways were conceived to accomplish "one-upmanship."

2. The research administrators think big-mechanisms have been developed to be responsive to big opportunities.

3. The combination of talents in the several institutions makes the groups infinitely more competitive nationally.

Illustrative of these results are the present on-going programs which generally follow the pattern of Sea Grant.

The Mississippi Consortium on Alcoholism and Alcohol Abuse was established, presently conducting programs funded by state agencies, the National Institute of Alcohol Abuse and Alcoholism (NIAAA) and Department of Transportation (DOT).

Mississippi State University is the contracting institution for the EPA-funded program "Fate and Effects of Oil in the Aquatic Environment." Faculty of the other institutions participate in the research team as in Sea Grant. Incidentally, this contract was won in national competition by a response to an RFP. The response was possible because a Sea Grant team already existed having all

of the required capabilities to perform the work.

Similarly, Mississippi State University, the Gulf Coast Research Lab, and the Mississippi State Chemical Laboratory are joined in another EPA-funded program studying the effects of mirex on estuarine microorganisms. This program is of direct importance in determining the possibility of effects on the food chain, which have strong import on both sport and commercial fishing. As with the oil program, this was won in national competition, both because of the scientific teams and the research facilities offered by the three groups.

The University of Southern Mississippi is the contracting institution for a DOT University program entitled, "Analysis of a State-Wide Integrated Transportation System." The DOT program has other elements of state government involved to aid the Consortium in applying results to state needs. Without the experience of organizing multi-institutional efforts, success would not have been possible.

The University of Mississippi has lead responsibility for research in mineral resources with cooperation of other institutions. Each university has environmental research with interchange of personnel as needed.

Two-state Consortia

Finally, as can be noted in the program of the meeting, Alabama has joined Mississippi in a two-state effort called the MISSISSIPPI-ALABAMA SEA GRANT CONSORTIUM. Unquestionably, the same problems as discussed are present and they are being resolved. Governors of each state have endorsed the Consortium and faculty committees have already developed the programs. A magnificent opportunity is at hand as scientists, engineers, economists, lawyers, extension specialists, and others cross state lines to attack common problems of the adjacent coastal regions.

Sea Grant was born as an applied, problem-solving program, requiring cooperation of institutions, state government and industry to achieve success. It has delivered results in Mississippi in such areas as unmanned underwater research vehicles, management of marshes and wetlands, community action programs, seafood market development, etc., but from the standpoint of the institutions and for the long-term benefit of Mississippi, the breaking down of technical xenophobia and development of close working relationships between institutions to solve practical problems facing the state have been the most significant achievements.

Chitin/Chitosan Shellfish Waste Utilization Program

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Introduction

The chitin/chitosan project is an example of industrial participation in Sea Grant. The goal was to develop useful application of the waste products of the shellfish processing industry. To make these products, chitin and chitosan, available to the widest possible users, Sea Grant purchased quantities of the materials, advertised its existence, and made them available to qualified researchers throughout the world at no other cost than shipping and packaging charges.

The immediate goal of this project was to produce pilot plant quantities of chitin and chitosan for distribution to Sea Grant and other investigators for cost studies and market development. Through this research, we expected to achieve:

--Beneficial utilization of a waste product.

--Elimination of a major source of pollution.

--Demonstration of methodology for technical assessment and thence utilization of the by-products of a primary objective.

--Attract additional research in chitin/chitosan utilization.

--Develop commercial interest in establishment of shellfish waste conversion plants.

In a 30 month period the goals and objectives were met successfully.

The Investment

The industrial firm of Food and Chemical Research Laboratories (FCRL), Inc., of Seattle financed and constructed a pilot plant to produce substantial quantities of high grade chitin and chitosan.

The Oceanographic Institute of Washington (OIW), through Sea Grant funding, guaranteed the purchase of 1,000 pounds of chitosan per month at a price not to exceed $2.00 per pound for two years from production commencement.

In the event that Food and Chemical Research Laboratories, Inc. was able to sell its total monthly production during any given six-month period, the OIW was absolved from purchase support during that time. If the demand for the product for Sea Grant research through the OIW required the 1,000 pound per month output, the OIW guaranteed delivery in the quantity and at the price specified.

The product was made available to Sea Grant qualified researchers throughout the country, at no cost other than handling and shipping.

The OIW provided those financial and employment safeguards normally required in the administration of federal contracts.

Table 1 shows the proposed budget prepared in November 1971. The proposed Sea Grant investment was $48,000 with contributions amounting to $102,680.

Table 2 shows the actual expenditures through 30 June 1974. Since actual production of the plant did not commence until late 1972, the program was extended for six months to June 1974.

Table 1: Utilization of Shellfish Exoskeletons

	Budget - 1972 and 1973		
	Sea Grant	Regional Contributions[1]	Total Program Costs
Site acquisition and equipment installation		38,000	38,000
Market development program (not less than)		50,000	50,000
OIW Administrative support (includes audits, consulting, reporting and office assistance)		14,680	14,680
Market guarantee of 1000 lbs/mo. @ $2.00/ for 2 years	48,000		48,000
TOTAL	$48,000	$102,680	$150,680

[1] Oceanographic Institute of Washington, Food and Chemical Research Laboratories, Inc.

The Users

Some seventy Sea Grant qualified researcher's orders were shipped which included 669 pounds of Chitin and 1198 pounds of Chitosan. See Table 3. The total production was 14,148 pounds of chitin and 6012 pounds of chitosan through 30 June 1974. FC & RL also filled over forty orders from commercial laboratories and companies who did not qualify as research oriented activities. The users were far flung from Sweden, the Netherlands, Italy, Germany, Chile, Japan, to mention a few of the international users.

Most of the researchers that ordered samples are affiliated with universities. The remainder of the users are in industrial research laboratories or governmental laboratories.

Some of the identified applications are:

--Development of complexes of dyes with chitosan and other polymers which are able to sensitize the photo-oxidative destruction of waste organic materials such as phenols in industrial effluents

--Use of chitin and chitosan for coatings and encapsulating particles

--Use of chitin with new solvents to improve purification methods

--Use of chitosan in brewery purification experimentation

Table 2: Chitin/Chitosan Shellfish Waste Utilization Program

Program Cost Summary

	1972	1973	1974	TOTAL
Sea Grant Funds	$ 863	28,543	11,821	41,227
OIW Matching Funds	907	1,796	1,310	4,013
FCRL Matching Funds	56,554	38,500	42,881	137,935
TOTALS	$58,324	68,839	56,012	183,175

Information Exchange

Some 25 articles were published in professional journals, magazines, and newsletters. Over 2500 brochures were distributed nationally and internationally. A special information package was prepared for a workshop on Agro-Industrial Development in the Lower Mekong Basin sponsored by the United Nations Economic Commission for Asia and the Far East, Thailand. Some fifty individual requests for information were answered.

The Pacific Northwest Sea, published and distributed by the Washington State Oceanographic Commission, contained detailed articles in three separate issues with a total distribution of about 20,000 nationally and internationally.

The responses have been positive, encouraging and project an optimistic outlook for chitin/chitosan utilization.

The Outlook

This project has helped in the creation of a potentially new industry based upon total utilization of a marine resource. The Food and Chemical Research Laboratories have indicated that high demand markets for chitin/chitosan have been identified and the potential customer list is growing. The transition from pilot plant to a full scale production facility has been formulated and potential capitalization sources have been identified. Economic trade-offs indicate that protein recovery as well as chitin/chitosan production can provide an economical return.

Table 3: Chitin/Chitosan Shellfish Utilization Program

PRODUCTION/ORDERS SUMMARY

PRODUCTION (POUNDS)	1972	1973	1974	TOTALS
CHITIN	320	13,061	767	14,148
CHITOSAN	8	967	5,037	6,012
TOTAL	328	14,028	5,084	20,160
ORDERS (POUNDS)				
CHITIN	184	472	13	669
CHITOSAN	266	818	114	1,198
TOTAL	450	1,290	127	1,867

The Sea Grant support has provided the time to stimulate interest by a variety of industries in the utilization of chitin/chitosan, and afforded the opportunity for developing an economically viable market place for a unique product.

The outlook is optimistic and the ingredients for a potentially successful business are now in hand. The goal and objectives of this project nave been fulfilled. The program arrangement has benefited both the manufacturers in a critical development period, the fish food processor in his waste disposal dilemma, and the industry in search of innovative materials.

The Oregon Approach to Coastal Planning: Hearing All the Voices

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Oregon Coastal Conservation and Development Commission

Introduction

At the Sixth National Sea Grant Conference in Newark, Delaware, the conferees concluded that state coastal zone management agencies do not understand fully the potential contributions of Sea Grant. The purpose of this paper is not to reinforce that conclusion. Rather, by stating the nature and purpose of one state's coastal zone management program, it is hoped that cooperation will be made easier by mutual understanding.

Understanding between groups takes time, and coastal zone management has developed as a major program area only in the past few years. The passage of the Magnusson Coastal Zone Management Act of 1972 marks the beginning of extensive and formal activity in coastal programs nationwide. However, here on the West Coast, specific planning and regulatory programs were underway well before 1972. In 1969, the San Francisco Bay Conservation and Development Commission adopted a plan and a regulatory program. In 1972, the Oregon Coastal Conservation and Development Commission was established by the State Legislature. Shortly thereafter, both Washington and California passed coastal planning measures. In the past few months, over 30 states have applied for coastal zone planning grants. As these programs get underway, increasing numbers of coastal managers will turn to the Sea Grant community for program guidance, to request specific tasks, products, advice, and perhaps a shoulder to cry on. The latter request may come about because a major purpose of state coastal zone management programs is to establish permissible land and water uses in the coastal zone. The development and enforcement of regulatory programs for such uses and activities is an intensely political process. The successful development of a state program may well depend to a great degree on the participation of all major groups affected. The specific purpose of this paper is to describe these groups as viewed from the perspective gained in one state program. The potential participation of the Sea Grant Community in this process is also described.

The Process

The planning and regulation of the coastal zone does not differ radically in concept or purpose from the traditional forms of land use planning. It differs in approach, somewhat, because of the unique and complex nature of the coastal zone. Speaking at the annual conference of the American Society of Planning Officials, Mr. Richard Gardner, Deputy Director of the Office of Coastal Zone

Management, remarked that there may be 34 different approaches to coastal zone management (one for each of the 34 coastal states).[1] There are common elements which these programs will share, however. These have been classified by Mr. Gardner into three major groupings:

(1) an inventory and classification of the physical characteristics, both natural and man-made, in the coastal area;

(2) an identification of places and activities of particular concern in the coastal zone; and

(3) providing a policy framework for future use decisions.[2]

The participation of the Sea Grant community in the first two of these program areas is fairly obvious. The importance of the third element, and the significance of broad participation in developing a policy framework will be stressed here.

The Participants

Citizen Participation

The development of a policy framework for the coastal zone is extremely important. We have witnessed a decade of debates regarding particular development decisions in which single-purpose agencies or special interests determined the final decision. This process has led to a splintering - and intensification of activities - of special interest and citizen groups. In one Oregon coastal county alone, there are five different citizen groups active in monitoring local and state government decision-making. Regarding this process, Charles R. Ross has written that:

> Most of the frustration, cynicism, and disillusionment prevalent today from all our institutions stems from the lack of public involvement. The sense of helplessness of the average citizen can lead only to a further erosion of confidence in our system. It serves no purpose to say that the public can participate if they want to badly enough. On the contrary, the Establishment must go to the public, and if the problem is technical or

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[1] Remarks in the panel "Deciding the National Interest in the Coastal Zone" at the 1974 National Planning Conference of the American Society of Planning Officials, Chicago, Illinois, May 15, 1974.

[2] Remarks in the panel "Coastal Zone Management Process" in Proceedings, The Conference on Organizing and Managing the Coastal Zone, Annapolis, Maryland, June 13, 1973.

> complicated, then both financial and manpower resources have to be made available to persons or institutions in which the public has some confidence. Unless such confidence is promoted, whatever the cost, it will be almost impossible to assure a liveable world for future generations.[3]

The establishment of public policy regarding the preservation and development of land and water resources is a major necessity. We must focus the basic issues of who pays and who benefits in particular development decisions, and how these decisions will affect our lives in the coming years. If we do this, we can abandon debates of highly technical ecological and social aspects of development to those who wish to dissect the issue to that level. If major development decisions continue to be made on the basis of immediate, technical criteria (instead of the incremental effects of such decisions over time on our society), the whole process will be, as Charles Ross states: "...so technical that only an elite few will understand what is going on."[4] In the absence of public policy regarding the coastal zone or resource management and planning in general decisions continue to be made by a few who have special access to information, or more often, those who have little or none. As Ross states it:

> Increasingly, the public is being asked to accept on faith the soundness of far-reaching decisions involving complex technological, scientific, and social factors. No none is going to agree to make the necessary sacrifices without confidence and trust.[5]

Gaining confidence and trust in government through participation has not come about through accident. Rather, this process has developed through definite changes in law. Recent court decisions in land and water use cases have focused on determinations of what is the "demonstrated public need" or the "public interest". Deciding the "public need" in particular cases usually involves public hearings and other, more sophisticated forms of public participation, to establish in some degree the public concern for an issue of regulation. And secondly, under the leadership of a few key states (and the influence of the draft Model Land Development Code of the American Law Institute) a requirement for "effective citizen participation" has become a part of state and federal land use bills. Senate Bill 100, passed by the 1973 Oregon Legislature, requires the State Land Conservation and Development Commission (LCDC) to "insure widespread citizen involvement and input in all phases of the (planning) process."

Since March of 1973, the Oregon Coastal Conservation and Development Commission (OCC&DC) has been developing a coastal plan. From the beginning of planning activities, OCC&DC established citizen involvement as a basic process. As with any program, the Commission's public input was limited by a lack of time and

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[3] Charles R. Ross "Decision-Making at Social, State, Federal and International Levels", in Environmental Quality and Water Development, ed. Charles R. Goldman, James McEvoy, and Peter J. Richerson (San Francisco, W.H. Freeman & Co., 1973).

[4] Ross, op. cit.

[5] Ibid.

funding. Altogether, the Commission sponsored over 30 public workshops on the coast and in the interior to hear from Oregon citizens regarding the future of the coast. The process cannot end with that, however. Initial input must be only a beginning. The public must be assured that their input was put to use - or at least considered.

The OCC&DC experience indicates that effective public participation could best take place in a three-phase effort, based on the natural progression of the planning process. The three phases of exchange between an agency and the public should include:

(1) an exchange of opinions;

(2) an exchange of information; and

(3) an exchange of management approaches and techniques.

In the first phase, an informal exchange of general opinions, the public is invited to express any and all views regarding the coastal environment and its management. In these informal, preliminary meetings people express their opinions on issues, and the agency concentrates on familiarizing the public with its basic goals and responsibilities. The coastal agency may use general information gained in these sessions as an indication of needs and desires to be integrated into the goals and objectives of the program, which, theoretically, will influence the nature of regulations eventually adopted.

The second stage of citizen participation should involve an exchange of information regarding the natural resources, economy, and development problems of the coast. OCC&DC initiated a citizen input program without having any basic information on coastal resources to use in the process, or to serve as an objective basis for decision-making in the citizen workshops. Although this seemed a detriment at the time, experience indicates that the first meetings probably proceeded better without having technical material to digest. The second round of meetings, however, should involve consideration of factual information regarding a few of the basic issues of coastal management. These could include the impact of tourism on the coastal economy, the extent and importance of marshes in the coastal eco-system, and the need for regulation of certain key uses and activities. These discussions should be based on the actual inventory and study materials which will be used to support adoption and implementation of controls. This will facilitate a certain level of familiarity - and perhaps confidence - of the public in the information bases being used for coastal zone management. Perhaps in recognition of the key role of information in planning and regulation, the Citizen Involvement Advisory Committee of Oregon's LCDC has recommended a role for itself in the inventory process.

The third phase of public involvement should include a serious, meaningful participation of the public in the selection of controls to be adopted and implemented. This means that drafts of anticipated controls should be presented at public workshops - or public hearings - prior to their serious consideration by

the policy bodies. In this way, staff could forward the draft controls to the policy body with recommendations which include the concerns of the public.

Special Interest Participation

Of particular importance in any program is to include the concerns of those groups which have a particular interest in an aspect of coastal management or land use planning. Although many consider these groups as a part of the participating public, they generally may be distinguished by a high level of organization, a single-purpose interest, and greater effectiveness in influencing decision-making. Policy-makers have a special concern for the reaction of these groups to their decisions. As a result, an advisory committee, with staff and other appropriate assistance, may be established to assure effective and open communication between policy-makers and these interest groups. For example, the California Coastal Zone Commission has advisory committees for policy development (at both the statewide and regional levels) composed of representatives of major interest groups, including environmental coalitions, sport fishermen, utilities, and agriculture. An important feature is that these representatives are spokesmen for their organizations regarding coastal management policies. The coastal commissioners may determine from the advisory committees how their actions will be regarded by a significant portion of the public.

Agency Participation (State and Federal)

It is particularly important to include the appropriate existing laws and policies relating to coastal resource management in the coastal plan. In few fields of human endeavor are there no pre-existing guidelines or regulations, particularly in a subject area as broad as coastal zone management. Generally, these laws and policies will relate to single-purpose programs, such as fish management, subsurface lands ownership, and construction of docks and piers. For example, in Oregon, State controls over coastal beaches and dredging and filling in estuaries preceded the establishment of the Coastal Commission. In California and Washington, similar controls did not exist prior to the enactment of coastal management legislation, in part explaining the more regulatory nature of those programs. Each of the individual areas of coastal zone management, including marine fisheries, wildlife management, navigation and ocean development, forestry and agriculture, water quality control, and tourism are characterized by professionals who have worked, perhaps for many years, with the Legislature and others in the State to protect and develop the particular resource in question. To include the concerns of these groups, OCC&DC conducted what were termed "resource specialist workshops" to have these issues identified and interpreted. These existing policy areas were not considered a "hands off" area to be left intact by the Commission, but rather, were recognized as the result of considerable experience and effort over the years.

Relationships with Federal agencies are important because the (federal) Coastal Zone Management Act requires a "consideration of the National Interest" by

agencies developing a state coastal zone management plan. Specifically, the Act states that

> Prior to granting approval of a management program submitted by a coastal state, the Secretary (of Commerce) shall find that: ...the management program provides for adequate consideration of the national interest involved in the siting of facilities necessary to meet requirements which are other than local in nature.

The federal Office of Coastal Zone Management states that "...this policy requirement is intended to assure that national concerns over facility siting are expressed and dealt with in the development and implementation of State coastal zone management programs." The implications of this requirement are obvious (particularly to states with substantial federal investment in the coastal zone). In Oregon, the fulfillment of this requirement is proceeding through the use of a study team of federal agencies organized to prepare a policy plan for the coastal zone under the direction of the Pacific Northwest River Basins Commission. The OCC&DC expects to receive a description of anticipated federal programs and policies from this group, and an assessment of the impacts of these on the environment and economy of coastal Oregon.

Local Government Participation

Representatives of cities, counties, and port districts make up the majority of the OCC&DC. Therefore, in developing a participation program, an assumption was made that local government was adequately represented on the Commission. This assumption was unwarranted. Although Commissioners provide input regarding the concerns of their local areas to the coastal plan, there are few who adequately communicate with their citizens regarding the plan as it is being developed. In some cases staff may fill this gap by representing the Commission in local areas. Often, however, this is inappropriate. As a result, OCC&DC will enter the final phase of program development with what could be charitably termed an uneven record of support from local units of government. This deficit will be overcome to a certain degree by the fact that most coastal management policies will be implemented through the established planning process at the county level.

In Washington, the local unit of government (city or county) has been established as both the principal planning and regulatory agency, with the state providing an overview, appeals, and technical support function. The Oregon system, when adopted, will undoubtedly work this way to a large degree. The California system, on the other hand, appears to be geared more to State-level permit, acquisition and management activities. Experience indicates that having an active role for local government in policy formulation will not only increase support for the plan, but will make implementation much more feasible. As stated by a former Commissioner of the San Francisco Bay Conservation and Development Commission, "we adopted those policies we had a hand in making."

A concern to all of those working in coastal zone management is the relationship of coastal management to overall land use planning, at the local, state, and

federal level. On August 19, Secretary of the Interior, Rogers Morton, announced in a speech in Albuquerque, New Mexico, that a national land use bill remains a major need, and that he would support a renewed Congressional effort to pass this legislation. In Oregon, major steps have been taken to integrate land use and coastal zone management programs. In California, observers predict that state land use and coastal management will be integrated within the next five years. This would appear to be a desirable goal, because state-level land use planning agencies will have an increased capacity to support interpretation, regulation and education regarding coastal zone management.

Participation of the University Community

The point to be raised here might be "what has all this to do with the Sea Grant community?" First of all, coastal zone management requires extensive information-gathering and public communication activities. These activities fall, to a large degree, within the range of operations of Sea Grant. A recent report comparing the two programs included this comparison:

> The ultimate goal of the Coastal Zone Management Program is to encourage and support the optimum management of the Nation's coastal zone and its resources. The Sea Grant goal is to encourage and support efforts leading to the optimum development and utilization of marine resources, both coastal and oceanic.[6]

The report further states:

> While these goals are quite similar, the Sea Grant and Coastal Zone Management programs have been designed to take very different approaches. The main thrust of the CZM effort is to encourage and facilitate improved and realigned intergovernmental relationships between the Federal, State and local levels, whereas the thrust of the Sea Grant program is to develop an improved or increased understanding of marine resources.[7]

General Involvement (Long-Range Planning):

Universities are becoming more involved in formal land-use planning activities. While there are those who apparently view this process with alarm, others, particularly those in public planning and resource management positions, see it as a great opportunity to advance our capabilities for serving the public interest. Indeed, a more active role for the University in public planning is foreseen by many. In the final report of the Louisiana Advisory Committee on Coastal and Marine Resources, the Committee recommends the creation of a Long-range Planning Division within the State Planning Agency to be concerned with the

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[6] "Coordination of Coastal Zone Management and Sea Grant Activities" draft report prepared by the Office of Coastal Zone Management (multigraphed).

[7] Ibid.

"broader questions of coastal zone resource policy that transcend day-to-day regulatory decision making."[8] The report further indicates the important role that the University community, and Sea Grant in particular, would have in the operation of this long range planning and planning-related research function.

This approach is similar to one described in the Model Land Development Code of the American Law Institute, which suggests the formation of a Long Range Planning Institute, affiliated with the State University. In Oregon, one could visualize a long-range planning institute directed by the Land Conservation and Development Commission and the Board of Higher Education, and composed of particular institutes and departments of our three major universities: Portland State University, offering a major research emphasis on the urban environment; the University of Oregon, offering departments concerned with planning, environmental design, and law; and Oregon State University, offering research capability regarding natural resource use and management.

A major contribution of the current state efforts in coastal zone management undoubtedly will be the physical and social data bases. One of the major hindrances to proper management in the past has been a lack of adequate, pertinent, and current information. To develop and maintain an objective basis for decision making is a major goal for government, whether at the local, state or federal level. The development of state natural resource and land use information systems is being pioneered in several states by the university community, and certainly, the Sea Grant community could develop a major role in this. A recent article in the Coastal Zone Management Journal describes Sea Grant involvement in coastal information systems in more detail.[9] In Minnesota, the land management information system is a joint project between the State Planning Agency and the University of Minnesota. The New York State Land Use and Natural Resource Information System (LUNR) has drawn heavily on the resources of Cornell University. Other examples are easily identified to show that through communication and dedication to joint action, universities and state planning agencies may establish new mechanisms to facilitate decision-making.

Specific Involvement (Current Planning):

A basic responsibility of coastal zone management agencies at the State level is to establish permissible land and water uses in the coastal zone. This process involves documenting the reasons for adoption, and determining the costs and benefits of implementing the regulation. As a part of this, the State agency is required to identify what are termed "particular (geographic) areas of concern" and to establish specific management guidelines for these areas. For example, OCC&DC has designated the South Slough of Coos Bay as an estuarine sanctuary, under the provisions of the Coastal Zone Management Act of 1972. The Commission will identify and designate other similar areas for preservation and development.

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[8] Louisiana Wetlands Prospectus, Louisiana Advisory Commission, Baton Rouge, Louisiana, September 1973.

[9] Leatha F. Miloy, "Coastal and Marine Information Dissemination Programs," in Coastal Zone Management Journal Vol. 1, No. 2 (Winter, 1974) p. 165.

These processes of defining problems, adopting regulations, and designating areas of particular concern require detailed research support. Ecologists, economists, political scientists, and legal scholars are needed to justify the process in the first place, and secondly, to assure that the public interest is being served by the administration of regulation, and the management of specific areas. Individual coastal commissions, or even most state planning agencies, are not likely to have, or to develop, staffs capable of providing these functions. This is an area where university resources could be of immediate use, if the activities are determined to be appropriate under the goals of Sea Grant.

In the area of public and agency participation, there is a wide range of support activities which would benefit most coastal zone management agencies. These include surveying of public opinion, gathering and publishing technical information, sponsoring of seminars and conferences, and the providing of formal and informal liaison services. Some Sea Grant programs, such as those of Michigan and California, have already demonstrated programs of immediate applicability to coastal zone management.

Summary

As Mr. Gardner pointed out, there may be 34 different approaches to coastal zone management at the State level. This means there may be 34 different approaches the Sea Grant community may take to participate in these programs. A fundamental step would be to establish a staff position for coordination of coastal zone management and Sea Grant activities at the State level.

In this way, a process could be initiated to match the many critical needs of those working to formulate and administer public policy with the complex and changing resources available in the university community. Certainly, both the need to undertake this process and the opportunity to do so have never been greater than at present.

The Oregon Approach to Coastal Planning: Attempting to Fill the Gaps

Daniel A. Panshin

Oregon State University

In coastal zone management Oregon is characterized by separation of responsibilities. A state agency, the Oregon Coastal Conservation and Development Commission (OCC&DC), is developing the coastal zone management plan. On the other hand, the Sea Grant College Program based at Oregon State University (OSU) has special capabilities for coastal zone research, training, and advisory services.

Both OCC&DC and OSU are dedicated to more effective use of the coastal zone and its resources. It may therefore be helpful to specify the relative roles of the two programs with respect to the coastal zone.

Recently the federal Offices of Coastal Zone Management and Sea Grant have been seeking to address the matter of role identification. As a result they have prepared a draft paper entitled "Coordination of Coastal Zone Management and Sea Grant Activities." The program goals section of this paper sets out the following distinction: "The ultimate goal of the Coastal Zone Management program is to encourage and support the optimum management of the nation's coastal zone and its resources. The Sea Grant goal is to encourage and support efforts leading to the optimum development and utilization of marine resources, both coastal and oceanic."

These definitions are certainly applicable to the Oregon situation. The state agency has responsibility for management of Oregon's coastal zone through development and administration of the plan while the university program focuses on research, training, and advisory efforts leading to the improved development and utilization of marine and coastal resources.

As part of the planning process OCC&DC has identified critical needs for which adequate information does not presently exist. OCC&DC is increasingly looking to the Oregon State University Sea Grant College Program to help fill these gaps.

The categories of need of OCC&DC may be broken down as follows:

1. Management and short-term research.
2. Long-term planning.
3. Long-term research.

The management and short-term research needs of category one can involve inventories, economic studies and legal reviews. These types of activities could properly fall into the domain of either OCC&DC or OSU. Because of the special nature of these activities and the typically compressed timetable, the university program has frequently had a difficult time responding to this category of need, although the School of Oceanography is preparing the continental-shelf inventory for OCC&DC and the Ocean Resources Law Program at the University of Oregon (also part of the OSU Sea Grant College Program) is conducting a legal review of resource management policies. The long-term planning of category two is the responsibility of OCC&DC while the long-term research of the final category is an area where OSU can make a particular contribution.

From its start in 1968 the OSU Sea Grant College Program has been active in work dealing with food from the sea. More recently there has been a growing interest within Sea Grant in the coastal zone and its people. For several years OSU has been conducting a variety of oceanographic and engineering projects on such problems as sand transport, sea and surf forecasting, wave forces and effects, estuarine hydraulics, dredge spoil fate, and performance of wood in the marine environment.

In the last couple of years social and economic research has come to be recognized as unusually important. As a consequence, the OSU Sea Grant College Program has undertaken projects in economics, law, geography, and political science.

The geography project is looking at changing patterns of ownership, parcel size, land value, and use of Oregon coastal zone land. An economics project is determining the various effects of alternate pricing systems on distribution of costs of expanded public facilities along the coast. The basic objective of the political science project is to examine the factors that are associated with participation by citizens in coastal zone planning and analyze the implications of these findings on the design of citizen participation programs.

Other traditional roles of the university involve training and public service. In the training area a master's degree program in marine resource management is in the process of being implemented. An important part of the program is an internship through which each student will acquire practical experience and training with one of the agencies involved in coastal zone management.

In the public service area the OSU Sea Grant College Program conducts a fully developed marine advisory program. Four marine extension agents are located in coastal communities and have responsibility for all of the various kinds of marine matters within their areas. There is also a coastal zone management specialist based on the main campus in Corvallis who serves as a middleman between the coastal zone researchers and those marine users for whom the research is intended. In addition, the extension service has located two of its staff members with OCC&DC through a joint arrangement to assist with public input and public education. While these two staff members are not supported by Sea Grant funds they are considered informally as part of the Marine Advisory Program and are working on coastal management problems on a full-time basis and provide yet another element of coordination between OCC&DC and the university.

Oregon has been fortunate to submit the first proposal for an estuarine sanctuary and it has been acted upon favorably. When South Slough of Coos Bay has been acquired and established officially as an estuarine sanctuary, it is anticipated that the OSU Sea Grant College Program will conduct a variety of research projects on this unique facility.

In Oregon's approach to coastal zone management, separation of roles and responsibilities is considered essential. Planning and management are the proper concerns of a governmental agency; research, training, and public service are the proper concerns of the university. Working together closely the university through Sea Grant is seeking to fill the coastal zone gaps identified by OCC&DC.

A Mini Project for Tubbs Inlet, North Carolina

Jerry L. Machemehl

North Carolina State University

Introduction

At the request of the mayor, town council and local residents of Sunset Beach, North Carolina, a study of Tubbs Inlet, North Carolina was initiated in June 1972 to determine the processes at work in the inlet, to determine the inlet's flow and sediment distribution patterns and to collect and analyze data for a possible state-supported stabilization project. The study was funded by the Sea Grant Program (federal participation) and the North Carolina Coastal Research Program (state participation).

Project Area

The inlet is located in the southern coastal zone of the North Carolina coastal plain. The inlet forms a tidal pass in the Barrier Island system between Sunset Beach to the west and Ocean Isle Beach to the east. The coastline in the vicinity of the inlet is approximately east-west. Sunset Beach on the west side of the inlet is approximately 1.6 miles long and 1400 ft. wide. The eastern 3430 ft. of Sunset Beach is composed of dredge spoil. Ocean Isle Beach on the east side of the inlet is approximately 6.4 miles long and 1000 ft. in width. The Barrier Islands are separated from the mainland by tidal marsh, estuarine channels and the Atlantic Intracoastal Waterway. The inlet drains approximately 2.5 sq. miles of the marshland and the Atlantic Intracoastal Waterway via three estuarine channels converging near the inlet. No streams or rivers introduced fresh water into the system.

History of Inlet

The history of Tubbs Inlet is characterized by a westward migration. Between 1938 and 1969 the inlet migrated 3432 ft. to the west. With the development of Sunset Beach the migration of the inlet posed a serious problem. Damages to Sunset Beach developments forced local officials to close the inlet in 1969 by dredge and fill operations and reopen the inlet in its 1938 location. Figure 1. shows the shoreline as obtained from ground survey, while Figure 2. shows aerial photography for a 34 year period. The inlet width, gorge orientation and distance from its 1938 position are shown in Table 1.

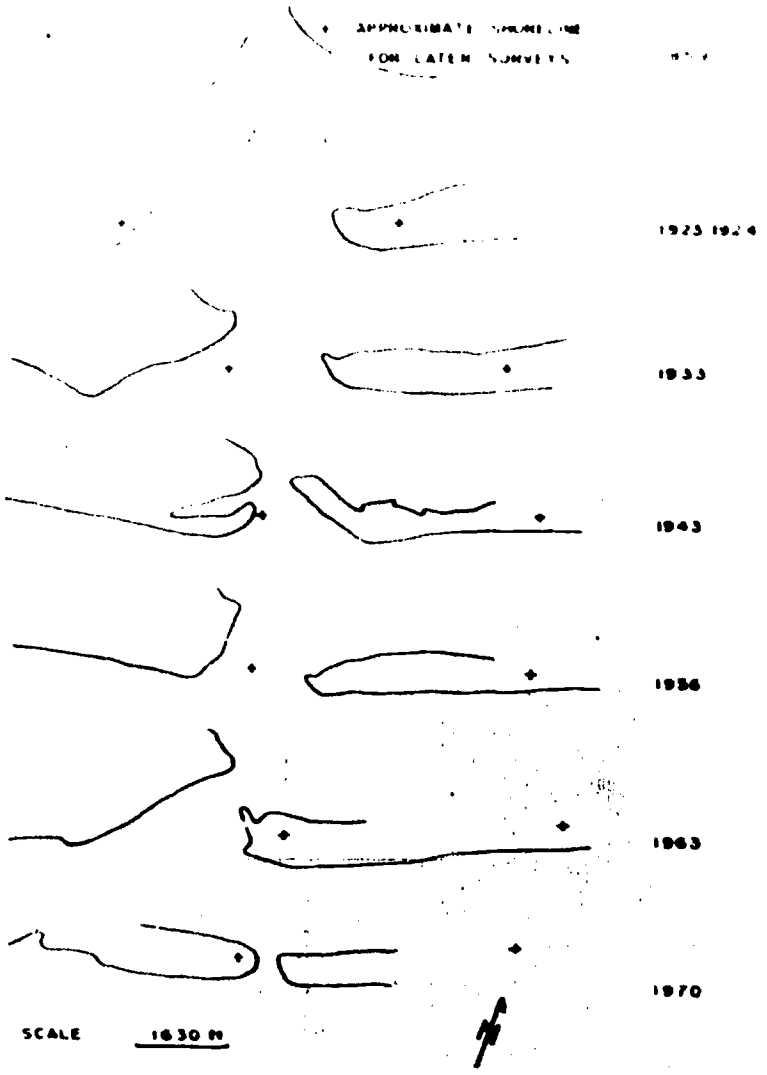

FIG 1 SURVEYED SHORELINE OF TUBBS INLET, N C FOR INDICATED YEARS NOTE INCONSISTENCY OF SHORELINE IN 1859 SURVEY WITH MORE RECENT SURVEYS THE X's ARE IN THE SAME POSITIONS ON ALL DRAWINGS (ADAPTED FROM DATA COMPILED BY U S ARMY CORPS OF ENGINEERS)

1949

3400 FT

1956

3480 FT

1961

3400 FT

1966

3360 FT

Table 1. Tubbs Inlet dimensions and location from 1924 to 1972

Date	Distance*	Inlet Width**	Inlet Gorge Width	Gorge Orientation***
1924	-571 (173)	1838 (557)	578	230 degrees
4 Apr 1938	0	1683 (496)	409 (124)	160 degrees
20 Nov 1949	+36 (11)	1980 (600)	340 (103)	160 degrees (Bay end) 205 degrees (Ocean
25 Mar 1956	+445 (135)	1429 (433)	281 (85)	170 degrees
29 Mar 1961	+1736 (526)	1122 (340)	330 (100)	215 degrees (Bay end) 170 degrees (Ocean)
18 Mar 1966	+3128 (948)	1122 (340)	307 (93)	210 degrees (Bay end) 218 degrees (Ocean)
? 1969	+3432 (1040)	?	?	230 degrees
? Mar 1970	-495 (150)	376 (114)	241 (73)	155 degrees
5 Feb 1972	-495 (150)	1492 (452)	294 (89)	140 degrees
29 Jul 1972	-495 (150)	1600 (485)	281 (85)	135 degrees

* Distances in feet (meters). Distance in Column 2 is relative to 1938 position. Minus sign if east of 1938 position and plus sign if west.
** Width at maximum high-water limits.
*** True North.

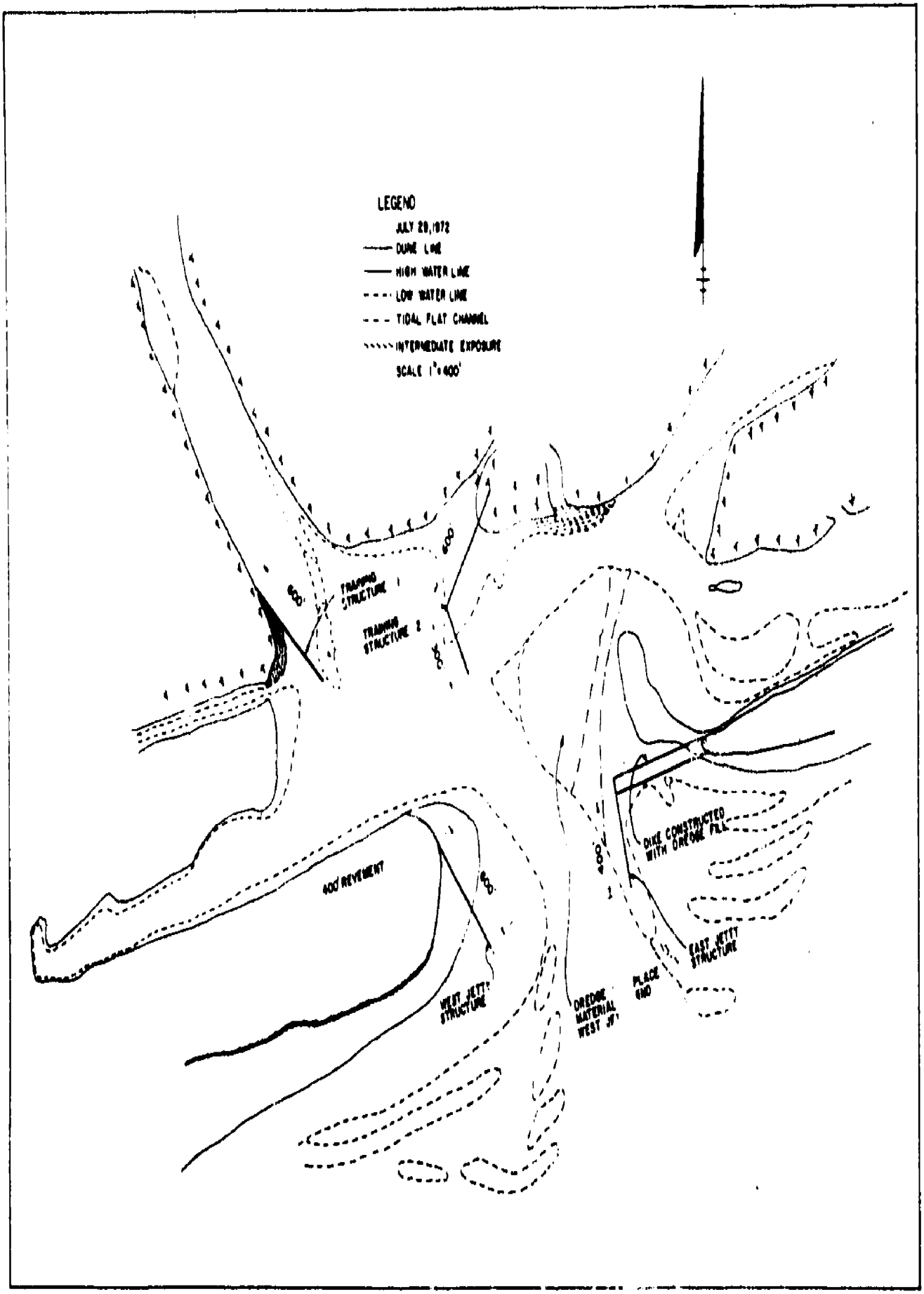

Fig. 3. Preliminary Layout of Stabilization Structures.

Inlet Study

A data base was established for Tubbs Inlet from aerial photographs, field observations and surveys. Bedform and sedimentary structures were analyzed and mapped while current velocity and direction were obtained for select stations in the inlet system. From these data, sediment movement patterns were established.

Separate ebb and flood flow movement tests were conducted using fluorescent tracer sand to monitor sediment transport under various conditions. Transport rates for individual grains and net movement of concentrated zones were calculated based upon the movement of tracer material.

A net landward movement of sediment into the inlet was found in the study (evidenced by the large intertidal flat and flood - tidal delta). The source of material was from the Barrier Island and beach east of the inlet.

North Carolina Civil Works Legislation

As a result of legislative action in 1963, the North Carolina Department of Water Resources received $1,000,000 for the purpose of building sand dunes and other civil works projects. Pursuant to a meeting of the Advisory Budget Commission on July 11, 1963, and by authority of G.S. 143-354 and G.S. 143-355, the North Carolina Board of Water Resources enacted the following rules and regulations pertaining to state participation in civil works projects:

> ...Certain portions of the appropriation...may be used for the purpose of defraying the costs of planning construction, or operation of any civil works project...for which there may be no federal funds available for any of these purposes...eighty per cent (80%) of the total costs of any particular civil works project, as calculated during any particular fiscal year shall be expended from the said appropriation by the Department of Water Resources, and the remaining twenty per cent (20%) shall be appropriated by the local political subdivisions or unit of government.

In 1974, the North Carolina Board of Water and Air Resources (formerly the Board of Water Resources) amended the rules and regulations pertaining to civil works projects to include:

> ...The State, through the North Carolina Board of Water and Air Resources, will consider participation in permanent or interim projects to provide hurricane protection and/or beach erosion control provided that: (1) local governments initiate a request, sponsor the project, and meet the State or federal requirements of local cooperation, (2) the project is physically feasible and economically justified and (3) the developments to be projected were not built unwisely...

Inlet Stabilization Project

At the request of the Office of Water and Air Resources (formerly the Department of Water Resources), a preliminary design of an experimental inlet stabilization

project was developed by Dr. J. Machemehl from North Carolina State University. The preliminary design for the stabilization of the inlet consisted of two training structures, two short jetty structures, a dike constructed of dredge spoil, a revetment and dredging of the estuarine channels as shown in Figure 3. The study of Tubbs Inlet, North Carolina was used extensively in the preliminary design.

The preliminary design for stabilization of the inlet was presented to the Office of Water and Air Resources and to local officials of Sunset Beach in 1974 for their consideration.

Conclusion

The cooperation between the Sea Grant Program, the North Carolina Coastal Research Program, the North Carolina Office of Water and Air Resources, North Carolina State University and local officials from Sunset Beach, North Carolina resulted in a study to understand the mechanisms in the migration of Tubbs Inlet, North Carolina which resulted in a preliminary design for an experimental inlet stabilization project to be supported with funds provided under the State's Civil Works Program.

Reference

Masterson, R. P., Jr., J. Machemehl, and V. Cavaroc, Jr. "Sediment Movement in Tubbs Inlet, North Carolina," Center for Marine and Coastal Studies, North Carolina State University, Report No. 73-2, June 1973.

Sea Grant:
A Catalyst for Community Action

Bruce W. Mattox

Mississippi-Alabama Sea Grant Consortium

Introduction

Sea Grant philosophy encourages local programs to become catalysts for action. The distinguishing feature of this philosophy is the basic concern for people who use marine and coastal resources. Sea Grant activities have been focused sharply on the task of finding solutions to the problems which directly affect the quality of life within the coastal zone.

Action is the ultimate key to implementing Sea Grant philosophy. In Mississippi, this action has been achieved through the Coastal Leaders Program.

Evolution

The Mississippi Gulf Coast region has been subjected to intense planning activity, but few of these plans have been implemented. Many of them were politically inspired; and partisan politics, geographic sectionalism, and apathy often led to the premature demise of potentially beneficial projects. The Coastal Leaders Program was established to surmount such obstacles.

Adhering to the philosophy that Sea Grant is a people-oriented program, leaders from a cross section of coastal communities were assembled to help identify areas in which Sea Grant could be most beneficial. From this meeting emerged general acceptance that a unified regional approach should be employed to solve coastal problems. As a result, a formal follow-up Coastal Leaders Conference was held to identify problems and assign priorities for their solution. Citizen's Task Forces were formed to investigate specific problems and to recommend courses of action. These Task Forces now form the core of the Coastal Leaders Program and provide a nonpolitical forum where leaders of all political persuasions can work together.

Sea Grant serves an organizational and informational role to help identify alternative solutions. However, the people select and implement their own solutions. The Task Forces originally formed were: Transportation, Tourism and Recreation, Seafood, Education, and Industry. As time passed, the character of these groups changed as need dictated. The Transportation and Tourism and Recreation Task Forces have now merged, as have the Seafood and Industry Task Forces. The Education group made a number of cogent recommendations and then

decided to cease operation. Tangible results have been produced by the two remaining Task Forces.

Tourism and Recreation Task Force

The Tourism and Recreation Task Force brings together various segments of coastal leaders interested in orderly development of the tourist industry on the Mississippi Gulf Coast. This Task Force provides a forum for an interchange of ideas and information among the various groups represented, including: industry leaders (hotel-motel operators and attraction managers), political leaders (Boards of Supervisors, Mayors, Representatives), Chambers of Commerce, planning groups, State Government agencies, and news media personnel.

Interaction among these groups has resulted in a better informed public and has reduced the time required to obtain action on various projects. Outside agencies or groups that sponsored or affected a tourist-related project on the Coast were requested to meet and discuss their plans with the Task Force. Examples of this were the Mississippi Park Commission projects, including Buccaneer State Park in Hancock County and the Fisherman's Wharf to be located in Biloxi. A State Park representative commented on the status of these projects and discussed the background of each, the problems encountered, and future plans. The Task Force was then able to pose questions and offer suggestions. Also, a briefing on tourist-related research was presented to familiarize the leaders with previous accomplishments before additional research possibilities were explored.

This Task Force has made a significant contribution simply by bringing together these groups of leaders to exchange ideas. This exchange has resulted in several action-oriented projects. Letters have been sent to the State Highway Department supporting adequate access from Interstate 10 to the Gulf Islands National Seashore Park entrance, and a favorable reply has been received. Letters also were sent to the Harrison County Board of Supervisors in support of their efforts to obtain beach patrols to discourage violations of beach ordinances. Efforts are now being initiated through the Mississippi-Alabama Sea Grant Consortium, in conjunction with the Gulf Regional Planning Commission and the Harrison County Board of Supervisors, to find a more efficient means for beach maintenance and upkeep. Presently, wind erosion is a serious problem. Sand build-up along the highway is extremely dangerous and costly to remove, and beach sand must be continually replenished.

Beach picnic shelter projects, initiated in Coastal Leaders Program meetings last year, were designed by the Sea Grant Advisory Service and funded by the Harrison County Board of Supervisors. These meetings brought together the various industry leaders, the planners of the project, and the supervisors who supplied the funds. Support for the project was immediate. A pilot project was funded, and two shelter oases have been built. This project has been extremely successful, and nine more oases have been approved. The Sea Grant Advisory Service has designed larger oases with sanitary facilities and dressing rooms.

An ongoing quarterly tourism report is being prepared by the Bureau of Business Research, University of Southern Mississippi. The report will supply data on the three coastal counties, including such items as hotel-motel sales and estimates of the number of guests served by the industry, change in hotel-motel units, and restaurant sales. Other indicators selectively chosen as representatives of tourist travel trends on the Coast include data on visitors to the Gulf Islands National Seashore and Beauvoir, commercial airline boardings, and analyses of tourist inquiries received on the Coast. Additional data may be included as they become available. Plans have been made to include a progress report on tourist-related projects and programs of interest to the coastal leaders.

Other projects under consideration by the Task Force include: determining who is responsible for the dangerous holes within wading distance of the beach, and what can be done to alleviate the problem; finding additional funding for beach development such as fishing piers and picnic areas; and generating favorable publicity for the tourist industry.

Seafood Task Force

The seafood industry presented a fertile area in which the Coastal Leaders Program could make a definite contribution. Many problems of a political and physical nature have plagued the industry in recent years. After the Seafood Task Force was formed, each meeting was attended by approximately 24 people, representing 75 percent of the industry. These industries are concerned primarily with frozen and canned shrimp, oysters, and crabs; but the menhaden and pet food industries also were represented.

Organizations such as the Mississippi Marine Resources Council, Mississippi Marine Conservation Commission, National Marine Fisheries Service, Gulf States Marine Fisheries Commission, and Sea Grant Advisory Services have actively participated in the program.

The Seafood Task Force projects were divided into two main categories: those that may be resolved locally within a reasonable time frame, and those of a more complex nature that may require research from outside agencies.

Examples of the first category include:
1. Seafood Waste Disposal Program (Headed by Glenn Williams of DeJean Packing Company). This program was generated by an edict from the Environmental Protection Agency and the Mississippi Air and Water Pollution Control Commission requiring that all shrimp hulls, heads and other processing debris be removed from waste water prior to discharge into the estuarine environment. Task Force personnel coordinated directly with Biloxi officials to use city land fills to dispose of solid processing wastes and to dispose of waste water through the new sewage treatment plant which will be completed soon. The Sea Grant Advisory Service performs a vital function in this program by coordinating closely with Dr. Lewis R. Brown, of Mississippi State University, who is conducting a Sea Grant research project to convert seafood processing wastes into useful products. Various alternatives have been suggested, and several local companies have expressed an interest in the project. Data is currently being collected to

determine the volume of solid waste that will be available to interested firms for feasibility analysis. Thus, a solution to the waste disposal problem will aid the seafood industry by converting an expensive waste discard into a valuable raw material. Research cost is minimal, but potential benefits to the industry are impressive.

2. Periodic and Controlled Additions of Fresh Water to Enhance Seafood Productivity (Headed by Victor Mavar, Mavar Shrimp and Oyster Company; and coordinated with Gulf States Marine Fisheries Commission, Corps of Engineers - New Orleans District, Gulf Coast Research Lab, Louisiana Wildlife and Fisheries Commission). A preliminary plan has been developed to provide a controlled amount of fresh water into the Mississippi Sound from the Bonnet Carre Spillway on the Mississippi River. Nutrients contained in the river water stimulate the growth of many species of seafood, and lowered salinities kill oyster drills. This project requires a great amount of interstate cooperation and coordination, but good progress has been made with many key people in Mississippi and Louisiana. Cautious optimism has been expressed by all of the agencies and parties involved, but at least one more year of effort is anticipated before any definitive action is expected on this project.

An example of the second category includes:
Utilization of Shrimp and Foodfish Discards (Headed by John Christensen, Quaker Oats, and assisted by Rolf Juhl, National Marine Fisheries Service, Pascagoula). From 5 to 25 pounds of fish are caught by shrimpers for every pound of shrimp. Approximately 75 percent of these fish are considered "trash" and are dumped overboard with almost total mortality. This excessively high discard rate has led to reports of large accumulations of dead and rotting fish on the fishing grounds. An estimated 500 million to 2 billion pounds of fish and shellfish are discarded each year by the shrimp fleet in the Gulf of Mexico. Although Mississippi and Alabama fish less in the Gulf than the other Gulf states, they contribute a substantial amount to total fishery activities and have a leading role in industrial fisheries. The groundfish fishery activity in the Gulf of Mexico can be expected to intensify as domestic and foreign demand for fish protein expands and as new products and processes are developed for utilizing these resources. It is essential that improved technology and techniques be introduced into the shrimp industry to reduce the capture of groundfish or to find an effective use for them. A Sea Grant project is presently studying this problem.

The objectives of the Fleet Discards Study are to determine the volume of groundfish and shellfish discarded by the shrimp and foodfish fleets operating in the Northern Central Gulf. Seasonal species composition and rank of these discards will be determined to develop the most effective method for collecting, transporting, and processing them into a useful product.

Summary:

The objectives of the Mississippi Coastal Leaders Program are to provide coastal residents with a means for expressing the needs of the area as they see them, and to assist these residents in solving problems of interest to them - problems to which they are willing to give time and attention.

The primary actors in this Program are the coastal leaders. Organizational assistance and information are provided through the Mississippi-Alabama Sea Grant Consortium. Dr. D. C. Williams, Jr., Dr. David J. Etzold, Charles P. Cartee, and Nell Murray of the Bureau of Business Research at the University of Southern Mississippi are the principal Sea Grant investigators.

The Mississippi Sea Grant Advisory Service cooperates closely with the Coastal Leaders Program. Research also is a part of the total informational loop. Since Dr. Sidney D. Upham, the first director of the Mississippi-Alabama Sea Grant Program, conceived and organized the Coastal Leaders Program, Sea Grant management has continued to participate in and benefit from this effort. Other agencies and activities also benefit from the cooperative spirit which has been engendered. Coastal Zone Management efforts, sponsored for the Mississippi Marine Resources Council by Mississippi-Alabama Sea Grant Consortium, have already benefited; and a Coastal Leaders Conference on Coastal Zone Management will be held soon to help meet the objectives of that Program. Plans are now being made to inaugurate a similar program in Alabama, in conjunction with the Alabama Development Office and the Alabama Coastal Area Board. Although other agencies and programs benefit from the efforts of the coastal leaders, the true beneficiaries of the Coastal Leaders Program are the users of marine and coastal resources - the members of the coastal communities.

Framework for Sea Grant and Industry Interaction

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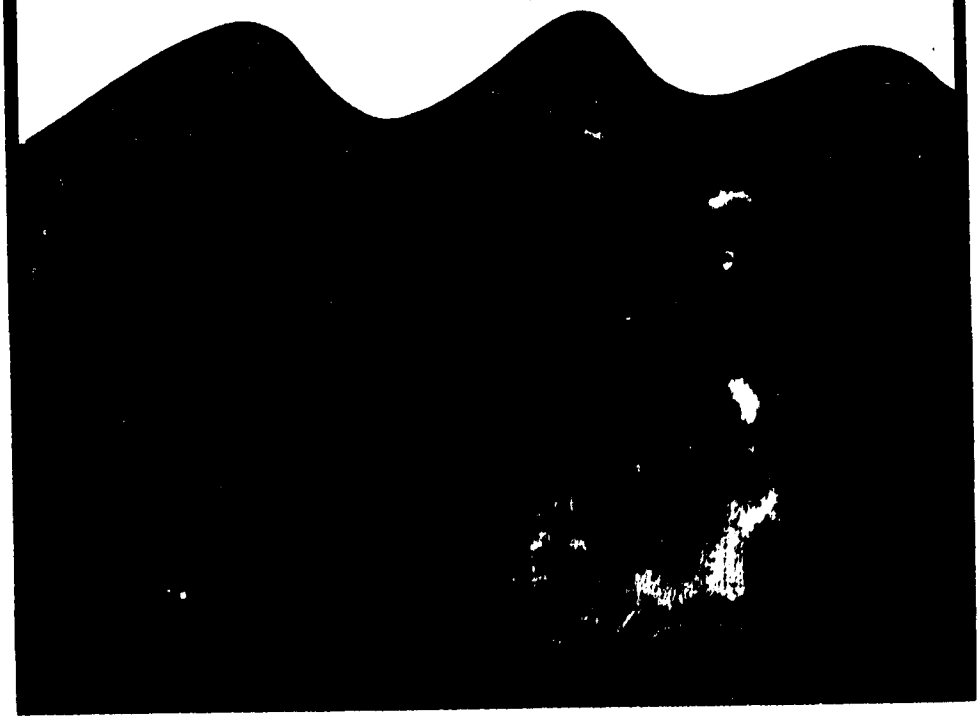

Rapid Response Funds and Industry: A Question of Timing

Stanley R. Murphy and Robert F. Goodwin

University of Washington

Introduction: Town and Gown

The lion's share of Sea Grant funding for research is consumed internally within the University community on projects of at least one year's duration. Many, of course, have much longer lives, particularly where basic information or technological methods must be developed from scratch, or require extensive reformulation or modification. Under such circumstances, the time lag between conception and project funding presents no severe constraint upon the successful outcome of research, since the criteria for measuring success are not based on corporate accounting systems: cash flow, return on previously committed investments, and so on.

Marine-based industries, operating in an entrepreneurial environment are more severely constrained, however, and time lags between commitments of capital and returns on investment can compromise the firm's profitability. This important distinction between the world of the scholar and that of the entrepreneur is a pivotal one, and one with which the Washington Sea Grant program has wrestled.

The context in which these problems of timing most frequently emerge occurs when an industry encounters unexpected snags in the development of a new product or process: snags which are unresolvable by the firm's in-house expertise or the state-of-the-art technology within proprietory consulting organizations. The University community might have specialized resources uniquely suited to resolving the problem in hand: a research investigator, or team of investigators, an institute with a mission encompassing the categorical problems facing the firm, where response can be initiated without redirection of research effort, or hiring additional personnel. Similarly, unexpected problems associated with existing products or processes which threaten the survival of a firm or the industry, may only be resolved by University research expertise.

Rapid Response

Broadly defined, these issues are Advisory Services functions, yet, because they lie outside the immediate expertise of the field agents and require heavier funding than Advisory Services' resources permit, a higher level of commitment is called for; yet, because time is of the essence, the formal proposal mechanism for Sea Grant funding is precluded. A small percentage of the Washington

Sea Grant annual budget has been set aside, therefore, for discretionary funding on short notice: the Rapid Response Fund.

Since proof of the pudding can be judged only after the dishes have been cleared from the table, some retrospective comments on the benefits and costs of projects funded through rapid response are now in order.

A Case of Shock

One of Washington Sea Grant's most publicized and startlingly successful ventures with marine industry probably would have been stillborn had Rapid Response funds been unavailable. The "Sequential Sea Mesh System" hull cleaning system has been deployed successfully on several U.S. naval vessels and the newly incorporated company expects to secure long-term commitments from that branch for a fleet-cleaning program. Commercial maritime interest is also evident.

In order to measure shock levels impacting on the ship's structure and the marine environment, the University of Washington's Applied Physics Laboratory conducted a series of tests on this explosive cleaning system. Results obtained have enabled Mr. Brad Meyers, Sea Mesh Corporation President, to produce a refined product, calibrated to reduce shock to levels that are acceptable both to vessel and to marine environment alike. Washington Sea Grant's investment of approximately $5,000, matched by Sea Mesh monies, shows promise of high returns to U.S. shipyards facing severe foreign competition in traditional, labor-intensive hull cleaning methods. Further, fuel cost savings accruing from scheduled maintenance applications of the system, are not without social benefits in these days of petroleum product shortages and escalated prices.

Use of Rapid Response funding for this project was justified because three conditions were satisfied:
1. Sea Grant involvement would remove barriers to the successful marketing of an innovative process with direct marine industrial applicability.
2. Special skills and test equipment were available only at the University of Washington's Applied Physics Laboratory.
3. Delays would have jeopardized the potential success of this new hull cleaning process, since, without credible evidence of the system's safety, potential users would naturally be skeptical of the claims.

Final judgment, of course, had to be made weighing this project against other likely demands for limited funds.

A Bowl of Jellyfish

Occasionally, there emerges in the course of non-Sea Grant funded research by University investigators, opportunities for the rapid realization of benefits accruing to the utilization of newly discovered marine resources. Where such contentions are supported by commitments from the private sector to test, market, or otherwise assist in the commercial application of such materials and delays would result in opportunities being lost, then Sea Grant can step in with Rapid Response funds immediately. In the case of aequorin - an extract from a Puget

Sound variety of jellyfish - a simplified, reliable assay for serum calcium, utilizing the bioluminescent characteristics of aequorin, had attracted the attention of clinical laboratories. Rapid Response funds were made available to continue this promising line of research which has since become a full-scale Sea Grant-funded project. A commercial outlet for the product has been found, one of the nation's largest biochemical suppliers. But in addition, further research has resulted in other important uses for aequorin being found: intracellular measurements, biological fluid measurements, and a possible fish freshness test based on ionic calcium changes occurring in fish muscle after death.

Market-testing aequorin preparations by the Sigma Corporation, St. Louis, will commence with the 1974 harvest and results will be evident within two years. Clinical testing for reliability and accuracy of the aequorin serum calcium test is being conducted in cooperation with regional medical centers and a diagnostic chemical company in Los Angeles. NIH support will be sought for further medical applications.

Thus, through use of Rapid Response funds, Sea Grant was able to "capture" a promising and, retrospectively, successful research effort and thereby enhance and accelerate the utilization of an overlooked, local, marine resource.

Recurrent Industry Problems

Certain marine industries operating in the North Pacific have encountered perpetual problems to which solutions have proven elusive. Periodically, attempts have been made to redefine the problem, and conduct literature searches in the hope that knowledge of a more recent vintage might be applicable. Two cases are illustrative here: recurrent oyster mortality in Willapa Bay, and the loss of fishing vessels operating in Alaskan waters.

Neither of these problems is new, but previous attempts to resolve them have failed for want of applicable knowledge and a broadly based perception of the importance by the community. Problems such as these may exist for years without the necessary community commitment to seek solutions, but this unified perception, when it occurs, creates a context, often of brief duration, within which the problem can be newly examined. Before this "community energy" has dissipated there exists a role for Washington Sea Grant to develop a program, as rapidly as possible, in order to capitalize on the favorable context created.

An Oyster Stew

Our marine biologist, Terry Nosho, recognized such broadly-based concern in Willapa Bay and Rapid Response funds were made available for the development of a research project designed to identify the causes of recurrent, seasonal oyster mortality.

Local growers were convinced that the culprit was pollution from a local debarking mill, but preliminary investigation suggested a biological etiology, or synergism between chemical and biological agents. Water quality studies have been conducted by students at Grays Harbor Community College and laboratory studies of

moribund or dead oysters have been performed by investigators at the University of Washington's Institute for Food Science and Technology, the locus of ongoing research in Improved Animal Aquaculture. The search for a candidate pathogen responsible for oyster mortality has been narrowed to the bacterium Vibrio anguillarum. Further research continues toward positively identifying the miscreant microorganism and developing strategies for coping with the threat it poses to the west coast's most prolific oyster beds.

Because Sea Grant support for this project was timely, community interest, evidenced by matching funding and participation by state regulatory agencies and the local Department of Public Works, was sustained - thanks to Rapid Response funding.

Safety at Sea

Between 1967 and 1971, 134 fishing vessels foundered in Alaskan waters. In 1972 alone there were 54 such incidents. Vessels are becoming larger, and more sophisticated, fishing seasons shorter, and the mounting demands made on man and vessel exacerbate this tragic and unnecessary loss of life and property.

The industry, the regulatory agencies, the U.S. Coast Guard and safety equipment manufacturers together with marine insurance underwriting firms all share the view that these casualties can be reduced. Again, we perceive not a new problem, but the heightened sense of awareness of an old one, and the concommitant belief that means could be defined by which loss of life and property at sea could be reduced.

Following a series of meetings organized by the Alaskan Fisheries Safety Advisory Council (AFSAC) the need for a thorough, systematic analysis of factors influencing vessel safety was recognized and, utilizing Rapid Response funds, Sigfryed Jaeger, Washington Sea Grant Fisheries Advisory Agent, on leave to Kodiak Community College, was assigned to develop a proposal for such research. Sig was uniquely qualified for the task, having spent most of his life as a commercial fisherman, many years of which in Alaskan waters. Not only could he tell them, he could show them!

During the early part of 1974, casualty data were assembled together with reports from Coast Guard and other agencies in order to identify the critical factors affecting vessel safety in Alaskan waters. These sources were augmented by conversations with industry personnel, and in June, 1974 a proposal for a more extensive research effort had been assembled. This is currently awaiting approval and further action by AFSAC and other industry organizations.

Sig Jaeger recently left the Washington Sea Grant program to take up the position of manager of the North Pacific Fishing Vessel Owners' Association, whose members operate primarily in Alaskan waters. While the loss to Sea Grant is acute, in his new capacity Sig will be able to sustain interest in improved vessel safety from within the industry.

The preliminary investigation identifying salient factors in vessel safety, has resulted in a better informed industry, aroused the direct participation of all parties concerned, and has set the stage for concerted industry-wide efforts to seek solutions to vessel safety problems. Demands for improved local charts, improved local weather forecasting and navigation aids and better service from safety equipment manufacturers at Alaskan ports can be expected. Further, the industry has been subjected to self-criticism concerning on-board practices, crew training, safety equipment maintenance and its successful deployment in emergencies.

Crews have had the opportunity to compare their own safety performance with that of their peers who are safe and efficient operators: the standards for the industry, then, have emerged from within rather than being imposed from without - an important distinction when dealing with proud, independent personalities who comprise the fishing industry.

Operating fishing vessels in the rich but treacherous waters off Alaska will remain a calculated risk; in such a hazardous occupation the dangers of the pursuit and the rewards of the catch must be weighed in relation to each other, but better practices, information and equipment can tip the scales in the favor of the fisherman in the daily pursuit of his occupation above Davy Jones' locker.

Risks and Returns

In committing funds on short notice in the hope of solving marine industry problems, greater risk of failure is encountered than would occur under the lengthy Sea Grant review process. The information is incomplete; the uncertainty of a successful outcome is high. Consequently, the onus for imprudent judgments is focused on the local directorate, imposing a need for careful review of circumstantial evidence for success - even though the funding levels are modest.

A reiteration of our opening comments is in order: profit-based marine industries do not share the luxury of timing flexibility enjoyed by University research efforts. Problems which interrupt production, create crippling increments in costs, or otherwise threaten the profitable operation of the enterprise must be addressed much more rapidly than Sea Grant's backbone research programs. Where the scope or the cost of the response exceed the human or monetary resources of Advisory Services some institutional mechanism such as the Washington Sea Grant Rapid Response Fund is imperative. Without such a discretionary funding source, Sea Grant's ability to respond to marine industry problems is compromised. Concommitantly, opportunities for establishing more productive long-term cooperative ventures with local industries - an imperative condition for developing a broadly-based regional program - would be undermined were those same industries to be refused appropriate assistance in a timely fashion.

In conclusion, then, Washington Sea Grant's Rapid Response Fund augments its advisory service capability, capitalizes on extant research efforts within the University community, and closes the gap in a temporal spectrum of response which lies between routine Advisory Services contacts with marine industries and long-term research ventures comprising the bulk of the Sea Grant program. The few

anecdotal illustrations outlined in this paper have illustrated the positive contributions Rapid Response funding has made to the program. We believe our results illuminate the need for this important, undervalued program element to receive stronger reinforcement, both in principle and in funding, throughout the national Sea Grant program.

University-Industry: An Unnatural Marriage without a Broker

Godfrey H. Savage

University of New Hampshire

The original title of this talk was to have been University/Industry Research - An Unnatural Marriage. The originator of that title could not be here, but the idea generated by his theme was so introductory to what I have to say to you this morning that I simply plagiarized it and added my qualification "Without a Broker".

My credentials for talking on this subject are simply that my University of New Hampshire faculty colleagues and I, during the past five years, have initiated joint research projects with corporations such as Bechtel Corporation (San Francisco), General Electric (Philadelphia), Raytheon Submarine Signal Division (Rhode Island), Sanders Associates (New Hampshire), Marine Colloids (Maine), Maine Salmon Farms, and Abandoned Farms (Maine). The latter three companies are all concerned with aquaculture or fishery development. These efforts have been in keeping with the National Sea Grant Program which has the unique goal of adding to the national wealth and well-being from our coastal territories and waters ing the capabilities of our higher educational institutions. In my opinion, the final measure of the success of the Sea Grant Program will be how much it assists American industry, big and small, and its labor force. They are the basic generators of wealth and jobs in our social-economic system and a group to which the Congress legitimately listens and relates. Yet we constantly are reminded of the classical separatism of industry and universities.

On the one hand, the primary purpose of a private business must be to make a profit for its investors. This is a desirable and legitimate goal that a responsible business corporation accomplishes by providing needed goods or services for its customers, using the talents of its employees to a maximum for which they are paid accordingly and maintaining a responsible partnership relationship with the community in which the business is located. Aside from a few radical socialists or frustrated economic planner types on our campuses, it is not the legitimate profit motive that separates universities and industry. However, making a profit also calls for obtaining patents and licenses on any technical innovation accomplished by the company, and maintaining corporate secrecy about technology or techniques and other legitimate competitive advantages in a free and open market. The professional employee in a company, such as an engineer or a scientist, looks for financial remuneration as well as professional recognition and often

receives his highest recognition by being given a management position and bonuses and stock options rather than by election to professional and honorary societies or other more idealistic laurels. There are, of course, notable exceptions, but I trust you will accept the truth of these generalizations.

The traditional university professional, on the other hand, has the goals of an educator and a scholar. His purpose is to educate students and add to the general body of knowledge. His recognition comes through the performance of his students after they have graduated from his institutions and from his ability to add to the body of knowledge in his particular discipline demonstrated through free and open publications that are judged by peers who are often located in other universities. While he is not often provided with the same level of budgets available to many industry researchers, so seldom has the same time/performance deadline commitments that close financial management usually puts upon industry projects. He is almost always a teacher and part-time researcher working with other part-time researchers who are graduate students and colleagues. While the university researcher is appreciative of financial rewards, his reward system is not so clearly identified with the financial advancement of the institution with which he is associated. Finally, the traditional university researcher seldom has very many people working for him and is seldom trained or experienced in the management of projects that have major pieces of capital equipment such as are often necessary to carry major industry projects through to conclusion. This characteristic of the university scientist/engineer has long been recognized by deep ocean oceanography which has provided him with national institutions to supply the ships, the personnel management and most of the other services the university researcher requires for work in the ocean. The industry approach to research projects, on the other hand, is usually one where they supply their own management and their own capital goods. In fact, their motivation is often to develop projects that utilize their present plant and equipment.

In addition to their different reward and operating environments, there is another ingredient that is usually added to joint university/industry projects that interferes with the working relationship. The two parties are often widely separated geographically. Communication is carried out by telephone, the mails or travel which then takes one or the other party away from their home environment. If one of the principal investigators is a university professor who teaches classes on a regular basis, his immobility results in the industry people being called upon to do most of the traveling to maintain communications. The result is predictable, and the usual arrangement has been that the work has been broken up into components that can be done at separate locations rather than having an integrated project team with all of the benefits of continual interaction (including mutual trust and respect) that come with day to day contact. Only during the summer months can the responsible university teacher/researcher give the kind of full-time attention to an active research and development project that is expected from a full partner. Therefore, university researchers are usually cast as consultants or advisors in their work with industry or simply recipients of purely educational grants. In some cases, a university has gone into business and established a research and development branch which has little or no interaction with the teaching faculty or the student body. Most of these university research and development companies have recently been divested of their university affiliation as the university community has begun to refocus its attention

on the business of educating and adding to the body of knowledge.

I could go on enumerating other trends and attitudes which inhibit the joining of industry and universities in joint projects where their personnel work together as partners toward a common goal. There are very real divisions. So how do we get them to work together in the marine field?

The first step is to have them both admit that their goals are really not so separate. A great deal of new knowledge and new talent has to be generated if we are to have significant and successful aquaculture, environmentally and societally sound exploitation of our coastal zone resources such as oil and gas, sand and gravel, wise power plant site location, and so forth. American industry must accept the basic equation that they will not be permitted a free hand in making decisions in the coastal zone. Their expertise and experience alone cannot, and should not, be the only major criteria for determining national or regional interest. Rather than blocking or resisting the integration of social science into the decisions about natural resources, industry should be in the forefront of assisting the institutionalization of the other legitimate interests in our marine territories. For instance, the American petroleum and mining industries received tremendous assistance from the U.S. Geological Survey in the first half of this century. Why can't they look forward to similar valuable assistance from a U.S. Biological Survey that would map out all the unknown and unmeasured biological parameters with which the public expects the offshore industry to contend in a responsible fashion.

Our university communities, on the other hand, need to recognize that it is their responsibility to help generate the new information and talents required to make responsible technological and economic progress within the new ground rules our society is adopting as we enter the third century of the United States of America. They also will not have the luxury of unlimited time in which to develop many of the answers. The stereotype of the traditional professor is still the fundamental building block of a university worth the name, but there is also the need and room should be made for faculty and students to work in interdisciplinary groups to accelerate the finding of solutions to more immediate and complex problems.

Real interdisciplinary project teams are very rare animals in our universities, much more rare than we like to admit. They present management problems which threaten traditional university department structure and promotion and tenure process. Further, many of the questions that are before us are so comprehensive that no one institution can expect to have all of the expertise on its own staff. Following this logic leads one rapidly to the conclusion that there is a need for ad hoc project management in which university faculty and students can work together in joint projects with professionals from other universities, industry and government organizations. There is a need for recognizing that some such projects will mature to the point where it will be desirable for the faculty members and some students to be full-time for one or two years to bring the project to successful fruition. And finally there is the need for all parties to recognize that such ad hoc project organization, serving people from several institutions, must be a true common ground where the project is foremost with the individuals involved being members of the project team first and employees of their respective institutions second during the life of the project.

In the past, such ad hoc organizations have only materialized as an accident of some unique national need or goal. Two of the successful ones that come to mind are the original Polaris Project Group under Admiral Raborn in the middle 1950's and a much smaller effort by the National Academy of Sciences with the Mohole Project Phase I. What these projects had in common was a highly understandable and acceptable goal that was accomplished by bringing together people from many different organizations. We have not seen many such efforts in the ocean and I submit we need them more now than we did 20 years ago. They won't happen unless private industry, our universities and the federal and state governments recognize that none of their present institutions can provide such efforts.

It is the conclusion of this paper that university/industry partnerships can work, but they won't unless we all recognize that we need to formalize and institutionalize the *process* of bringing them together. I am suggesting that the National Academy of Engineering should initiate a number of feasibility projects with marine social/economic objectives where men and women from industry, the academic community and government can be drawn together in temporary partnerships that will be governed by none of them, but from which they can all profit. It is possible to envision a number of coastal zone laboratories with little permanent equipment and permanent staff that would be as independent from any present institutions, but under the policy control of a private professional group such as the National Academy of Engineering. Such laboratories would provide a common and neutral ground from which projects could be staged with funding coming from many sources including private industry and Sea Grant.

For those industry people who might look upon this suggestion as just another sink for tax dollars, I urge you to recognize that the projects accomplished through such laboratories would be those that you might have envisioned doing with your own research money alone, but cannot afford because they have a low profit potential within your ground rules of risk and return even though they have high priority in the national interest.

I started this talk with an analogy to marriage. Surely the marriage of a man and woman brings together two very different bodies and I agree with the Frenchman who said"vive la difference." The institution of marriage between people works because it has been developed over a long period of time and people enter into it wanting to make it work. We have no such traditional institution to facilitate the marriage of academia and private industry and I suggest that the reason why we are not getting together more often and more fruitfully is because we always have to live together out of wedlock because there is nobody around to perform the marriage ceremony.

In 1831 a French philosopher named Alexis de Tocqueville visited the young United States and wrote a treatise on his observations called "Democracy in America". His remarkable perception of our national character has long since been established. One of hispredictions was that most able Americans would seek careers in commerce rather than in the civil services because it was the peculiar task of Americans to conquer their vast territory and harness its resources. He predicted that this attitude toward career values would persist until our conquest of nature was accomplished. After nearly 200 years as a nation, we seem to have come to the understanding that our historical drives have accomplished their goal, and we are a mature nation with many other needs for talented men and women in

addition to those of simple commerce and business. On the other hand, Americans have a traditional fear and suspicion of governments; so we do not want the Federal or State bureaucracy to increase their participation in our affairs. Thus, there is a real and present challenge to the American genius for organization and management to create truly temporary, ad hoc, non-alligned organizations to attack our major ills and concerns such as the many decisions we must make about our coastal zone and marine territories. We must encourage talented people, drawn from industry, government, universities and other public or private organizations to join together in full-time applied research and development efforts with goals of national service which will naturally and eventually feed back to the general profit of all the institutions who lend their personnel. We must do for ourselves instead of standing around blaming our various institutions for not doing for us. Paraphrasing another historical figure at this appropriate juncture in our national history, people from industry and academia must join together in the face of our present national difficulties and challenges or we shall surely decay separately.

An Analysis and Proposal On the Amplification of the 'Commercial Applicability Element' In Sea-Grant Sponsored Aquaculture Research Programs

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Introduction

One of the elements that guided the evolution of the Sea Grant system was the report issued by the 1969 Commission on Marine Science, Engineering and Resources. The Commission identified that "expanded ocean industries offer some of the nation's most inviting opportunities for economic growth" and further concluded that "the nation's marine capability must be built upon an expanding base of knowledge and practical skills" (Stratton et al 1969).

As a member of the seafood industry, I confirm that Sea Grant programs have significantly assisted in fulfilling the mandate for an expanded base of knowledge and skills. Nevertheless as an observer of on-going activities, especially in the area of aquaculture, I question whether Sea Grant can be considered totally effective in directing sufficient research effort towards the generation of information which can directly assist industry in amplifying the exploitation of marine resources on a commercially viable basis.

I believe the "insufficient commercial application" element in research programs is not explained by any fault in the motivation of Sea Grant administrators, but mainly stems from the problems inherent in the process of developing research proposals and the evaluation/grant award system by which such proposals are judged.

The purpose of this paper, therefore, is to compare the research proposal/grant award and program evaluation process of Sea Grant, as exemplified by aquaculture, with the same administrative process used in industry. The purpose of making such comparisons is to possibly identify the causative factors which can reduce the degree of commercial application of public sector research and also to propose possible modifications in the Sea Grant administrative system whereby this problem may be overcome.

Involvement Decision and Research Proposal Development

Figure 1 indicates that the organization/communication channel structure, as it relates to the initial direction to consider involvement in aquaculture, is virtually equivalent in both sectors, the only variance being the actual title of the participating members. Furthermore the motivation of the direction element in the involvement decision is similar, with both directive bodies

desiring to obtain economic gain from developing aquaculture programs.

The first and most important dichotomy between the public and private sector approach occurs within the executional elements of this system during the research proposal development phase and is attributable to the variance in the approach of the proposers (see Table 1).

The influence of the elements described in Table 1 on public sector research programs is that the resultant proposals may exhibit the following characteristics: (i) reflect the personal interests of the scientists (ii) may be weakened by assumptions on the expected size of the grant award (iii) be restricted to a species of local availability although not necessarily of major commercial potential (iv) reflect a tendency to utilize capital equipment already available at the institution as opposed to the equipment most suitable for the project and (v) inadequately meet the need to generate data for direct use in the commercial culturing of aquatic species.

The unfulfilled "commercial application" requirement mainly stems from insufficient input from external sources on the various parameters which could affect the financial implications of both the research program and nature of the results.

This can be contrasted with research proposal development in the private sector, where input on commercial viability is fundamental to the planning process and is achieved through close interphasing between R&D and line management. Furthermore the planning stage in the private sector probably tends to be given much greater emphasis through utilization of such techniques as path analysis programs of the type illustrated in Figure 2.

Actual quantitative analysis within such networks can be achieved using simplified numeric rank scales for the key factors involved, where the rejection/continuation decision is tied to a predefined miminum summation score for these factors. Computer simulation of such networks is possible, although the limited availability of data on aquaculture complicates the analysis. Furthermore the cost in personnel and computer time in such a task probably outweighs the potential sensitivity increase of the model that is attainable by this more sophisticated approach.

The key points of interest in the network model are as follows:

(i) The entry point being the market potential for the product, with the actual technical aspects of the R&D program being relegated to a much later section of the analysis (cf., the public sector where technical matters are probably the area of primary interest in the planning process).

(ii) The major importance of predefined corporate objectives in terms of their influence on the decision process. For example in the case of a national seafood company which has an objective of maximizing sales within major market categories, this would lead to an immediate rejection of limited potential species such as pompano even before one ever reached the technical evaluation stage of the analysis.

FIGURE 1

THE COMMUNICATION CHANNEL STRUCTURE OF THE AQUACULTURE ENTRY/EXECUTION DECISION

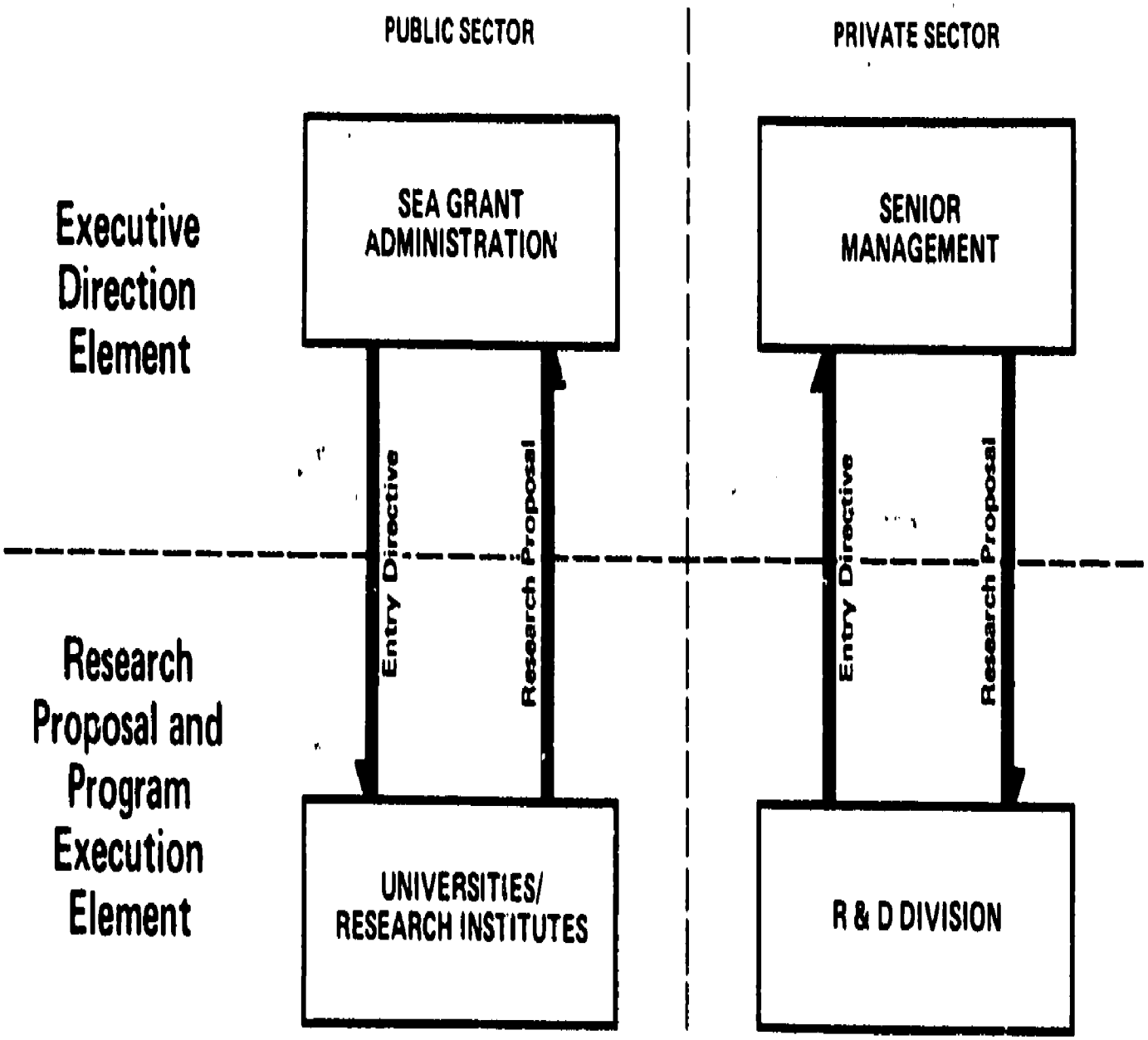


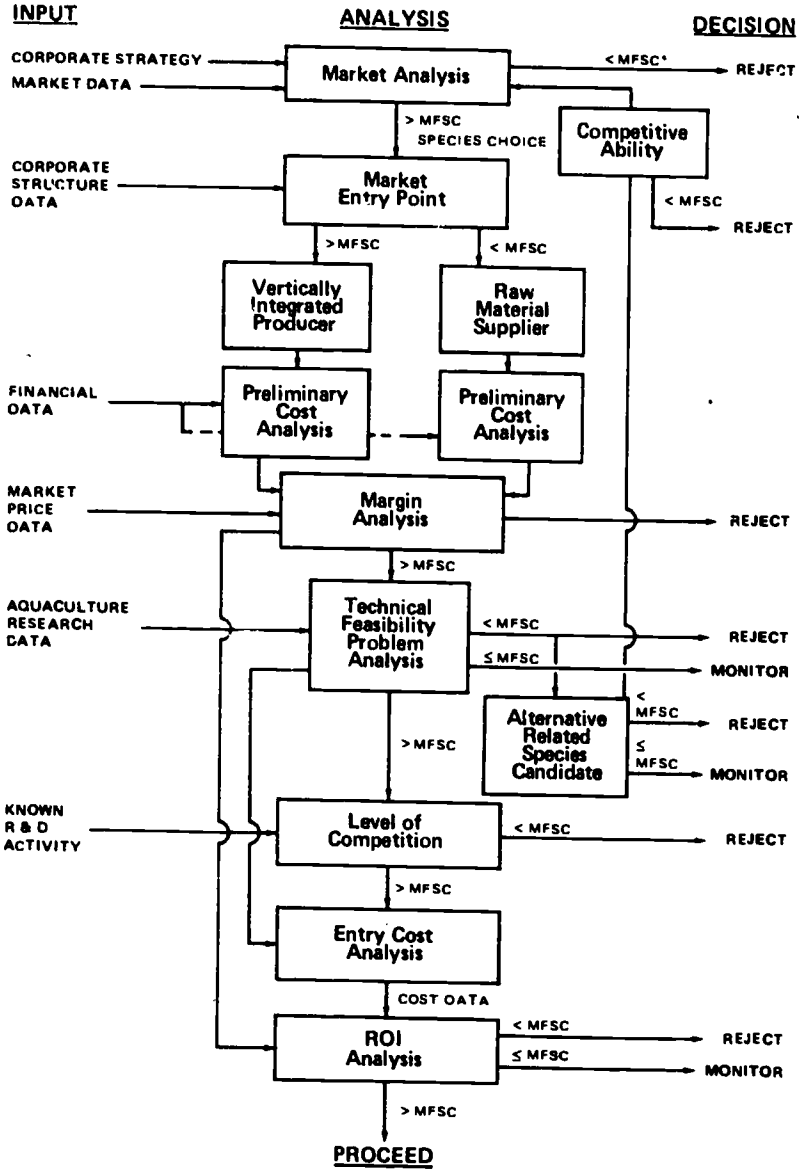
TABLE 1

A COMPARISON OF PROPOSER MOTIVATION

	PUBLIC SECTOR	PRIVATE SECTOR
ORIENTATION	I Subjects of personal interest II Reputation enhancement	I Non-personalized corporate goal satisfaction
CONSTRAINTS	I Magnitude of fund availability II "Band wagon" association to exploit "project popularity" III Location IV Institutional environment	I None
EXTERNAL INPUT	I Limited	I Total available corporate resources

FIGURE 2

AQUACULTURE NETWORK PLANNING MODEL



*Minimum Factor Summation Score

(iii) The presence of "financial viability" considerations at all stages of the program which therefore ensures that the resultant proposal is orientated toward generating a commercially exploitable proposition.

It is possible that although the planning process is different in the private/public sector approach, the resultant proposal may be a program orientated toward the same species proposition. This however will tend to be more a matter of coincidence that one of frequent likelihood.

Program Proposal Evaluation

The proposal evaluation in the private sector is probably the simplest of the two; namely that the program is tabled alongside other investment opportunities and the final decision relates to the potential ROI weighted against the magnitude of risk. Depending upon both corporate attitudes and general business climate, the risk element has a varying degree of importance. For example, in a poor or economically uncertain business climate, the risk element may become extremely important with the choice over the medium-term orientated towards low risk, low ROI programs as opposed to those offering a much higher ROI, but proportionately greater risk.

To exemplify the use of the planning/proposal approach in the private sector Booth Fisheries used analysis of this type and as a result concluded that on the grounds of either limited market potential or ROI/risk, shellfish and marine and freshwater finfish were all areas in which direct R&D investment was not warranted. In the final analysis it appeared that only marine shrimp fulfilled our corporate objectives and ROI parameters. Hence we have approved a small scale research program on marine shrimp to gain a better insight on the production economics associated with aquaculturing such a species.

This decision does not mean that we have totally rejected other species opportunities in aquaculture. You will note from Figure 2 that there are "recycle examination elements" built into the model. In such areas where we feel there is marginal potential for aquaculture, we continually monitor research activity and review the financial aspects of the model as more data become available.

As mentioned previously it is quite possible for private and public sector research proposals to reach the same conclusion. This is aptly demonstrated by the large interest in universities and research institutes in the proposition of aquacultured shrimp. To a certain degree however the interest in the public sector has stemmed from the interest of the research worker and the location of the institution. If one is located in a southern state marine university one would obviously be more interested in shrimp than in cold temperate water marine finfish. Unfortunately the reverse is also true, i.e. that somebody in the northeast will develop research programs for a species of finfish, even though a private sector operation would reject this item early in the assessment process on commercial viability grounds.

The proposal assessment/grant award activity in the public sector is probably more complex with important factors being: (i) the originality of the field of investigation, (ii) the scientific validity of the approach (iii) the previous history of the proposer including such elements as reputation within the

scientific community (iv) the reputation of the proposing institution in which the scientist is located (v) the personal bias of the members of the committee in relation to their knowledge of the proposers (vi) political influence (vii) the need to fairly allocate funds on a geographic basis and (viii) inter-institutional relationships as this relates to the members of the review committees (i.e., an over-critical analysis by one review team may be avoided by that team if they are concerned that a review committee for their own programs may contain an individual from the institution on which they are reporting).

Program Continuation Assessment Parameters

Concurrent to the approval of a detailed R&D program in the private sector is the definition by senior management and the R&D staff of the target objectives of the project, and specified review dates for completion of each stage. In the public sector this assessment tends to be more of an implicit effect which relates to the annual review of the grant should it run over more than a 12-month period.

Potential Problems in the Public Sector Approach

The problem of insufficient commercial application has already been stressed and mention also given to the question of progress assessment during the research period.

Linked to this latter subject is a problem concerning the inflexibility of expenditure in the grant award process. In many instances a R&D program will encounter unforeseen problems and the solution may require further injection of funds. In the case of public sector research, however, this is not usually possible because the available funds are fixed at the beginning of the program. Thus if the researcher later encounters a problem requiring further expenditure, this is usually unforthcoming, and the whole future of the project can be endangered. This is an unfortunate situation, especially in the cases where the project has already absorbed large expenditures in capital investment, which would be wasted if additional working capital funds do not become available. For example in aquaculture if one is working on a shrimp grow-out program, it is possible that one could encounter a problem over the availability of post larvae if the originally agreed hatchery source encounters an unforeseen disease problem. In this instance it is possible that the only solution for the researcher is to buy such larvae from a private hatchery. If his original budget did not allow for this expenditure, then lack of additional funds could result in nullification of the purpose of grow-out system because it cannot be stocked.

Another potential problem area in public sector research lies in the duplication of programs. This duplication does not occur as a planned activity but merely stems from the fact that various institutions may be working on similar projects and this can cause program overlap. For example in the case of shrimp aquaculture there are universities in Texas, Miami, Mississippi, Arizona, Colorado and Washington all involved, or planning to be involved, in research on this animal. It can be argued that the approach being taken by these various bodies

is different and therefore research expenditure is warranted. Nevertheless it would seem logical that one or two of the suggested approaches would be potentially more viable than the other techniques proposed. Thus grant awards spread thinly over many programs may dilute the potential benefits that may be generated by research effort in any one area of aquaculture.

One other problem area in public sector research is the priorities given to various phases of research. It is quite possible in a commercial situation, that a technical problem in one minor area of aquaculture can generate a major obstacle in establishing commercial viability. In the case of public sector research, the definition of priorities tends to be towards those of greatest scientific interest, even though it is possible for a situation to develop where the subjects of greatest interest are not those which currently provide the greatest barriers to the establishment of a commercially viable culture operation.

A Proposal on Revision of [illegible] Sea Grant Administrative Process

One solution to the above problem areas may be for Sea Grant to utilize the administrative approaches currently in effect within the private sector. This would involve changes in (a) the planning stage of the research proposal development, (especially in the areas of analyzing the financial implications of the proposed research and the commercial application of the results) (b) the Grant award decision process and (c) the assessment of the progress of various projects.

Increasing the weight given to planning in the public sector may result in the introduction of the path analysis model approach described earlier. The important factor in using such models is to ensure validity of the input data. Satisfaction of such an input requirement would demand participation by individuals from various disciplines (e.g. economists, scientists, industrialists, etc.) in order for such models to be of any practical benefit. Structuring of such a wide base of inputs can probably best be achieved by the formation of aquaculture planning boards at the federal and local levels.

The primary function of such planning boards would be to define areas of research opportunity which could serve as the base for research proposal development by research institutions in the public sector. The establishment of both state and federal level boards is necessary because local conditions (e.g. a need to stimulate local economies and reduce above average unemployment levels) can drastically alter the potential viability of a proposal. Thus without local information, allowance for such effects would not adequately be covered if one merely relied upon a federal level planning board system.

(I am fully aware that this use of central planning boards to define research objectives can be interpreted as a restraint upon academic freedom. This paper is not the place to enter into the diverse nature of such a debate, except to pose the question of whether the current economic climate is such that we can continue to enjoy the proportion of funds spent in the academic area, for which the return in relation to the direct economic gain of society is disproportionately low?)

The other possible functions of these boards could be for them to become involved in the research proposal evaluation/grant award decision and continuing assessment of the progress versus the predefined objective of the funded programs.

In the area of grant award, the planning board is in the best position to evaluate the various research programs proposed by scientists through examination of such factors as the location of the institution, the research bias of the individuals and the probability that one chosen institution has the best chance of successfully completing a program to solve the research problem previously defined by the boards as requiring attention.

As was stressed earlier a key problem area currently associated with public sector research is progress assessment of on-going projects. This is a function for which the planning boards are also well suited. Having agreed on the program objectives with the participating researchers, on possibly a monthly or quarterly basis, the boards could then evaluate project progress on the basis of reports submitted by the participating scientists. The board would not function merely as a critic however, because it should also provide an opportunity for the scientist who encounters problems, to table the nature of the obstacles and obtain the opinions of others on possible solutions. This would seem an extremely functional role for the boards because in many instances the problem/solution situation in public sector research tends to occur after publication of the results of the research in which the encountered obstacle is described. The publication then stimulates further research by another individual. The time lag between identification and solution in such a situation can consequently range anywhere between 12 and 36 months.

Industry Attitude

The inclusion of private sector individuals on such planning boards is only of use if industry is prepared to cooperate fully in the R&D programs. Many people can probably provide examples where industry's attitude on confidentiality is so extreme that they are not prepared to act as a guiding factor in public sector research. This situation is to the detriment of all parties, because the response of the public sector scientists is to reduce the degree of assistance he is prepared to give to the industrialist in the solution of problems. The involvement of industry therefore requires a more cooperative attitude in terms of the time it is prepared to give to such programs, and also the degree of input and communication it is prepared to make to ensure their success.

Consequently it can be concluded that should the planning board approach be considered as a way of increasing the "commercial application element" in Sea Grant aquaculture programs, the success of such an aim is very dependent upon industry's willingness to participate in assisting and advising public sector research to a degree significantly larger than is currently usual.

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Expanding Marine Advisory Impact Through Trade Associations

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The theme for this conference, "Sea Grant--An Action Catalyst," suits me very well for I view a large part of my role as a marine business management advisory specialist as one of bringing people together to define and seek solutions to their problems.

We have found in Texas that one method of effectively carrying out this catalytic role is to work through trade associations. Participation in these associations permits us to expand our impact considerably beyond what might be expected from relying solely on individual contacts with separate businesses.

I must add, quickly, that direct, one-to-one relationships with representatives of individual firms are very important. And it is through such contacts that our work with the trade organizations began.

My job is to provide advisory services to small and medium-sized marine-oriented businesses. I work with managers, owners, and staff personnel in solving management, marketing, and production problems. I must know as much about industry problems and interests as possible and be able not only to recognize the alternatives for solving a problem, but to recommend the best alternative. This requires more than having the necessary information, it requires knowing informed individuals in the industry who will assist in evaluating that information.

The firms I service are diversified in both size and function, varying from marine supply firms to shipyards to machine shops, to marine electrical contractors to divers. Their problems usually are very different and require entirely different approaches for solution. Since I cannot participate daily in the specific industry that may call on me for assistance, I have to maintain contact with experienced industry leaders who can and will help in identifying problems and evaluating possible solutions.

When these industry leaders are organized into a trade association with specific goals and objectives, a large pool of knowledge becomes more readily available. When functioning as a group, these industry representatives not only offer broad and practical insights into industry problems, but very often possess the capability to devise solutions as well.

My objective today is to provide evidence of the value of trade associations for certain segments of the marine industry, to relate some experiences in the formation and conduct of associations, and to demonstrate their usefulness as

mechanisms for expanding the impact and effectiveness of Sea-Grant supported marine advisory programs.

I will discuss three separate trade associations which serve their respective segments of the Texas marine industry. Each was formed with the support and assistance of advisory services personnel in Texas A&M University's Sea Grant Program. They are the Marina Association of Texas (MAT), the Texas Shipyard Association (TSA), and the Marine Services Association of Texas (MSAT).

First of these is the marina group.

Texas has more than 300 marinas and more boats per capita than any other state. That statement is not meant to be a Texas brag, but evidence that recreational boating is important to the State's economy and to thousands of its citizens.

The idea for forming this association developed from marina management seminars presented by Texas A&M's Industrial Economics Research Division, the organization through which marine business management advisory services are conducted.

Kathryn Dulane, a recreation and tourism specialist with I.E.R.D., became familiar with marina industry problems while coordinating two of these seminars, the first of which was held in March, 1972. When participants in these programs decided their interests would be served by forming an association, she assisted by drawing up by-laws, recording the state charter, and serving as executive secretary for the organization.

From a nucleus of about 25 interested owners and operators, membership has grown to 76. Since the organization was formed in January, 1973, members of the association have participated in other marina management conferences, including programs on such topics as breakwaters, highway access, and safety. They have obtained a group insurance program for marina employees and personal and property liability. They have established guidelines for marina operations and a code of ethics. A newsletter provides a regular source of information important to marina managers.

An officer of the association, Myrven Cron, is a member of the Texas Sea Grant Advisory Council, and an enthusiastic advocate of both MAT and the Sea Grant Program's role in its formation and continuing operation.

The Texas Shipyard Association, in which I have a personal role, serves another important segment of Texas' marine economy.

The state has 56 shipyards which provide a variety of shipbuilding, repair, and maintenance services. They range in size from a small, one-man firm which builds shrimp trawlers to several large facilities which construct and repair hundreds of ocean-going vessels each year.

Total employment in Texas shipyards is approximately 16,000 and the industry has an annual payroll of more than $140 million.

Major activities in the larger yards include the construction of offshore drilling rigs, and barges and support vessels for the oil and petrochemical industries. Vessels for the shrimping industry in the Gulf of Mexico and several foreign countries are supplied from a dozen or more small to medium-sized shipyards which specialize in trawler construction.

Although there are great differences in the size, products, and services of Texas shipyards, they share many of the same problems--shortage of trained personnel, supplies and raw materials; insurance, safety; water quality and so forth.

Frustrated by their experience in addressing these problems alone, several shipyard owners and executives met in February, 1973, to evaluate the possible benefits of a common organization. A participant in this meeting was the owner of a small repair yard at Freeport, Texas, who had received assistance through the Marine Advisory Services Program. He contacted me for assistance in forming an association.

In subsequent meetings, I worked with the interim leadership in drafting a constitution and by-laws and in establishing goals and objectives and a membership campaign.

The Texas Shipyard Association received its charter as a non-profit corporation in October, 1973. It now has 35 members, or representation from almost two-thirds of the shipyards on the Texas coast.

The first seminar sponsored by I.E.R.D. and Sea Grant for benefit of the shipyard association members featured an evaluation of 1972 amendments to the Longshoremen's and Harbor Workers' Compensation Act. Since these amendments meant a 300-percent increase in workmans compensation insurance rates for the shipyards, it was a well-attended program.

Other programs have been held on such subjects as water quality control and disposal of shipyard wastes. Several association members have cooperated in the conduct of Sea Grant-supported research on these problems.

After a year of operation, the association has several permanent committees for the study of continuing problems and a newsletter which reports changes in laws and regulations and other items of interest.

I serve as an advisor to the association and assist in the planning of programs. The Sea Grant-Shipyard Association relationsnip has been and continues to be a valuable one, I believe, both for me as an advisory specialist and for the shipyard industry. As one shipyard owner observed, "Six months ago the shipyard people wouldn't even talk to each other, now they are working together to solve problems of their industry. It shows that once you establish the vehicle to solve problems, like we have with this association, people will begin to use it."

The third trade association I will mention originated, again, at a Sea Grant-supported seminar--this was an October, 1973 program on "Marketing to the Marine

Industry." The program was designed to acquaint the marine supply and service industry representatives with effective marketing techniques.

Initial interest in forming an association came from four representatives of smaller firms who wanted to find out more about marketing their goods and services, particularly to the large offshore oil industry. At their request, I arranged for 12 representatives of marine supply firms, commercial divers, marine equipment manufacturers, and marine services companies to meet at my office in Houston to evaluate the need for a marine supply and services association. Among the questions considered by the group at this meeting in January of this year were the following:
--What are the needs of the marine industry and can an association offer to meet those needs?
--What can an association accomplish that cannot be accomplished by individuals?
--How can the Sea Grant Program interact with this type of association and the industry it serves?

An interim committee was appointed and at a second meeting in February, the committee agreed unanimously to form an association and seek industry-wide participation. Activities proposed for the association include the following:
--Sponsor conferences and seminars.
--Provide a clearing house for information on available marine services and products.
--Develop directories providing information on the marine supply and services industry in Texas.
--Provide direct assistance to owners and managers of individual firms, as well as to the industry as a whole.
--Conduct studies to develop information on marketing, transportation and credit.
--Conduct public relations programs to keep the general public informed of the Texas marine supply and service industry.

The Marine Services Association of Texas held its first general membership meeting, along with a marketing seminar, in April. More than 125 persons attended. I was elected secretary-treasurer of the group.

The association currently has more than 70 members from several segments of the marine industry, including marine supply, diving, marine construction, marine salvage, marine repair, marine insurance, marine equipment manufacturing and repair, and towing.

In addition to the marketing seminar, it has sponsored a conference on supply shortages affecting the marine industry, as well as several round-table discussions.

One of the major contributions of the association to date has been to create a common forum for both the traditional marine industry and the "new" marine industry created by the rapid expansion of the offshore oil industry.

Although none of these trade associations resolve each and every problem faced by their respective industry segment, they can provide a greater understanding of the problem and a means of minimizing the effect on the industry.

The Texas Shipyard Association has not eliminated the problem of trained manpower shortages in their industry, but through informal discussion sessions individual members have been able to learn of methods to reduce the effect of the problem by improving recruitment programs, locating special vocational programs to train people in welding and other crafts, and reducing labor turnover.

The Marine Services Association of Texas has not solved the problem of shortages in raw materials and certain marine products, but through participating in seminars and round-table discussion programs, members have been made aware of additional resources for these materials and products.

To conclude, we feel that our work through these groups has enabled us to make significant contributions for a relatively small investment. The reception we have received demonstrates to me the real need these industries have for University-based advisory programs. It seems to me that work with trade associations offers these principal advantages to the conduct of marine advisory services.

--First, through the organization, you can get to know industry leaders who can provide support for your programs and practical insight into industry problems.
--You can develop programs that address more representative, industry-wide concerns.

Through relationships developed through regular activities of the association, you gain access to a real-time "data-bank" of practical knowledge acquired through years of experience in the industry.

You can expand your impact several-fold, with resulting benefits to the industry served and to the Sea Grant Program.

Catalyzing Commercial Application Of Mariculture Research

Herbert Hidu
University of Maine

Over the years it has been the concern of many that practically oriented aquaculture research has been applied commercially only minimally in the U.S. Certainly we have an abundance of suitable water and no scarcity of potential entrepreneurs, thus we should examine closely our techniques for stimulating new commercial technology and the steps by which a new technology may become commercially viable.

It is our idea that a new promising marine technology can rarely become a large scale commercial success overnight. This is because of inevitable difficulties encountered with specific geographical areas and a host of biological and engineering problems all of which must be solved before the technology can stand on its feet commercially. We believe that new technology must undergo a process of evolution; to first diversify on a small scale from somewhat related existing technology and only later perhaps stand on its feet commercially. In Maine we have good possibilities with intensive molluscan aquaculture coupled with an abundance of suitable water and existing marine structures such as lobster docks and pounds that could be diversified for the new use.

The analogy between developing a commercially viable new technology and the evolution of a new species in nature is, I think, a valid one. Never, for example, has nature produced a highly adapted land animal directly from an aquatic species. Rather, an almost infinite number of "experiments" are tried, a few being successful, then radiating to form more adapted successful species. Similarly in aquaculture it is dangerous to expect an overnight multimillion dollar success from promising experimental data. When this is tried there is a great danger of the new technology collapsing of its own weight, again because all problems must be solved before success can be achieved. A walking mammal did not emerge from the sea, nor did Henry Ford invent the 1974 Cadillac and we try to bear this in mind when trying to catalyze commercial use of aquaculture research results.

In Maine we feel that the political climate is now right and research results are promising, so we have been active in trying to catalyze commercial ventures particularly in oyster and mussel culture. In 1973, the Maine Aquaculture law (HP 731) was passed through the efforts of the Maine Department of Marine Resources (MDMR) allowing a private person for the first time to lease suitable

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inshore marine areas to protect his crop. Research results indicate that it is possible to rear market American and European oysters in a period of 2 years using hatchery seed and rafting techniques. Similarly, a pearl-free market mussel can be produced in 1 year using rope culture tachniques. Thus, the following types of new commercial mariculture appear possible for Maine now.

1. Oyster growout operations using hatchery produced seed. Four of these are in a late pilot stage and several more in an earlier experimental phase.[1]

2. Oyster hatcheries. Presently all seed is purchased from California hatcheries, except that which we can provide for experimental purposes from our Sea Grant effort. With a growing demand and a very limited natural seed potential there will soon be need for a Maine based commercial hatchery to produce seed from Maine shellfish stocks. Marcrafts, Inc., of Freeport, Maine is constructing a mobile hatchery in anticipation of increased demand.

3. Mussel Aquaculture. Raft culture by hanging rope technique as practiced in Spain looks feasible. Abandoned Farms, Inc. of Walpole, Maine began a pilot commercial operation in 1973.

4. Pen culture of coho salmon. This is an application of NMFS and Sea Grant efforts from Puget Sound. Two companies are in an early commercial stage in Maine, i.e., Maine Sea Farms, Harborside, Maine and Maine Salmon Farms, Wiscasset, Maine.

With the very favorable political climate and encouraging results coming from programs of the MDMR and our ongoing Sea Grant program, we felt it necessary to devise a plan to most efficiently transfer usable information to the prospective entrepreneur. The plan must reach persons with the highest potential for success and do it in a manner which would produce a minimum chance of failure and financial risk for the potential entrepreneur. The use of traditional extension agents did not appear to be the answer because we felt that a new commercial start would need a really indepth interaction, something that an extension agent with broader duties could not afford to do. Thus, we have instructed an aquaculture research associate and then made his sole responsibility the interaction between prospective entrepreneurs. The program began in 1971 and has evolved in 3 stages:

1. Preliminary involvement of prospective entrepreneurs in commercial aquaculture possibilities. Seed oysters, hardware and hatchery culture apparatus were donated and loaned to coastal residents who expressed interest in shellfish culture and who had a suitable area. Our initial purposes were two-fold; first

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[1] Maine Coast Oyster Corporation, Blue Hill, Maine.
Acadia Aquacultural Enterprises, Inc., Mt. Desert, Maine.
(Began independently but now in our cooperative experiments).
W. Brown and M. Moree, Cundy's Harbor, Maine.
E. Newbold, Southwest Harbor, Maine.

to find the persons with a genuine interest and ability coupled with a superior area for rearing shellfish. Second we obtained much scientific information by asking cooperators to assist us in obtaining comparative shellfish growth data in different areas; data which would supplement information gathered on a more intensive environmental evaluation study by one of our students. This program has worked out very well; most cooperators were stimulated by participating in the data gathering, but more important, they could, without significant expense, determine the suitability of their area either for an oyster growout operation or a small shellfish hatchery. They would be then in a position after a year or two to make a preliminary cost estimate leading to a decision whether or not to begin a more serious operation. In 1971, 1972, and 1973, about 40 coastal residents participated in this program. As our program continues each year we add additional stage 1 cooperators.

2. Selection of more promising candidates for more intensive research interaction. Again, we looked for the combination of good productive marine areas coupled with a genuine desire and ability on the part of the cooperator to make the project a success. In 1973, we found four such combinations.[2] These people participated in a more sophisticated research problem which is the thesis topic of one of our graduate students and the interaction of student and commercially motivated persons is beneficial on both sides. The other candidates, who did not appear to have sufficient interest, donated their shellfish stocks plus the information gathered and were told to contact us should they contemplate future activity.

The research problem with the four cooperators involved the comparative performance of California reared vs. Maine reared hatchery stocks of European oysters. Both parent stocks came from Holland in 1949 as part of a cooperative effort between MDMR and the National Marine Fisheries Service to establish natural populations in Maine. Today we are dealing with 3rd and 4th generation survivors in the Maine group which were originally stocked mostly in the Boothbay Harbor region. It is possible that genetic movement has occurred in the Boothbay stocks to favor performance in the northern waters; thus, they may be the favored parent stock for a more intensive hatchery development. By participating in this experiment the cooperators not only gained some valuable data, but by our constant attention were made to feel that somebody was really behind them in their efforts.

3. Continued research interaction with viable commercial starts in the form of student thesis problems, and aquaculture trainee programs. We are just now entering this phase with our effort in Maine. Any new commercial venture is bound to have inevitable biological problems and the cooperative idea allows the proper feedback to permit us to pick really relevant research topics. For example, the Maine Coast Oyster Company has achieved excellent oyster performance in the Blue Hill region of Maine. However, the site is in close proximity to active copper/zinc mining activities. They have requested our assistance to

[2] See footnote 1.

learn of a possibly incompatible interaction. A student thesis topic on heavy metal uptake would be valuable to MCOC and would take on regional importance for the Maine coast and elsewhere.

Further, we have agreed to cooperate in an aquaculture trainee program proposed by the Southern Maine Vocational Technical Institute. Students will obtain an Associate Degree spending 4 semesters in classroom subjects with the summers spent rotating between the commercial aquaculture sites in the state and our aquaculture research and development effort. The commercial people will get much needed help and the students of course would get some first-hand experience. Nearly all of the aquaculturists have expressed enthusiasm for the proposed trainee program and may be in a position to hire some of the trainees in the future.

Logically, one would expect an aquaculturist with commercial ambitions to be highly secretive about his activities; however, the group we have been working with has been anything but secretive. In fact, several have suggested a conference to share information and problems. We hope to follow through in late 1974.

In summary, almost all marine areas in the U.S. would be suitable for application of some form of new aquaculture related technology and potential entrepreneurs are everywhere in the U.S. If there exists a potentially valuable new technique, the plan should be to expose it to persons with the highest potential for success in a manner which doesn't involve high initial risk on their part. In shellfish aquaculture in Maine, a cooperative extension research approach has been very successful in screening a relatively large number of participants and in stimulating to action those with the highest potential. Too often in practically oriented research, the end product is the writing of a paper with then a prayer that the right people will see it and use it. Somehow this doesn't seem to happen too often.

A Marketing Communications and Physical Distribution System To Provide the Midwest with Coastal Fish

Donald F. Mulvihill and Leonard J. Konopa
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Introduction

"Fish must be sought and caught. This may be hazardous at times and frustrating at others. It is natural, therefore, that much of the research in the industry and sponsored by the Federal government should be on equipment and navigational devices rather than physical distribution and marketing." (12, 33-34).

The first sentence of this quotation which appears in one of a series of monographs reporting the results of a Sea Grant project at Kent State University[1] might be paraphrased to read, "Fish that are sought and caught must be bought," since a transaction is not completed until a household consumer purchases the fish and payment flows back along the marketing channels to the processor or fisherman. Since selling and buying also occur at intermediary points in the channel and various members "get their money out" of their inventory of fish at that time, it is often forgotten that, unless the product reaches the ultimate demander, there will be gluts of inventory that do not move and for which no payment is received. This is particularly risky when dealing with a highly-perishable item such as fresh fish.

The study reported here, stemming from a proposal made by the Pacific Northwest associate director of the National Marine Fisheries Service (6), probably is the only study dealing with fish as a consumer menu item and indicating the feasibility of an orderly marketing communication and physical distribution system as proposed. The research deals with fish, not by single species, but as a menu item, whether it be finfish or shellfish, fresh, frozen, or canned. The focus is on the demand by household consumers, institutional users, wholesalers, and retailers, rather than on the supply of fish by processors or fishermen.

Since the original proposition dealt with the movement of fresh fish into the Midwest, the results are limited to that area. As often happens when funds are subject to yearly allocation, the consumer survey, which is one of the most important aspects of the study, was curtailed. The consumer questionnaire, which drew over 1,700 replies from the Akron-Cleveland market area, was to have been

[1] NOAA 2-35364, Application of Computer Technology and Advanced Physical Distribution Techniques to Seafood Marketing.

used in a somewhat abridged version in five other Midwestern states. Although the findings probably would not be very different, the expanded insight into consumers' use of fish, particularly fresh fish, would have been worthwhile.

As it is, however, this study relates for the first time to the full length of the marketing channels for the physical distribution of fish as viewed by the demanders rather than by the suppliers of fish. Other studies, such as those by Gaston and Story (4), Gillespie and Gregory (5), and Schary, Soule, and Shirley (14), have dealt with a local area or a single species.

Purpose of Study

The original suggestion that led to the Kent State Sea Grant project was based on the concept that a nationwide distribution system for marketing fresh seafood might result in a higher return to all members of the distribution channel. The question arose as to what kind of distribution system would ensure rapid delivery to the entire domestic market, not just those portions near the coastal sources of supply. Such a distribution system should provide a dependable supply of high quality fresh seafood throughout the United States. The goal would be a system whereby retailers could order domestically-produced fresh seafood by telephone and delivery would be made within twenty-four hours or less.

Research Methodology

To carry out the study and to reach a conclusion as to the feasibility of such a system, Kent State University submitted a proposal for a study of the demand situation in the interior of the United States and of the ways in which seafood marketing could be improved and which would provide answers to the questions below:

1. Is the present demand for fresh fish sufficient to support a sophisticated distribution system?

2. Is the demand for fresh fish likely to increase if consistent supplies of high quality fresh seafood are available generally?

3. Are there adequate facilities presently available to permit application of a streamlined ordering and delivery scheduling system, that is, computer technology and advanced physical distribution techniques?

4. Would the new system provide economic advantages due to lower costs, greater efficiency in processing, etc.?

In order to determine the feasibility of the establishment of a more orderly system of marketing and distributing fresh coastal fish in the Midwest, it was desirable to study the components of the channel to see the existing structure.

Since little is known about the acceptance of fish as a menu item in households, or about the attitudes of middlemen in handling fish, particularly fresh fish,

research was carried out at all these levels through sample surveys, using mail questionnaires and personal interviews. The greatest task was that of dealing with consumers where over 1700 usable responses were obtained. Twenty-five wholesalers, 115 retailers, and 91 institutional users of fish and fish products were surveyed.

This field work resulted in a series of monographs reporting the attitudes of the household consumers (13), retailers (7), wholesalers (8), and institutional users (9). The consumer data based upon univariate and multivariate analysis were further refined by the use of the Automatic Interaction Detector (AID) program (10).

The first year was spent in making a "situation analysis" of the fisheries industry, to obtain government and other publications bearing on the project, and to make preliminary plans to determine the channel structure and the attitudes of the household consumers and middlemen towards fish and seafood, particularly fresh fish. The second year was devoted to the mail questionnaire survey of household consumers in Summit and Cuyahoga counties, Ohio (the Akron-Cleveland market area), and interviews with middlemen in that area and on the East coast.

The third year was to have seen the use of a similar, but shorter, questionnaire to consumers and middlemen in five other sections of the Midwest, but a curtailment of funds eliminated this phase. Refinements of data previously obtained were accomplished. Interviews were held with processors and middlemen on the Northwest coast as well as truck and airlines regarding physical distribution problems. Coupled with the interviews and correspondence with similar groups in the East in the first two years, it was possible to set up a schematic model approximating the present physical distribution channels in the marketing of fish and one for the communication network necessary to carry out the system proposed (12).

Overview of the Fisheries Industry

It was found that data in regard to the supply of fish were segmented into separate species lines. Few, if any, studies treated fresh fish, or any other form of fish, as a menu item by the household consumer. Similarly, the associations in the fisheries industry were segmented by product line and geographic location. Although wholesalers handling fish were concerned with increasing sales, the results of the interviews showed that they were not too concerned with delivery time or types of fish handled. In fact, they, and the retailers, felt they would not sell more fish if it were fresh, or on a shorter delivery time.

As a result of interviews with fish cooperatives, processors, and wholesalers on the East and West coasts, it appears that there is no physical problem of having a supply of fresh fish delivered to the interior of the United States, but that there is no great demand by the middlemen for fish in this form. If greater attempts are made to sell additional fresh seafood in the Midwest areas, risks due to spoilage become greater. Even though freezing incurs higher cost and somewhat lower prices, an absolute loss caused by fresh fish spoilage may be avoided. Since not only wholesalers but also retailers and most institutional

users preferred to handle frozen fish, the main market for it appears to be restaurants specializing in fresh fish items or those regular household consumers of fish that prefer fresh to frozen forms. It is doubtful that these particular market segments would justify a complex distribution system as proposed.

Physical Distribution System for Fish and Seafood (12)

In order to envision the proposed distribution and communication network, it is desirable to look at the existing channels. Figure 1 presents a schematic model of the present-day marketing and physical distribution structure. It should be noted that both the auction and the fish specialty house are dying institutions, the first because of the growth of cooperatives or the tying arrangements made between fishermen and processors, and the second because of the growth of generalized outlets such as the grocery supermarket.

A possible model to provide the system proposed might be that in Figure 2. The emphasis here is on a communications network as well as the physical flow. A computer center would be fed information from all the processor or producer units regarding fish available by species, form, and grade. This information in turn would be available to suppliers and form the bases for their order. Conversely, suppliers' orders might be sent into the center and matched against the existing supply and its location. In these ways, the sale would be culminated and the fresh fish appear in the market for the consumers.

Factors Favoring Proposed System

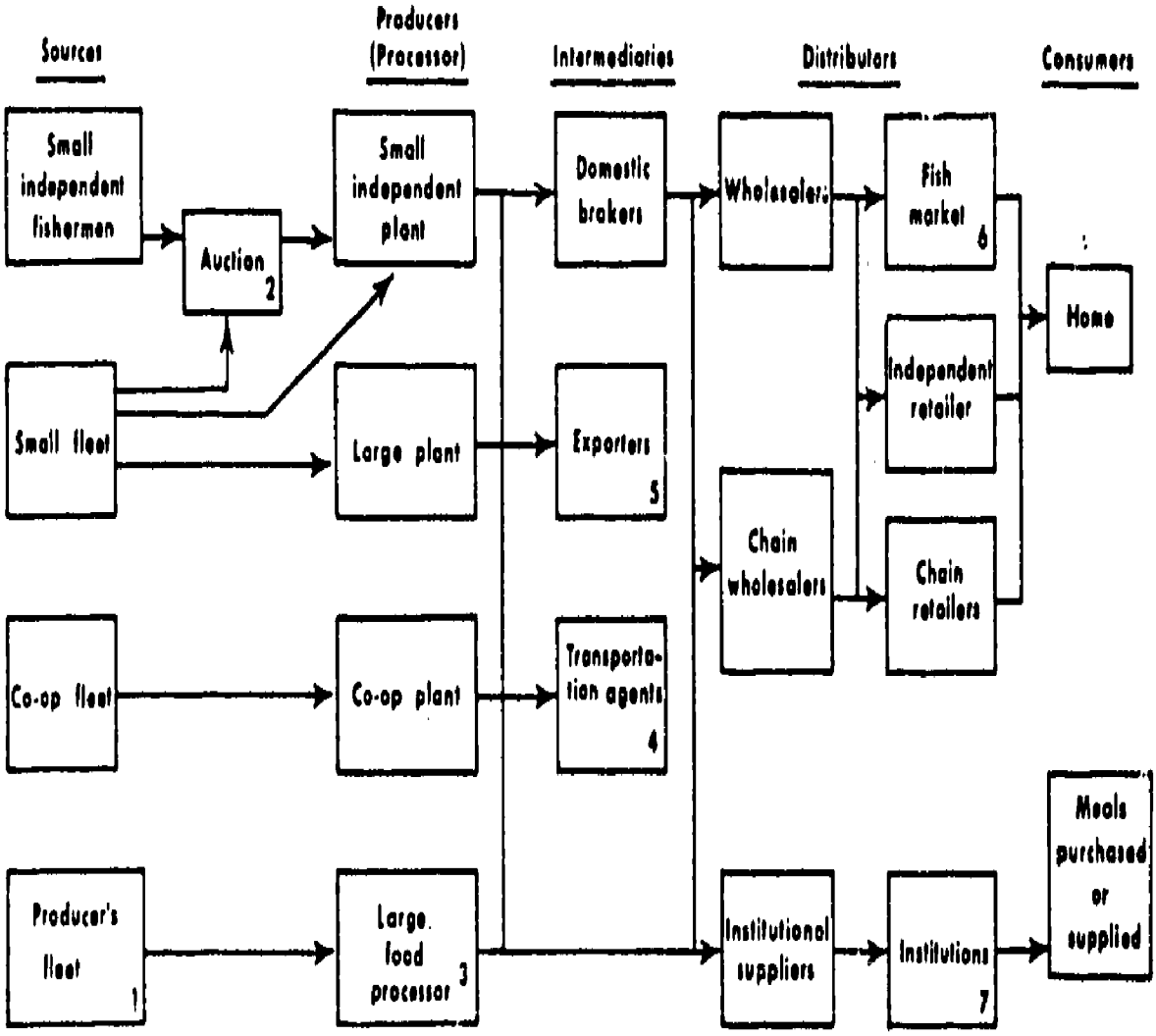
One of the problems previously present and a deterrent to the development of such a proposed system was the matter of the physical movement of the fresh product by carriers, either truck or air freight. Movement by refrigerated truck from Eastern coastal points to the Midwest within the time limit of twenty-four hours, however, is now possible because of the network of interstate highways (there may be some increase in the time caused by recent changes in speed limits).

Movements from the West coast by air were, at one time, difficult because improper containers made fresh fish undesirable cargo items. Research by airlines and designers concerned with new uses for plastic materials has eliminated this difficulty (11). Also the desire by the air carriers for back-haul (West-to-East) traffic has provided an incentive to seek out such movements.

Since fresh and frozen fish are exempted under Section 203(b) of the Act to Regulate Commerce, it is possible for trucking lines to make individual carrier quotations, hence providing some flexibility in rates that may be conducive to their use. Again, air carriers may publish their own quotations on such movements which makes it possible for them to provide a possible incentive for their use. (Because of the high perishability of fresh fish, little if any, is done today in movements to the Midwest or East from the West coast by truck or rail.)

FIGURE 1

Physical Distribution Channels in Fisheries Industry



1 May be owned by food processors or financed.

2 Only for certain species; to set price; a dying institution.

3 May finance small independent fisherman or small fleet owner.

4 Not strictly agents; airlines particularly may serve processor and distributor as communication agents.

5 Exported fish may move to distributors or processors overseas.

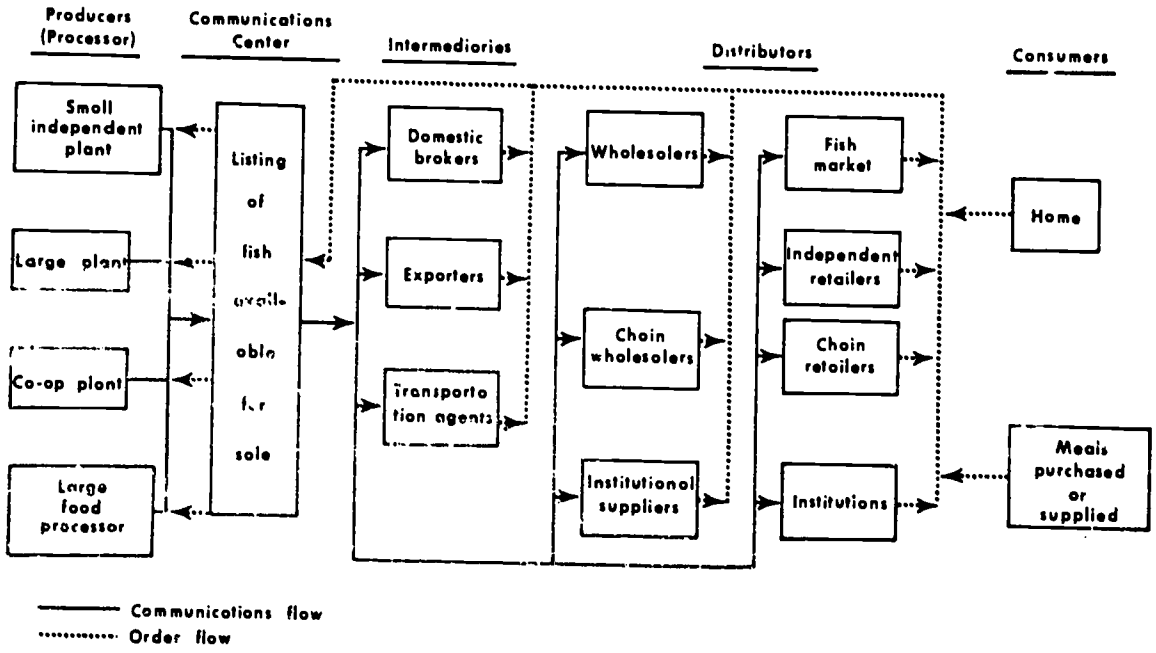
6 Fish specialty house is another dying institution; fish stalls in public markets present in coastal cities.

7 Includes restaurants (independent as well as fish specialist outlets), schools, hospitals, industrial plants.

Not all fish move through so complex a channel. In coastal areas, whole fish may move directly from fisherman to home consumer, with all other members of channel eliminated.

FIGURE 2

Possible Communications and Order Flow in Fisheries Industry with Computerization



Computer networks, often achieved through existing telephone circuits, are almost commonplace in business activities. Although costly to establish, the "hardware" is available for the system proposed.

Factors Not Favoring Proposed System

Since the fisheries industry is highly fragmented and associations within it are based upon species and location, there is no natural, existing group that might sponsor or pay for such a system. The results of the surveys of wholesalers and retailers indicate little concern over particular species,but more interest in kind (finfish or shellfish) and form (particularly frozen and prepared). Perhaps the cooperative groups come closest to having a sense of homogeneity that might lead to such a system. Interviews with East coast cooperatives indicate the possibility of integration from the fishermen to the wholesale market, which might point the way as to how more orderly marketing may be achieved. On both coasts, short channel structures between fishermen and retailers are possible. Perhaps the great geographic distance, more apparent than real with today's facilities, to the Midwest from the coast, coupled with the relatively small demand, may be why such a system has not been attempted.

As early as 1968, the head of a computer data company specializing in somewhat similar systems for individual firms indicated the average facility cost per year to be $1,500,000 and forecast higher costs, particularly for personnel, in the future(7). With no association that might underwrite such an operation on an industry-wide basis, the costs of such a system appear to be prohibitive.

External Factors Affecting the Industry

Certain factors external to the industry over which its members, and perhaps even the Federal government, may have little control affect the feasibility of setting up such a system as proposed. Each would require detailed discussion not possible here, but they are listed as they do play a part in the conclusions below (12, 53-56):

1. Foreign fleets in United States waters (1:3)
2. Ocean jurisdictional problems (3:15)
3. Greater demand for fish abroad (1)
4. Diminishing stocks of popular kinds of fish (1:3)

Conclusions

Very succinctly, the major conclusions based on the Sea Grant project at Kent State University are that:

1. The demand among household consumers for fresh fish does not apparently warrant a sophisticated (and more costly) distribution system.

2. Considering the present chaotic situation in the fisheries industry brought about by foreign exploitation of coastal waters, it is unlikely that consistent supplies of high quality fresh seafood may be obtained. Since this condition cannot be met, it is doubtful that, even if the demand were increased for a time, it would be a sustained increase.

3. The supply of fresh fish will not be increased even if there were an additional demand because of other factors which will offset such a supply-demand shift (see Number 4 below).

4. Most wholesalers and retailers would rather handle frozen fish because of ease in handling, less deterioration, and a more consistent supply; hence few, if any, additional resellers would be willing to spend money to promote the sale of fresh fish.

5. Adequate physical facilities are available to provide the system proposed. Since many retailers already have 24-hour delivery service, it would appear that delivery systems are adequate at present.

6. Although lower costs of processing, physical handling, and transportation might be obtained by such a system, there would be higher cost to provide the communications network and order-filling process. No centralized agency appears ready to maintain and control such a system and it is doubtful that the Federal government, if it should establish it experimentally, would find it being used by the middlemen.

To answer the question as to the proposed system's feasibility in terms of findings above and the overall fisheries study made through this research, it must be concluded that, considering only the domestic situation, such a system, although technologically possible, should not be established at this time because of the nature of the product, which does not provide a stable, constant source; the structure of the industry with thousands of fishermen and vessels of extreme differences in size and gear; and the indifference, at least of Midwestern distributors, and perhaps even of consumers.

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A Multi-agency Regional Approach for the Development Of an Under-utilized Marine Resource

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We would like to describe a new program in northern New England which involves three units from two states working on a common problem. We will describe the problem, how each unit is involved, and what we have experienced to date in the area of coordinating a multi-agency program.

The edible blue mussel, Mytilus edulis, is one of the most abundant marine molluscs in the colder waters of the northern hemisphere. It is circumboreal in distribution and in parts of its range it is harvested and even cultured extensively and intensively as an item of food. This species accounts for about 10% of the world's total production of molluscan shellfish. Denmark, the Netherlands, France, and Spain account for 86% of the world's harvest. The United States, on the other hand, accounts for 3/10th of one percent.

Along the shores of the Gulf of Maine there are extensive natural beds of Mytilus edulis. In addition, the deep, protected bays and estuaries along the Maine coast appear to offer conditions that are favorable for commercial, raft-type cultivation. Only a small fraction of the natural stocks are harvested commercially, these harvests going principally to metropolitan areas in the east which have concentrations of ethnic groups.

Why isn't this resource being utilized? There appears to be several reasons. Primarily, the American Public has never been adequately introduced to fresh or prepared mussels of high quality, and consequently has no idea of how delicious they can be. Mussels vary in quality from place to place. People who have obtained mussels of poor quality or who have eaten mussels that have been improperly handled or prepared obviously could not be impressed with the product and therefore could not be promoters of the species as a good food. Mussels are susceptible to paralytic shellfish poisoning (PSP), especially during the warmer months of some years in the Gulf of Maine. News media coverage of the occurrences of PSP in this country, even though state agencies rigorously monitor shellfish for PSP and close affected areas for harvesting, do little to reassure the general public that mussels sold on the market are safe to eat. Even if a person does like mussels, the supply of quality ones from natural beds is presently limited and unreliable, which makes it difficult to market them anywhere but in the most specialized markets and restaurants. As a result of these several factors, the blue mussel remains an under-utilized species.

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There is good evidence that the blue mussel industry in the Gulf of Maine has excellent potential for significant growth. During the beef boycott in the spring of 1973, the Maine Department of Marine Resources (DMR) started a promotional campaign touting the merits of the blue mussel as an inexpensive protein source with excellent taste. The response of the general public was most encouraging. Demand soon outstripped the supply. With the onset of summer the mussels started their spawning season, meaning poorer quality mussels, so the promotional campaign was halted. Nevertheless, it was clear that mussels had much more market potential than was currently being realized.

The University of New Hampshire Sea Grant Marine Advisory Service also had been promoting mussels concurrently with, but independent of, the DMR. In New Hampshire the response was equally promising but similarly experienced a lack of a dependable supply of quality mussels.

Since 1971, the University of Maine under its Sea Grant Program had been studying various aspects of mussel biology. In a comparison of pearl incidence and growth rate among rafted vs. shore populations of mussels, it was evident that the superior quality and growth rate of rafted mussels in local waters could have a high commercial potential. It was the results of these studies together with the demand visibility created through the efforts of the DMR that stimulated one Maine corporation to embark on culturing mussels from rafts in the late spring of 1973.

At about this same time, the Directors of UNH's and UMO's Coherent Sea Grant Programs, began talking seriously about starting a joint project, or series of joint projects, under their respective Sea Grant Programs. A joint program involving both state universities and the Maine Department of Marine Resources, all bringing their respective expertises to bear on changing the mussel from an under-utilized species to one of significant commercial value to the region, seemed to be an ideal objective for all concerned.

At the first Joint Mussel Program (JMP) planning session, it was clear that no one of the three groups could accomplish the objective alone. By working together the objective appeared attainable and had a high potential for success. First we agreed that the development of a blue mussel industry, utilizing both high-quality natural stocks and cultivated stocks, would be a great boost to the local and regional economies. We then listed those areas of endeavor which we felt were necessary ingredients for the successful conclusion of the program. Next came a matching of expertise from the three groups with the different ingredients. With a division of labor decided upon, a proposal to Sea Grant was synthesized, submitted, reviewed, and finally funded in 1974 under a supplementary budget to UNH. Table 1 summarizes the division of effort. Two ongoing projects on mussels under the UMO Sea Grant Program are a part of the JMP although they are funded differently from the rest of the JMP

Coordination of the three-organization effort has revealed some problems and solutions which are worth sharing with others. Each of the three units named a person to serve as the contact in their unit. Each contact is charged with disseminating information from other units within his own unit, assisting in organizing coordination sessions, etc.

Even though our joint program is an empyonic program and it is clear that we all have busy schedules, cannot afford the time to travel long distances, or spend precious time devoted to more meetings, the best chance of success appears to be by maintaining personal contact. All the memoranda, minutes of meetings, progress reports, letters, circulars, etc., etc., cannot do the coordination as well as person-to-person communication. The eyeball-to-eyeball contact, the informal discussion, and the ability to question and give answers are vital to joint efforts. Obviously not all efforts are going to succeed, but the chances for success are immeasurably increased through periodic (no less than bi-monthly) meetings to discuss problems, progress, and where-do-we-go-from-here sessions. Our JMP is far from complete, we have many bridges to cross, but we feel our observations to date are well worth sharing. We feel that they are pertinent to any joint effort.

Table 1: Coordinated efforts in a joint mussel program between the University of New Hampshire, the Maine Department of Marine Resources, and the University of Maine entitled "Development of a Sustained Edible Blue Mussel Industry in the Gulf of Maine."

Projects		Agencies Involved
I	Survey of the existing natural populations	UNH - DMR
II	Mariculture development	UMO - UNH
III	Product development from source to table	DMR - UNH (CES)
IV	Extension of shelf-life prior to consumption	UMO

UNH - University of New Hampshire

DMR - Maine Department of Marine Resources

UMO - University of Maine at Orono

A Three-party Cooperative Mariculture Study At Henderson Inlet, Puget Sound

Ernest O. Salo and Bruce P. Snyder

University of Washington

Introduction

As a part of the University of Washington's Sea Grant Salmonid Aquaculture Program of 1973, the University and the Weyerhaeuser Company cooperated in a pilot study to evaluate three sites in the state of Washington for the pen rearing of salmon for the market. This was a continuation of the program described by Moring (1973) and by Abbott (1970).

Much of the background for the study was similar, and occasionally phased in with the research at Manchester by the National Marine Fisheries Service and Domsea.

The major emphasis in 1973 was at Henderson Inlet in southern Puget Sound where zero-age coho (*Oncorhynchus kisutch*) and zero-age fall chinook (*O. tshawytscha*) salmon were used as test animals. The objectives were to determine: (1) the environmental limitations of the site for a commercial maricultural venture; (2) the optimum densities for maximum growth and food conversion for the two species; (3) the causes and sources of diseases, particularly *Vibrio*; and (4) the effectiveness of orally-administered vaccines for the control of *Vibrio*.

In 1973, the rearing facilities were minimal and consisted of two 20-ft. x 20-ft. floats holding eight pens, each 8 ft. x 8 ft. x 8 ft. A total of 6,000 chinook and 6,000 coho salmon were reared with duplicate density and vaccine experiments for each species.

University personnel monitored the fish daily for signs of disease, fed the fish, and performed general maintenance. Environmental data were collected, along with periodic samples of the environment for the presence of the bacterium, *Vibrio*. The base of operations was the University's research vessel, *Kumtuks*, which is a 100-ft. research barge equipped with complete living quarters for a crew of eight, dry and wet laboratories, workship, crane, freezer for holding fish food, and is self-contained in case of power failures or in the event that it is operated offshore.

Results of the 1973 Field Season

The 1973 season proved successful with 70% of the original number of chinook salmon reaching marketable size. Small (< 15 grams) coho salmon which were introduced into the salt water as pre-smolts (zero-aged) showed no growth. Diseases, predators, and stresses from handling accounted for the mortalities and the environmental factors that are possibly limiting at the Henderson site are discussed in Snyder, Didier and Salo (1973). The oral vaccine was ineffective in controlling *Vibrio*; however, pure culture isolates of local *Vibrio* strains were obtained (Didier, 1974).

The Research Program for 1974

In 1974, the Washington State Department of Fisheries, the Weyerhaeuser Company, and the University of Washington signed a formal agreement to continue the mariculture program coordinating the rearing of salmon for both a commercial enterprise and for release as advanced-reared fish. Advanced salt-water rearing apparently increases the survival, alters the migration patterns, and enhances the catchability of coho and chinook salmon.

The University agreed to:
(1) make a complete assessment of the environmental impact of a commercial sized salmon mariculture project;
(2) continue disease research on *Vibrio* sp., including the following:
    a. assess the effectiveness of intraperitoneal inoculation with vaccines prepared from Henderson Inlet isolates;
    b. monitor all production fish for symptoms of other diseases and blood antibody levels;
(3) assess the possibilities of polyculture, including the compatability of invertebrates such as oysters, mussels, and shrimp;
(4) make available the University's barge as the base of operations for all parties involved.

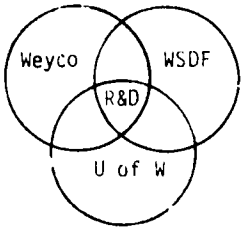
The Washington State Department of Fisheries agreed to:
(1) provide pond space and the tagging trailers which were used for the inoculation of the fish:
(2) furnish 80,000 coho salmon and 60,000 chinook salmon for the pen-rearing studies;
(3) conduct its own rearing program at the site, which included 92,000 coho salmon and 92,000 chinook salmon.

The Weyerhaeuser Company agreed to:
(1) assist in funding of the research;
(2) supply all manpower and services for the rearing of the fish;
(3) assist in monitoring all relevant physical and biological parameters.

Advantages and Disadvantages of Interagency Cooperative Research

Understandably, the objectives of the Weyerhaeuser Company, the Washington State Department of Fisheries, and the University are different. Schematically, their

areas of interest can be diagrammed as three circles with the area of overlap being labeled "Research and Development". The outer parts of the circle can be labeled as one sees their objectives, but for the sake of simplicity, let's label Weyerhaeuser "Profit and Contribution to the Nation's Economy", Washington State Department of Fisheries as "Contribution to the Public and Private Fisheries (Commercial and Sport)", and the University as "Education, including Research."



The area of overlap of the three circles is not static, but varies in size with the needs of each agency and at the rate at which problems are solved. Thus, cooperation in the strict definition of the word also varies from enthusiasm and great mutual need to mere tolerance. This symbiosis is only as permanent as the rate at which problems are solved, the cost of solving the problems, and the need for continued research.

In any interagency enterprise, problems can, and probably will, occur with transitions of leadership and changes in direction as the program phases from one stage to another. In our case, we feel that most, if not all, of the problems are temporary. Some processes and relationships demand almost a legal agreement, such as the acquisition of fish, the disposition of fish, public access, and the proprietary nature of the data.

At Henderson Inlet, the role of the Washington State Department of Fisheries, besides furnishing the fish, remained almost completely independent as far as direction and leadership was concerned.

The University, of course, maintains the advantages of publication of the research findings. For example, in the case of the current study, this includes three Master of Science degrees and two Ph.D.'s. The theses and reports become public information.

A great advantage to the University is that commercial-sized ventures require multi-dimensional research with large capital outlay that simply cannot be afforded by the University. In some respects, this is analogous to the history of agriculture, the Land Grant colleges and the Extension Services, and as we all agree--this is what Sea Grant is all about.

Progress Report on the 1974 Program

This year's research indicates that:
(1) the intraperitoneal immunization against *Vibrio* appears promising, and future plans may include immunization against other diseases;
(2) precise environmental monitoring is necessary to detect environmental impact, and the parameters continue to be monitored;
(3) polyculture studies at present indicate the compatibility of shrimp to be marginal; however, the culture of mussels is promising, and the farming of oysters is possible jointly with a salmon mariculture project.

In summary, the advantages of this type of "cooperation" (which sometimes can be defined as how-to-get-along-with-a-minimum- of-friction) are real--and the proof of the pudding is that it looks like we shall continue again next year.

Thanks are extended to the Weyerhaeuser Company, the Washington State Department of Fisheries, and the Sea Grant Program.

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Commercial Utilization Of an Unexploited Species: A Case Study

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New England is not blessed with latent fisheries resources of the magnitudes available in Alaskan waters or in the Gulf of Mexico, but a number of species are under-utilized or not utilized at all. The University of Rhode Island has been, and still is, involved in research directed towards commercial utilization of some of these species, working with Sea Grant and NMFS. For this presentation, I have chosen the deep-sea red crab (Geryon quinquedens). First, I will give you the history of our involvement with this species from the time it was only considered an exotic creature, then give you a brief description of the harvesting and processing phase combined with an economic evaluation, and finally discuss some future problems.

In the mid-1950s the Bureau of Commercial Fisheries found a significant stock of offshore lobsters in deep water south of New England, and during the late '50s and early '60s several vessels entered the trawl fishery for offshore lobsters. In some of those years during late winter, the lobster moved far out to a 200-fathom depth, and at that depth lobstermen picked up red crabs in their trawls. In fact, in some areas crab catches were so large that the fishermen ceased fishing them for lobsters.

When I came to Rhode Island in the fall of 1963, I talked to the captain of one of the lobster trawlers, the Ocean Clipper out of Point Judith, and he told me that he had cooked some red crabs onboard and found it very tasty. He also had brought in a couple of bushels to a fish dealer in the spring of that year who considered it "the best crab he had eaten." The captain promised to bring me some the following spring when he would be fishing in deep water again.

When the crabs arrived I tried them out on my wife and a couple of colleagues in my department. I cooked them the way we cook crabs in Norway, that is, by putting the whole crab in boiling water. I paid no attention to the fact that these were trawl-caught crabs, with gills full of sand and mud. The cooking water looked like the boiling mud holes of Yellowstone Park. It was an unappetizing mess, but my guinea pigs, or taste panel, liked it and survived it, and that spurred me on. Let me point out that at the time I had no knowledge of fisheries, and with a farm management background my knowledge of seafood processing was not overwhelming. Nevertheless, the fishermen were good enough to bring me crabs, and we ran cooking experiments in the college of agriculture,

Rhode Island Agricultural Experiment Station Contribution No. 1559.

where the offices of the faculty in horticulture smelled of anything but roses. Faculty wives were recruited to pick crabs free of charge under an agreement that they got the meat and we got the data. In 1966 the State of Rhode Island and the Bureau of Commercial Fisheries awarded us funds under Public Law 88-309 to study the commercial potential of the deep-sea red crab. This was particularly gratifying in view of the fact that the Bureau had categorically stated in 1961 that based on their exploratory cruises there was no basis for a commercial fishery for red crab.[1]

Since the red crab is rather fragile, it lost a large number of legs and also claws while being dragged in the trawl, and it was difficult to keep alive. It was immediately evident it could not be brought to market and sold whole and alive like lobster and cancer crabs. The red crab had to be processed, but there were no crab pickers in southern New England. Melbourne Oyster Company, Crisfield, Maryland, came to the rescue. They processed blue crabs and they made their plant available for our experiments on processing red ones. The location was excellent since it was only five minutes away from the University of Maryland Seafood Processing Laboratory, where the staff also were extra-ordinarily cooperative. So we started trucking crabs to Crisfield, which was about 400 miles from Rhode Island. Depending on the quality of the landed crabs, some loads looked reasonable at arrival in Crisfield; others looked black. From the first shipment we took samples of fresh and pasteurized red crab meat, and similar samples of regular blue crab meat processed the same day back to the BCF Technological Laboratory in Gloucester, Mass. The taste panel there judged the red crab to be superior to blue crab in every characteristic. Consumer acceptance of the product was evidently not a problem, but output per worker was a disaster.

Let me point out that the crab was handled the same way as the blue crab; it was steam cooked and picked with an oyster knife. Because the labor force was unfamiliar with the species, we had put them on hourly pay. I changed that immediately to piece work. For the next shipment the labor force was paid a very high wage per pound of meat, and the output per hour increased 150 percent. The output was still poor--poorer than for blue crab--but I did not realize at the time that the output per ton of input also was a disaster, because the meat yield was about the same as for blue crab. We felt at that time that machinery had to be developed to pick the crab; otherwise, it would not be economical to process, and different handling practices onboard had to be developed to deliver crabs in better condition. We sent some crabs by air to Wakefield Fisheries in Alaska to solicit opinions from there, but the crabs were in such a mess at arrival that there was not much they could do with them.

In the late 1960s two developments took place which drastically changed the prospects for developing a red crab fishery in New England. First, the technology of the offshore lobster fishery changed from trawling to deep sea potting, and many vessels installed refrigerated seawater storage. Second, a fish processor in Nova Scotia, who had read our publication and had talked to a member of our

[1] Ernest D. McRae, "Red Crab Exploration Off the Northeastern Coast of the United States," Commercial Fisheries Review, May 1961.

faculty, started processing red crabs by boiling, quick chilling and shaking the meat out of the red crab. Shaking out the crab meat was introduced by Hiram McAllister from Sequim, Washington, who had experience with this process from the Dungeness crab industry, and who at that time served as consultant to the Canadian government. When his figures from Nova Scotia became available, there was no doubt that the last major stumbling block had been eliminated. According to his figures output by inexperienced pickers was about 65 percent higher than we had experienced with the technology used in Maryland, and the yield (output of meat per ton of live crabs) was almost 100 percent higher. (20.5 versus 11.4 percent packed-up weight.) Things looked pretty good except for the fact that nobody was interested in harvesting or processing red crabs. From 1969 to 1971 the offshore pot lobster fishery appeared to many as another Klondyke, and it was not until 1972 that the fishermen had overfished that resource. Then alternative resources were again considered.

One of my colleagues, Dr. Thomas Meade, had talked with many people in the industry about red crab processing and. I believe, he was partly instrumental in helping a group in Massachusetts, New Bedford Atlantic Associates, Inc., obtain a grant from the Economic Development Administration for studying the feasibility of establishing a red crab industry. That firm contracted with the University of Rhode Island in January 1973 for help on technical matters and for an economic feasibility study. At the same time a corporation many of you know about came on the scene. One representative of International Basic Economic Corporation (IBEC) had heard a talk at the National Fisheries Exposition in Seattle given by one of the captains who worked with us on the red crab, and he had suggested to his firm that they look into the possibility of establishing a processing plant for red crabs in Rhode Island.

So, since January 1973 we have been back in red crab work. The plant in New Bedford had some management problems, but now seems to be moving forward. IBEC, I understand, changed their plans, but their employee Jack Lawrence resigned and with some partners bought IBEC's subsidiary in Point Judith, Rhode Island, which carries the name of Galilee Offshore Marine. That firm is moving forward every month with more equipment and better capacity, and it is the latter--the capacity of the processing plants--which has been the limiting factor in the industry so far this year. A vessel load might consist of somewhere between 30,000 and 40,000 pounds of crabs, and none of the processing plants have the capacity for this volume. That increases the cost both to the boats and the processing plants. During the last months one of the plants has reached a reasonable capacity in terms of butchering and cooking, and is shipping what it is not able to shuck to Cape Cod Fisheries in Boston. This firm is in the minced fish business and it is using a Bibun machine on the crab sections. One vessel owner is now considering installing butchering machines and a freezer onboard. As of this writing (July 1974) we have two plants in operation (not including the minced product plant) employing 100 to 110 people on a full-time basis and four vessels in the fishery with a combined crew size of 30 men.

This history of our involvement with the red crab has not offered you much information about the animal or the technology and economics of harvesting and processing it. Mr. McAllister and I just published a paper this summer on some

of the economic and technical aspects[2], so without going into much detail, let me just give you a brief summary.

The deep-sea crab inhabits a narrow belt along the edge of the continental shelf from Nova Scotia to the Gulf of Mexico. The minimum depth at which it is found in New England is about 180 fathoms (about one thousand feet), while off Florida it is about 700 fathoms. The best catches in New England are from depths between 200 and 400 fathoms. The crab is bright red when alive, and male crabs reach a weight of at least 2 1/4 pounds. Lobster pots are used in the red crab fishery. A fairly open pot design seems to be best, but the soak has to be short. A 16 to 18 hour soak might be optimum. When the bait is gone the crabs leave, and pots that are able to keep the crabs from leaving do not fish well. Fifty pounds of commercial crab per pot seems to be a reasonable catch at the current time. Many fishermen seem to feel that figure is too high, but those who feel that way have not followed our recommendations--a fairly open pot, fresh bait, and a maximum 24-hour soak. The catch rate will of course decline considerably as fishing effort increases.

Vessels used in this fishery in New England should be at least 75 feet long, preferably 85 to 90 feet, with refrigerated seawater storage. If the vessel has only internal water circulation, the hold should be pumped dry and refilled at least three times a day. A vessel of this size would normally hold 30 to 40,000 pounds of crabs. With a suitable deck layout it should operate with a crew of five and lift about 250 pots a day (five strings of 50 pots). I feel it is reasonable to expect that a red crab vessel would average one four-day trip per week from May through November and make an average of two trips a month during the winter season; this would mean 160 days at sea and 120 days of fishing per year. Based on the catch rate indicated, a full-time red crab vessel should deliver about 1.4 million pounds of crabs per year.

For a vessel of this kind and size a $90,000 to 100,000 boat-share is a very good return in Rhode Island, Based on a broken 55 lay, budgeting of trip expenses, and a five-man crew this would call for a gross stock of about $210,000, and would give a gross crewshare per man of $16,000. Furthermore, this gross stock would be achieved at a price of 15 cents per pound of crab. ($210,000 ÷ 1.4 millions lbs.). The current ex-vessel price is 30 cents per pound.

The red crab can be marketed in many forms: as fresh or frozen meat with different proportions of merus meat and salad meat; as whole, cooked, frozen, glazed crabs; or as machine meat. The claws can be removed, sawed around to expose the meat and sold as individual quick-frozen cocktail fingers. Tests in Canada have shown that the red crab also cans very well. Nevertheless, in New England at the current time frozen meat has to be the basic product.

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[2]Andreas A. Holmsen and Hiram McAllister, Technological and Economic Aspects of Red Crab Harvesting and Processing, Marine Technical Report No. 28, University of Rhode Island, (Sea Grant) 1974.

Details of the processing operation can be found in the URI Sea Grant report mentioned earlier. Briefly, however, the crabs are butchered and the shoulder sections with legs and claws attached are cooked, chilled, and then shaken and picked. The salad meat is sent through a flotation tank and inspected for shell fragments, freshened, treated with a chemical, packed and frozen. The yield might run about 22 percent packed-up weight. If wringers are used for recovering meat from the tips, or if machinery is available for secondary recovery, the yield could be raised a couple of percentage points.

A 50-shucker plant (74 employees) with an output of 400,000 to 500,000 pounds of meat per year based upon current prices of red crab meat (about $3.50 per pound), current cost rates and a 15 percent return on assets, should be able to pay 47 cents per pound for crabs. Thus, there is a very wide spread between the price fishermen have to receive to make it a successful operation with the present catch per unit of effort and the price a processor can afford to pay. As indicated earlier, the price has been 30 cents per pound over the last year, which should give an excellent return both for an efficient vessel and for an efficient processing plant of the size indicated.

To utilize an unexploited species might not only mean to introduce a new commodity on the market, it might also call for significant innovations or even inventions in both the harvesting and processing phase. The first fishermen and processors into a fishery will generally face many unexpected problems; the first ones who entered the red crab industry had their share--problems with refrigeration systems, heavy death losses due to ammonia poisoning, imbalance between harvesting and processing capacity, etc. However, it has finally become an established industry, albeit an industry with an uncertain future. First, the resource, despite the good current catch rates, is a small resource. The National Marine Fisheries Service predicts the MSY between Cape Hateras and Georges Bank to be very little in excess of five million pounds. If that is the case, then there will not be room for more than seven or eight vessels and three processing plants of the size indicated in the red crab industry.

Currently, in New England, fishermen are releasing females, newly molted crabs, and crabs smaller than 4 1/2 inches across the carapace. For processors, who manually shuck crabs, it is not economical to handle these categories. However, the introduction of the minced fish equipment in the industry is a source of concern. Besides the fact that I feel it is a pity to make that kind of end product out of such excellent raw material, the economics of machine-processing smaller crabs is different. In New Jersey fishermen just rip off the claws and throw the rest of the animal back to sea. To protect the resource, legislation might be required.

Thus, despite the fact that the economics of this industry looks very good in the short run, I would recommend to people entering this industry that they ought to build flexible vessels and flexible plants so they can work on alternative species if the red crab stocks do not hold up.

Marine Advisory and Industry Develop a New Fishery: The Case of South Carolina's Ugly Ducklings of the Sea

Kenneth J. Roberts

Clemson University

Marine Advisory Program (MAP) staff members have the difficult task of allocating their time and professional talents among both planned and reaction type tasks. The former generally involves a smaller number of tasks than the latter, but considerably more staff time per task. For Advisory to make a substantative contribution to the goal of development and improved utilization of marine resources, extensive planning of staff time and interrelationships with researchers and industry is necessary. Improving fishery resource utilization through harvesting and marketing latent stocks or reducing processing waste is a sizable task with low probability of success even in the face of a carefully developed strategy.

These comments or a similarly worded statement on the subject could be drawn from a textbook on Advisory, if one existed, or from a consensus of program leaders. The comments as viewed from the South Carolina experience may be more incomplete than inaccurate. In September, 1973 when Clemson University MAP received the initial contact on the reported project, staff planning was a simple task--there was but one specialist and professional talents were easily coordinated--there was no biological talent available. Neither reviewers should draw inferences that can be used at the next brutal budget slashing site visit nor should fellow program leaders show concern. The project was successful due to an element of all advisory programs that seldom receives recognition. For lack of a better term Advisory KISP--advisory knowledge of industry structure and people. KISP gave this project a high probability of success as it does in other programs. It does not come with advisory funding but rather as a result of many hours of listening, informal dock discussion, and numerous meetings. To the MAP'er this is the kind of work it is difficult to have others view as valuable.

The framework consisting of local marine agents (KISP experts) linked to university and agency expertise provides industry and other audiences beneficial educational information. In concert with marine industry and the non-business oriented laymen, MAP provides a framework for felt difficulty research. KISP is essential to the successful utilization of the framework in those cases necessitating transfer of research results or research needs. However, the experience in South Carolina with development of a horseshoe crab business exemplifies its value to Sea Grant for an additional reason.

The Paradigm

A review of proposals or case histories focusing on attempts to utilize the unutilized may reveal common elements. The common elements of the paradigm of importance include:

1. terminology such as unexploited, underutilized, incidental catch, trash, or latent resources
2. ample resource but no market and no interested processor
3. human or animal food oriented
4. involve processed products rather than live animals
5. university as opposed to industry research is involved

The request made of MAP by a large pharmaceutical firm via the Medical University of South Carolina did not fit the paradigm. Travenol, a leading pharmaceutical company, requested assistance with a research project that could have significant impact on a marine crustacean (Limulus polyphemus) caught incidentally to shrimp trawling. Advisory was asked to combine the capabilities of Travenol, commercial shrimp trawlers, and dock owners to develop a stable year-round supply of large female horseshoe crabs. The process of developing a market and interesting a firm to produce the drug had taken place before MAP involvement. However, other elements of the paradigm's antithesis provided challenges.

The competitiveness of the drug industry, size of the market, and questionable value of a rush to patent the drug made work with industry frustrating. The task was to prime the fishing community's interest without drawing water. A second challenge was to deliver a live product dockside consistently in summer's intense heat.

The Reaction

Advisory reacted with enthusiasm to the potential of additional income for the fishing industry. South Carolina has few economically viable alternatives to the shrimp and blue crab fisheries. The two fisheries provide more than eighty percent of total landed value with little expansion forecast for either. Initial indications were that the value of crabs purchased would approach $300,000, an increase of three percent in total dockside value.

Advisory first had to learn of the decisions facing the company. Through many meetings key decisions were identified as:

1. What is the population of crabs?
2. What is their geographical and seasonal distribution?
3. How many buying stations should be established?
4. Should purchases be made from the boats or dealers?
5. Who are the most reliable industry people with which to deal?
6. Will coastal or inland bleeding of the crabs be more feasible?
7. Should the crabs be returned to the sea alive with tags to prevent reuse or killed after bleeding?

Discussions with the state agency's marine biologists pointed out that the company would have to proceed with little scientific knowledge of the population's size, sex composition, or distribution. The ports were visited with company representatives to introduce them to dealers, fishermen, and industry characteristics. Travenol has an intravenous fluids production facility within four hours of the furthest port. Arrangements were made with the dock owners at all three ports. Meetings with selected shrimpers were held to demonstrate the preferred care and handling techniques. Travenol's trucks began hauling crabs daily. Three locations widely separated on the coast were selected even though logistical problems were expected. This was necessary due to Advisory advice that to bleed from 1,500 to 2,000 crabs per week through one dealer and location may add unnecessary risk to the operation.

Through Advisory introductions to industry members known to be reliable businessmen, dealers capable of delivering a quality product, and open minded shrimpers interested in developing new income sources the project reached pilot scale successfully.

The Sting

The pilot plant success provided brief occasion to gloat. Success was accompanied by increased knowledge leading to improved bleeding procedures and substantially higher end product-blood ratio. The efficiency gain was of such magnitude that one dock owner of the three became the remaining supplier. The supplier remained in business shipping about one hundred and twenty-five crabs each working day. Bleeding operations remained at the inland location some four hours distant. Advisory should be willing to become involved in such risky development projects but should nonetheless frequently call to mind the caution of becoming too closely aligned with an industry or project that the casual observer cannot identify distinctions.

Following the sting of reduced dealer participation and demand for the crabs a series of problems beset the lone dealer. Fuel prices nearly doubled while the dealer was committed to a contract to deliver the crabs to the bleeding site five days each week. The dealer requested Advisory recommendations after being rebuffed on asking for a higher crab price. Without acting as mediator, the suggestion was made that both parties would profit from one large delivery each week, the crabs being sacrificed rather than returned after bleeding.

Mass mortalities began in early 1974 among the crabs held in the floating pens while awaiting shipping. An Advisory biologist theorized that the same sensitive pyrogen indicator present in the blood which was valuable to the drug producer indicated the crabs would be seriously effected by minor infections. The chance for infection was high due to layering of crabs in the pens. Pen numbers and sizes were increased and fewer crabs stockpiled while awaiting shipment. Mortality was not eliminated but reduced to a bearable lev

Shrimp trawling in estuarine waters where horseshoe crabs are concentrated ends with the calendar year. Thus, incidental catches drop to zero with the close of shrimp season. To circumvent this problem Advisory scheduled a meeting

between the dock dealers and marine management officials. A special permit was authorized allowing limited dragging with a special large mesh net in closed estuarine waters. This removes the kinks in supply throughout the year and eliminates the need for risking mass pen mortalities from stockpiled horseshoe crabs.

The Lessons

Today a patented pyrogen indicator drug is on the national and international market after little more than a year of activity. The same professionalism one would expect of a large sophisticated pharmaceutical corporation was identified within the seafood industry and further improved by Advisory. We with Advisory in South Carolina are not double-jointed at the elbow from self back slapping. Rather, we are proud of the role Advisory had in providing KISP, the key to success in this case, as well as playing the role of educator and problem solver.

The successful development of a market for horseshoe crabs has resulted in an annual dockside value of $130,000. A plant has been constructed in Kingstree, South Carolina to produce the pyrogen indicator from the horseshoe crab's blood derivatives. The indicator will reduce Travenol's expense of maintaining indicator rabbits that were used in the past to test the quality of the company's intravenous fluid products. Cost savings and pilot plant operations approach a quarter of a million dollars annually.

Though we have no Advisory how-to-do-it textbook on methodology, we are not shooting in the dark. At the risk of making hasty generalizations from but one observation there are some conclusions which may be useful to Advisory from this project.

1. It is difficult to work with all parties involved in developing a new fishery when private industry is concerned about its proprietary rights. To stimulate fishing industry interest in the low key manner desired by prospective investors is near impossible. This must be recognized early in the relationship and openly discussed with all parties.

2. Developing a relationship with private industry that fosters the idea that Marine Advisory will work with it, not for it is essential.

3. Help private industry researchers and executives learn the complexities of making a living from the sea by getting their "feet wet" on the docks and decks.

4. Work to establish Advisory's identity separate from that of the industry or project.

5. Be prepared to work intensively with the fishing industry people early in the process because some may lose interest as logistical or marketing problems associated with a new specie inevitably arise.

6. New specie fishing and marketing may require institutional changes to be successful. Fishing laws, product labeling, etc. problems may be confronted in the development process.

The Inter-relationship of Multi-Source Funding With the Development of a Viable Gem Coral Industry in Hawaii

Norrie Thompson

Hawaii State Center for Science Policy and Technical Assessment
Hawaii State Department of Planning and Economic Development

Richard Grigg

Hawaii Institute of Marine Biology

Clifford Slater

Maui Divers of Hawaii, Ltd.

Speaker - John Gordian, Hazeltine, Maui Divers

Pink (angelskin) and Black Coral harvested in the waters surrounding the Hawaiian Islands, today provide the raw material for a local jewelry industry which grosses about $8-million annually in retail sales. The most rapid growth of the industry has occurred in the last five years.

As recently as 1969, the industry was dependent for its pink coral on importations from Japan, and produced retail sales of about $2.5-million. In 1969, it employed approximately 100 persons, compared to over 500 today.

The following appear to have been the major factors behind this rather rapid growth:
--Hawaii's booming tourist industry has approximately doubled the size of the local market for coral jewelry.
--The coral industry has conducted vigorous promotion campaigns to promote coral jewelry and identify it with the Hawaiian Islands.
--The Industry, the University of Hawaii, and the Federal and State agencies have had good communication and cooperation in their joint efforts to develop the coral resource. For example: a major factor contributing to the growth of the industry has been a substantial investment in coral research by Federal and State Programs, and the coral industry. The first support for coral research in the Islands was Federal, via the Sea Grant Program, but over a four-year period during which Federal support declined, the industry has assumed an ever-increasing share of the research support. The State of Hawaii also played an important role in providing research money while the industry was growing strong enough to assume much of the research burden.

Table I shows the annual amounts expended by the Federal Government (Sea Grant), by the State of Hawaii, and by private industry to support coral research; and the annual growth in gross retail sales of the coral industry.

The Hawaiian Islands have had a precious coral industry since 1958, but it was the discovery of a bed of pink coral off Makapuu Point in 1966 that triggered visions of a greatly expanded industry.

Five years ago, only a small amount of pink coral used in the jewelry manufactured in Hawaii was harvested in Hawaiian waters. Today about seventy-five percent of the coral used by the jewelry industry is harvested locally. Today, as in the past, black coral is gathered by independent scuba divers in waters off the Islands of Maui and Kauai, at depths between 150 and 250 feet. Pink coral grows at greater depths, usually around 1,200 feet.

The coral research program in Hawaii began in 1970 with a $101,536 Sea Grant award to initiate ecological studies and determine the feasibility of establishing a pink coral "fishery."

Dr. Richard Grigg of the Hawaii Institute of Marine Biology was the principal investigator for this and subsequent University coral research projects.

In the first year, the Federal Grant was partially matched by State funds amounting to $47,633, and by private industry with a contribution of $6,642.

The initial grant was used to study the literature on precious corals; to make a survey of the existing precious coral industry in the Islands and abroad, and to begin preliminary field work. The survey of the precious coral industry in the Orient and Italy showed that landings (or production) of pink coral were declining, and prices for the precious materials were rising. It was apparent that the health of the industry was dependent on the discovery of new beds of coral.

Table I. Annual Support for Coral Research and Coral Industry Growth

Year	Federal Gov't. (Sea Grant)	State Gov't	Private Industry	TOTAL	Gross Retail Sales (millions)
1970-71	$101,536	$47,633	$ 6,642	$155,811	$ 2.5
1971-72	25,000	16,960	---	41,960	4.0
1972-73	16,557	51,890	68,276	136,723	6.0
1973-74	5,429	32,876	30,000	68,305	8.0
1974-75	0	30,000*	30,000*	60,000*	

*Proposed

The following year, 1971, the University of Hawaii received a smaller Sea Grant award of $25,000 to explore Hawaiian waters for new coral beds and to further survey and map the Makapuu bed. The State contributed $17,000. The 1971-72 funds were used to collect coral samples, to survey the beds with underwater still and television cameras, and to conduct exploratory surveys aboard the University's R-V TERITU. Pink coral beds were discovered at Necker Bank, Brooks Bank, and on several banks north of Midway Island.

That year, bamboo coral was discovered to be in plentiful supply off Makapuu. It proved to be quite hard, attractive, but inclined to fracture after it had dried out. No use in jewelry was found for this material.

That same year, Bo Bartko and Rick Grigg surfaced from an exploratory dive with what has come to be known as "Gold Coral." With colors ranging through tan, bronze gold, olive and near black, this versatile material has great commercial potential.

Also in 1971, two research reports were printed: "Status of the Precious Coral Industry in Japan, Okinawa and Taiwan: 1970", and "Economics and Market Potential of the Precious Coral Industry in Hawaii."

In 1972-73, Federal funding of coral research in Hawaii fell to a little over $15,000 and State support grew to over $50,000; but the lion's share of this period's research funding was assumed by the industry--almost $70,000. This contribution consisted primarily of $65,250 from Makai Range, Inc.--the cost of using their Star II submarine for ten working days, and for designing and building the coral harvesting assembly.

The main effort of the year 1972-73, was to establish a local precious-coral "fishery" by developing a method of harvesting coral with a manned underwater vehicle. The harvesting system was invented by Bohdan Bartko, Richard Grigg and Claude Brancart, who equipped Star II with a coral cutter and a basket in which the coral could be collected.

Previously, coral had been collected by dredging the ocean floor with weighted nets. In this process, the nets (hanks of 4-inch mesh nylon netting tied to a heavy bar or cement stones) were lowered from boats and dragged across the ocean floor. Coral was entangled in the nets and hauled up to the boats. The process was destructive and wasteful, as the nets often broke and dislodged the coral, much of which was not caught in the nets, or was lost while being hauled up to the boats. Moreover, the dredging operation destroyed much of the coral remaining in the dredged area.

The year's research tentatively established the economic feasibility of harvesting pink coral with the Star II. Harvesting with a submersible is, of course, much more expensive in terms of capital costs than dredging. A dive with Star II requires that the submarine, carried aboard a launching platform (the Launch and Recovery Transport or "LRT"), be towed out to sea by a third vehicle, the support vessel HOLOKAI. Submersible harvesting is also expensive in terms of equipment and manpower, and it is still practiced by only one

concern of all the world's commercial harvesters. This company is Maui Divers of Hawaii, Ltd., the largest precious coral jewelry manufacturer in the world.

During a dive, the sub is manned by a pilot, tended by three support divers, and by three men who are required to operate the support vessels. Thus a total of seven skilled men are needed in the operation. It is therefore readily apparent that the sub must harvest a sizeable amount of high quality coral to pay for the cost of a single dive.

While the labor and capital costs of harvesting coral with a submersible are high, this procedure makes it possible to gather coral selectively. Larger and more valuable specimens can be collected than would be possible with dredging. With the sub, the value of sub-collected coral is about ten times that of dredge-collected material.

Another advantage of selective harvest with a sub is that the amount picked can be limited so that it does not exceed the coral growth rate. This permits prolonged if not indefinite use of the coral bed, and contributes to its conservation.

Part of the research involved mapping and appraising the Makapuu bed. Surveys with the submersible determined that the bed covers approximately 1.4 square miles, and has an average pink coral density of 0.02 colonies per square meter. The bed's worth was estimated at $2-million, with a potential yearly yield of about $100,000 in raw coral without depleting the bed.

In 1973-74, the State and the industry funded research on an equal basis ($30,000 each), mainly to explore the new coral beds. By the end of FY 1974, thirteen of the areas around the Hawaiian Islands where conditions favorable to coral growth exist had been explored, and no significant new beds of pink coral were discovered. However, two gold coral beds were located off Koko Head and off Kaena Point on the Island of Oahu. This latter discovery made possible the start of production in October of 1974 of gold coral jewelry, with the knowledge that the new beds added to gold coral already known at Makapuu would provide sufficient material for continued production of gold coral jewelry.

Known coral beds occur in areas swept by relatively strong currents, where there exist solid sediment-free limestone substrates. The University research also found that small-scale distribution of coral is affected by larval settling behavior, which appears to be gregarious.

More exploratory dives with the submersible are planned for 1974-75 in areas close to the major islands. Exploration in the Leeward Islands is also scheduled, but because logistic support is lacking, a remotely controlled vehicle equipped with television cameras will be used instead of the submarine.

Federal and State expenditures for coral research (about $150,000 each) have already been repaid in benefits to the State. The expanded coral industry has led to an increase in retail sales of approximately $1.5-million annually, with

commensurate tax revenues. Furthermore, the industry is labor-intensive, produces no polluting by-products, and hence has provided additional employment without despoiling the beautiful Hawaiian environment. The short history of this "fishery" dramatically illustrates the success that can be achieved by Federal, State and private revenue-sharing programs.

The Translation of Mariculture Research To Viable Commercial Culture Systems

John L. Dupuy

Virginia Institute of Marine Science

Contrary to most efforts by many agencies or institutions to gradually involve the private sector into mariculture operations, we have taken the position that an efficient and profitable mariculture operation requires substantial funding in order to achieve reasonable success through efficient mass production within the time framework normally allowed by private industrial investment to show a profit. Fisheries products, including the economics of their marketing require not only the minimization of the cost of production through the use of labor saving industrially designed equipment but also the consistent availability of the product for sale. For this reason we have discouraged enterprises which have relatively small investment capabilities. Furthermore, we have discouraged multiple species and polyculture operations until at least one system has yielded a satisfactory track record of production and profit. We know that there are relatively few sites where optimal conditions exist where multi-species mariculture can succeed under the constraints which such operations are bound by environmental parameters, engineering and economic constraints.

The major points for encouraging single species commercial operation with adequate capital and operational funding will then be discussed in sequence to underscore the importance of the need for adequate financial resources for single species culture in relation to the compounded problems of multispecies or polyculture ventures.

The initial start up costs such as the sociological and environmental site selection considerations, including engineering problems, training and payment of key personnel, permit acquisitions, building lead time, equipment purchases and installation for the execution of plant design consume not only relatively large sums of capital outlay and investment but valuable time. The environmental information needed to successfully initiate any mariculture operation requires the consultation and output of information held by the state or federal agencies. That the private sector could hope to amass such information in sufficient time under their scheduling constraints of profit making would seem unrealistic. The cost of compiling such information, by one mariculture venture, would skew the probability of profit into a good probability of failure. It must be then accepted that these agencies or institutions should bear the responsibility to make available the necessary information and expertise through specifically trained personnel other than those involved in the actual research and development of different mariculture systems. The utilization of published materials,

by federal or state institutions, as a guide to help those corporations or individuals interested in starting a venture is not sufficient. More often than not it is the minute details in such an operation which can make the difference between success or failure. It is unfortunate that these details are impractical to note in most publications.

The time scheduling for the production of commercial marine species and the associated cash flow calculations (input and output) may be and usually are at the beginning partly invalid due to the inherent delays in obtaining federal, state and local permits to operate. The corporation venturing into such mariculture operations may then be permanently doomed because of an inadequate cash reserve. The attempt by corporations to initiate multiple species mariculture or polyculture are then faced with compounded problems and large money expenditures. The lack of sufficient funds to sustain momentum after the initial start up problems are usually resolved at the expense of the execution of the purchase of necessary equipment to produce a product consistently and efficiently at a profit. The encouragement of "Ma and Pa" operations by agencies or institutions and the hope of large profits or "quick kills" by individuals even with single species operations have given mariculture, as a whole, a bad reputation. There is already a long list of failures throughout the United States. Those institutions and agencies must realize that mariculture is in its infancy at this time, which is comparable to agriculture of thirty years ago.

We must consider primarily single species operations with the present biological and engineering knowledge that will yield a better chance of success. Many of the past mariculture ventures have been initiated without consideration of an adequately engineered system to yield an efficient process and, therefore, in the final analysis consistent production and profit. Even though the necessary biological information to culture certain species has been available, little effort has been expended to integrate this information with modern engineering designs. Most systems observed have utilized designs that have shown consistent failure. The success of any production facility is the reliability of the system to operate consistently and at a high rate of efficiency. High labor costs require the highest degree of automation. The intensive culture of marine organisms also requires special adaptations to insure that the growing medium be optimal for that organism. Too many mariculture ventures have faltered because, even though the quality of their sea water has been excellent, they have degraded the quality of water by the utilization of a poorly designed salt water system. As previously stated not only must the system design insure high quality water to grow the chosen marine organism, it must also produce sufficient quantities to insure the normal physiological function of that organism. Unfortunately, from the repeated failures that have been encountered, the realization of this problem has not been acknowledged by the industry and many researchers. The system design to insure these basic requirements for a mariculture operation is costly even for one species but prohibitive for multiple species. Even if the funds are available, the complexity of one system and the engineering requirements as we see them usually result in sacrifices whereby all organisms suffer. It must be made clear that the requirement of the functional physiology of broodstocks and offspring must be met if consistent yields and profits are to be obtained on an industrial basis. No one system can serve efficiently several species. The

ecology of most species is sufficiently disparate to preclude costly engineering integration that would be required.

The Virginia Institute of Marine Scien has taken the approach that commercial marine culture systems require efficient and automated salt water systems in order to properly regulate broodstocks and grow their offspring. The major thrust is a system which delivers high quality temperature-regulated salt water in more than sufficient quantities to meet the demand of the organisms to be cultured. The system is designed primarily for oyster culture with the emphasis on the production of oyster seed on twelve months basis.

Procedures and the design of new hatchery type equipment integrated with available industrial equipment for obtaining successful fatting, conditioning and spawning of Chesapeake Bay oysters in four to six weeks on a year-round basis were developed in modular form to facilitate translation to a commercial seed operation. Major emphasis on and priority of this part of the total system has been to obtain broodstock oysters capable of spawning high quality gametes which in the final analysis will insure high yields of seed oysters. Past research at the Virginia Institute of Marine Science and the present problems encountered by hatcheries to obtain acceptable yields of oyster spat has reinforced our hypothesis that the processing of bay or sea water through ill conceived designs to obtain "quality and quantity" bay or salt water for broodstock oysters has been a major cause of failure.

The isolation, culture, and sequential feeding of three new algal species as food for oyster larvae in order to obtain setting in 9 to 11 days coupled with a new designed system to obtain pasteurized algal medium in a continuous flow system has not only allowed the utilization of mass cultures (185-250 gal.) but also permitted the growth and setting of oyster larvae on a year-round basis.

The design and implementation of a setting and oyster spat system to efficiently produce cultch-free spat in the Chesapeake Bay area was achieved with consideration to the handling of heavy silt and organic loads. In addition, conservation of space to hold the maximum number of oysters efficiently in terms of cost-effectiveness had to be considered. However, the prime consideration in designing the individual modular units was again the assurance that the oysters would receive adequate food for good growth, optimal water quality conditions within the system, and that the manufactured units could be adapted to an automated cleaning system.

The total system design in basic modular units has been utilized with success at the Virginia Institute of Marine Science and has been applied successfully to the design and operation of a commercial oyster seed hatchery. The goal of this private venture has been the production of 12 to 16 million 3/4" cultch-free seed per year for planting on the operators own oyster grounds. The cost of equipment to implement the design has been about $80,000. A similar hatchery with the potential production of 80 to 100 million cultch-free seed is in the process of being built on Chesapeake Bay. The cost of land, buildings, and equipment will be over $150,000 with operating costs of approximately $125,000 per year. In addition, another hatchery with the potential production of 80 to

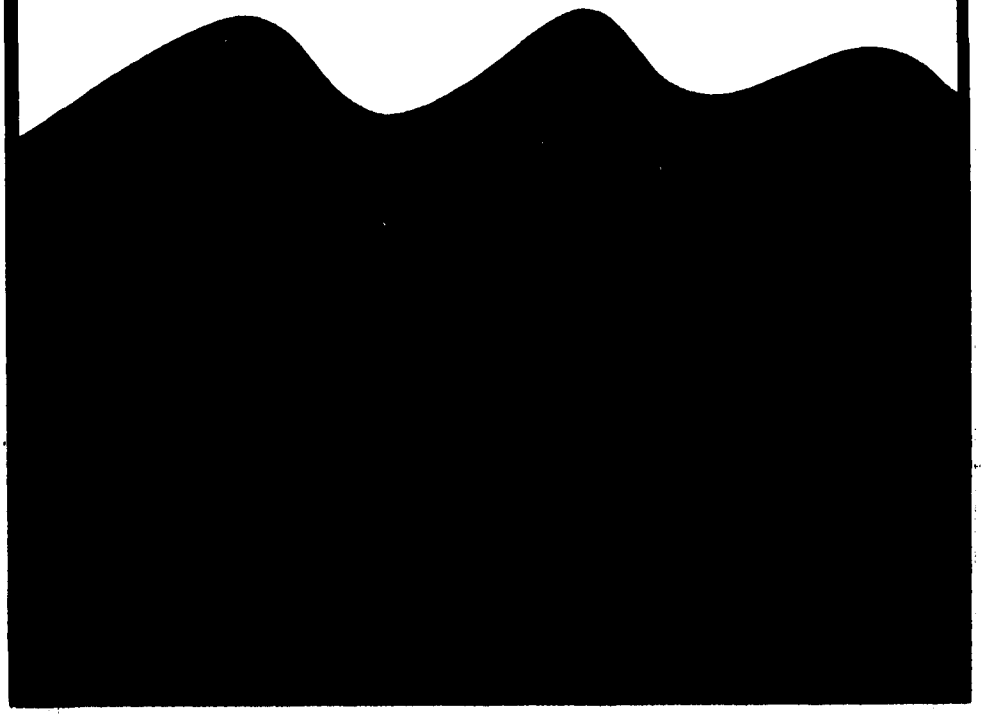
to 100 million cultch-free seed is in the advanced planning stage and will be built on Mobjack Bay in the State of Virginia.

In summary, the successful translation of research to viable mariculture systems to a successful conclusion requires relatively large capital outlays on the part of the private sector, the recognition and implementation of a designed system which incorporates the realization that high quality water is the basis for biological success and that integration of engineering with industrial equipment is mandatory. To encourage "Ma and Pa" operations to go into mariculture with little or no capital reserve usually leads to potential difficulties resulting in failure with many of the past attempts a testimonial to this discouraging record.

Developing a Framework for Sea Grant's International Involvement

Session Chairman

DONALD L. McKERNAN, Director
Institute for Marine Studies
University of Washington



A Case for an International Sea Grant Program

Judith Tegger Kildow

Massachusetts Institute of Technology

Last year the United States Congress amended the National Sea Grant College and Program Act and allocated a sum of money to study how the U.S. might more effectively share marine science and technology information with other countries. M.I.T. was the recipient of the funds for this study, and, as the principal investigator, I was invited here to talk about the work we've been doing and about some of the recommendations found in the report* which was submitted to Congress this month by Dr. Robert Abel, Director of the National Sea Grant Program.

I'd like to explain a bit of the background behind this legislation for those unfamiliar with it, because I believe it gives both justification and urgency to our recommendations for an international Sea Grant Program.

The convening of the Law of the Sea negotiations several years ago under the auspices of the United Nations made the 150 nation states increasingly aware of their interests in the oceans. All states, not just the major maritime nations, decided that the oceans held importance for them economically, politically, and militarily, and some chose this time in hsitory to attempt to change the centuries-old concept of freedom of the seas. Before any agreement has been reached in the Law of the Seas negotiations, a large number of nation states have either threatened to extend or have already extended their legal jurisdiction over their offshore waters out to as far as 200 miles. They have done so recognizing the value of this area to their own national interests, particularly if there are living or non-living resources in their waters.

The implications of this new concept of national jurisdiction over a large part of the oceans are overwhelming. Generally speaking, those interests which were satisfied with things as they were, are unhappy with the prospects which lie ahead.

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*An executive summary and a 3-volume report will be available through the M.I.T. Sea Grant Program at the end of 1974.

One group, in particular, recognized several years ago how these changes would affect their interests and attempted to protect their interests from the political arena. These were the marine scientists. Somewhat awkwardly making their way into the policy process, they sought protection for their rights to do oceanographic research wherever they thought necessary, in foreign waters or domestic.

Having convinced the U.S. negotiators to argue for the "freedom of oceanic research" and finding their case being brought into the international arena, the scientists soon found themselves plagued with even greater problems. Why, thought some nations, does the U.S. government find scientific research in foreign waters so important as to make it a significant component of their negotiating position? It must be very important to the U.S., they concluded, and so set out to understand why.

Not being particularly receptive to the arguments of the scientists who claimed that their research was important to the entire world for environmental protection, for better understanding of weather, and for more effective use and management of the natural resources of the oceans, many nations concluded that the information which the scientists had been allowed to gather throughout the world was of value to their government either for military surveillance or for economic gains from greater access to natural resources.

Both the scientists and the representatives of these "doubting" nations had justification for their positions, but the result of this situation has been gradual restraints with the threat of further restrictions which would result from the probable acceptance of a 200-mile economic zone by all nations at the Law of the Sea Conference next year.

The consequences of severely curtailing scientific research within 200 miles of the coast unless a nation has its own capability (and few do) are difficult to imagine. But, what are the alternatives? Some of the nations who oppose unfettered scientific research offer a deal. They would agree to allow foreign scientists to carry out work in waters under their jurisdiction:

--If they can share the information gathered in their waters with foreign scientists;
--If they can put scientists on research ships;
--If they can be taught how to understand the implications for their own countries of the research information gathered;
--If they can receive assistance in actually applying the information to the development of the resources of their coastal areas.

By now it should be apparent why the National Sea Grant legislation was amended: because scientific research can benefit all nations, it must be allowed. The U.S. needs to have access to foreign natural resources to maintain current living standards, and there is a need for heightened global awareness of the harm man can inflict on the fragile coastal areas of the world which shelter the natural resources so necessary for man's survival.

There should be little doubt in anyone's mind that these needs can only be satisfied with greater international cooperation in the exchange of information and

expertise about the oceans. But how to bring this about is the real question and that is the task we set out to explore last February.

Several things became apparent to us soon after we began our study. First, we found a significant number of international activities already existing at universities throughout the country, some of which were marine-related and some of these peripherally related to Sea Grant. Secondly, we found that many of these programs were supported by agencies of the U.S. government, primarily the Department of Commerce, the National Science Foundation, the Department of Defense and the Department of State. Most of the programs have little or no connection with each other. In addition to U.S. government sponsorship of projects, there are numerous international marine-related progarms sponsored by the United Nations through the U.N. Development Program and specialized agencies such as the Food and Agricultural Organization and UNESCO. Others are sponsored by the World Bank and by private foundations. Again, most of these programs are carried out discretely and provide little or no benefit for each other. Third, there are extensive marine-related activities in the private sector, through international and multinational enterprises, again which operate quite separately.

A fourth factor which we found interesting was that many nations, particularly the less industrialized nations, had already initiated discussions and projects with people in other nations, including our own. These were marine-related projects which had been recommended to help resolve some identified probelms in their own countries. While the process of problem identification is often in itself difficult, representatives of a number of less-developed nations are already taking advantage of expertise from all over the globe to help them develop their marine capabilities. Several members of this audience have been the recipients of invitations for assistance or have initiated their own discussions for the same purpose.

The Director of the Sea Grant Program at M.I.T., Professor Ira Dyer, was invited this past year by the Government of Nigeria to visit that country and make an assessment of potential marine resources in the Niger Delta and to suggest how that country might more effectively develop those resources and derive benefits from them. After visiting there, he made the following observations:

> Deltas and immediate offshore regions have generally proven to be areas rich in natural resources, including both living (renewable) and non-living (depletable) resources. The Niger Delta may prove to be also. Certainly petroleum beneath the Delta and its adjacent continental shelf has already dramatized the rich legacy of a prehistoric sedimentary process. But other resources, which I here class as marine, may also be available for development. As one example these include fish such as may be harvested directly from the water column. As another example. these include phosphate, such as may be present in sediments on the continental shelf.

He then recommended a number of things they could do. Among them was the suggestion that the university in the area take the lead role in the early steps of development, including exploration, assessment, preliminary planning, feasibility analysis, and preliminary engineering. He suggested support for such activi-

ties might come from the River State Development Corporation, with later support coming from the federal government, from international assistance or profit-seeking investors. It seems to me that an international marine-related program in the United States might play a role in this type of project either by providing manpower for training and education, actual project money on a joint matching basis, or general consulting services similar to Dr. Dyer's initial efforts. There might by any number of people within our own university program who would be interested in doing their research in the Niger Delta. Both personal and professional satisfaction could be high.

Let me turn to another example of an already-identified activity with high potential as a target or candidate for U.S. international effort. During the Spring I visited the lovely Mexican town of Guaymas in the coastal State of Sonora. It houses a small branch of the University of Monterrey that offers programs in oceanography and food sciences. While Mexico has many miles of coastline on the Pacific, the Gulf of Mexico and the Sea of Cortez, it concentrates disproportionately on land-based industries and has almost ignored its coastal potential. With known fisheries and newly-discovered oil off its coasts, Mexico is in a rare position to expand and develop its economy very rapidly with the appropriate efforts.

The Guaymas Marine Institute includes classrooms where students study a broad range of subjects from business management to marine biology, as well as research laboratories primarily used for fisheries research. While the classrooms are full, there is a significant lack of trained professors and the research facilities stand unused much of the time. The Director of the Institute, Dr. Henry Schaefer, explained to me that most of the professors which they have are their own graduates and hold only undergraduate degrees. Occasionally, professors from Guaymas go abroad on special fellowships to receive training. These latter usually earn degrees from universities in the U.S. and Europe. The money for the training had come from the Ford Foundation. He also told me that the shortage of trained professors precludes time for research. They are needed to teach. In addition the research funds that had come from their Mexican Government, which prompted the World Bank to finance the research facilities at the Institute, have been discontinued, making research almost impossible.

The Director suggested that a fairly small program could begin to solve their problem. He suggested that a few marine biologists from the U.S. might go to Guaymas, teach a course and use the vacant research facilities. If professors there could be relieved from part of their teaching responsibilities for a time, they could use that time to do research, invite students to help with the research, and generally improve the quality of education at the Institute--all by merely adding a temporary professor-research person to the staff for a time.

The Guaymas Marine Institute is in a unique position of having received assistance from a number of sources: the Ford Foundation, the World Bank, the Mexican Government, the University of Monterrey, and the Fulbright Program, to name a few. The Institute had fairly successfully integrated these varied forms of assistance to build a marine education program. It seems there are obvious opportunities for appropriate participation in the kind of international marine program we were recommending to Congress. American scientists could go to a

well-equipped laboratory along the Sea of Cortez and, unhindered, carry out useful research, while teaching bright, interested, eager students. Guaymas would provide the facilities and some matching funds, and the Institute would also benefit by permitting a faculty member time for research.

An additional role for that Institute stands waiting. The developments taking place along the coast near Guaymas call for someone to take the lead in a coastal zone management role. While sport fishing communities are growing up a few miles from Guaymas in San Carlos, there are plans being laid to build a copper smelter across the bay to receive the ore from a newly-discovered deposit in the mountains nearby. The potentially conflicting activities compounded by the unusual beauty of this area make it obvious to an outsider that something needs to be done quickly. What better place for the lead role than at the Guaymas Institute?

I relate the details of these two examples because I am most familiar with them. However, I know that Jens Sorensen,[1] Jack Davidson,[2] John Armstrong,[3] and a number of others could relate equally appropriate cases where the need for international cooperation is apparent and urgent. Since the inception of this study, Dr. Abel's office as well as mine have received letters indicating a large number of other similarly-appropriate cases for consideration. The possibilities are there and ready to blossom. It is for us to find the right way to help that happen.

The final factor that we recognized soon after we began our study led us almost directly to our conclusion that an International Sea Grant Porgram might be the appropriate way. That was the recognition of the immense pool of skilled manpower involved in the National Sea Grant Program. The quality and quantity of scientists, administrators, and extension agents participating in Sea Grant-funded activities, and those easily identifiable through the program, made the National Sea Grant Program unique among all other activities in or out of government.

While the need for greater international cooperation is evident and the opportunities seem abundant, there is still reason to approach this problem with some deliberation and to move ahead very gradually. There have been and are currently, numerous efforts at international cooperation in marine-related areas, as I mentioned before. But many of these efforts are short-lived and fall short of expectations.

Attempting to identify and understand some of the shortcomings of these programs, we concluded that far more serious consideration must be given to the communications process than has occurred in most international programs to date. While

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[1]Sea Grant Program, University of California, Berkeley
[2]Director, Sea Grant Program, University of Hawaii
[3]Sea Grant Program, University of Michigan

the necessity for scientific and technical expertise certainly is not in question, the means for transmitting the expertise is equally important and up to now has been badly neglected. The extension agent concept of the Land Grant and Sea Grant systems seemed to be an appropriate one to consider for an expanded international effort. But the problem of how to train what persons to carry out this effort is not an easy one to resolve. The subtleties of cultural differences, of negotiations in the planning stage, of understanding how one can make a positive lasting impact on an area, or even what a positive impact may be, are not easily understood. Language barriers compound the problem.

Another thing we found was how discretely each international program operates. There is little effort made either to record experiences or to evaluate them so that others can benefit. Certainly there have been a number of books written, but few offer the basic help which many of us who are novices would appreciate. One would hope that this would be a first order of business with a new international program.

In addition, there are some fundamental problems that must be overcome by individual researchers and others who would like to participate in an international Sea Grant Program. How many professors or research staff members at most universities could just pick up and go to a foreign country for six months, a year, or several years, without jeopardizing their positions? I would suspect few, and certainly very few among the young, untenured faculty. Our university system is not geared to handle this problem very smoothly, if at all. Hence, one can foresee early personnel problems. Also, while Guaymas, Mexico, is a beautiful town in which to work, other places where programs are necessary may not be so desirable. In such cases, incentives will be necessary to induce quality personnel to participate. One need not go further to make the point that the administrative and professional obstacles are not insignificant.

There is also the problem of coordinating and integrating a program such as we propose with other international programs, marine-related and otherwise, to provide consistency, continuity, and a focal point for international cooperative activities. Closely related is the issue of whether or how such programs might be coordinated with activities in the private sector. We are currently studying the problems and possibilities of public-private cooperation.

Finally, since international activities have foreign policy implications, and particularly because this study has been a result of a foreign policy activity--the Law of the Sea negotiations--it is essential that the activities of such a program as we propose be consistent with broad foreign policy objectives and not contrary to them. While foreign policy constraints should not be an overriding consideration, the program would operate more smoothly and with greater support if such considerations were included.

The difficulties in building a strong and effective International Sea Grant effort cannot be underestimated. Yet, I believe the effort should be made. It can have far-reaching benefits for all. The justification for such a program is apparent to me: the tools for building one are partially in place. The desire to take the initiative is evident through already existing programs. The opportunity awaits us. I hope we can meet the challenge.

A Non-coherent Approach to the Implementation Of a Sea Grant Program for Underdeveloped Areas

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The Environment of Sea Grant

There have probably been few periods in the history of Man when the expeditious, yet environmentally sound, development of a natural resource has signaled the far-reaching consequences that ocean resource development appears to do. As so ably shown by Meadows, et al, in "The Limits of Growth" both depletion rates of terrestrial resources, and population growth, are increasing exponentially; the gap between needs and supply appears to be widening appreciably almost daily. It is to the role of helping to bridge that gap that Ocean Resource Development must address itself. Since the establishment of Sea Grant in 1966, as essentially a "wet" version of the Morrill Act of 1862, it rapidly became apparent that the old post-frontier concepts of a Land Grant College would be broadened to include a much wider range of activities and a much further reach. The subsequent integration of Sea Grant into NOAA and its multinational programs (SICAR, for example) only verified Sea Grant's imminent global involvement in marine resource development. While national needs are still primary, the very successful establishment of diverse programs and projects, starting with the naming of four Sea Grant Colleges in 1971, to the present network of involved institutions, almost mandates that Sea Grant now turn its attention to shores other than our own. As many well intentioned Federal program directors have found out to their sorrow, extension of a successful activity from the mainland United States to other countries (especially underdeveloped ones) is not a simple transplant operation; to stretch the analogy a bit further: some immunization is required to make donor and recipient compatible. It is the purpose of this paper to analyze the factors that would be integral to the implementation of Sea Grant Programs in areas where the criteria and standards requisite to institutional and possibly even project support do not exist. A further purpose is the suggestion of an approach or method to construct an alternate foundation upon which a subsequent standard Sea Grant Program can be erected.

Let us examine, then, the factors involved in the establishment of a normal, (U.S. Mainland) institutional or project support program. Consideration of the primary or direct operational factors in initiation of these programs leads to a synthesis of all the criteria against which both institutional and project proposals are judged and yields three considerations:

First, Experience. This involves a "history of significant marine related activities..."; institutional "competence or experience in marine related fields;" and a staff "recognized in the marine community," or a principal

investigator with standard "qualifications."

Second, physical facilities and other resources. Consideration here is given to the availability of the necessary equipment for "conduct of a Sea Grant Program" including boats, docks, laboratories, etc. and applies (presumably to a lesser degree) to Sea Grant projects as well. Other resources involve finances and institutional capacity.

Third, intangible elements. This is a highly subjective area where definitions materialize somewhere between the writer of the proposal and the reader. Implicit in this group are the concepts of project merit, institutional commitment, management, capacity for growth, and intentions.

Obviously, the rapid expansion of Sea Grant Programs and the excellent quality of the results of the majority of Sea Grant institutions confirms the choice of criteria and suggests that even the application of the intangible criteria has been responsive to the character of the American educational and institutional community. One criteria-related aspect, the importance of which will become apparent later in this presentation, is that generally even those institutions which do not meet all or enough of the Sea Grant specifications may become at least marginally involved in marine resource development through a consortium or other arrangement very easily.

A second consideration which is much more diffuse, but very much an integral part of our national character is the climate of coherence or, for want of a better term, "integratability" of all the elements of our University-Industrial-Community complex. That this structuring of the functional aspects of our society has not been carried too far, either economically as suggested by Gailbraith[3] or socially and perhaps operationally as indicated by Bell[4] is certainly a question which must be resolved rapidly and effectively; consideration of this aspect is, of course, beyond both the scope and interest of this paper. There is no doubt, however, that these complexes are real and, on the positive side, we must credit to them (and our ability to form them), our successes in environmental control, integration, the landings on the moon, and in a stress situation, even the conduct of World War II. The point need not be labored much further; it is amply demonstrated at the Sea Grant level in projects ranging from the early University of New Hampshire-Raytheon proposal[5], for example, to the many recent and well known consortia which have been established to implement Sea Grant Programs.

The final factor which seems to be basic to the establishment of Sea Grant Programs is the role which the offices of Sea Grant administration appear to play in the development of the programs. Given the existence, first of basic criteria, and second of an atmosphere of coherence (or at least cooperation) the primary function of Sea Grant has been to activate a reaction - to be, in other words, a catalyst. This function has been utilized in many ways and varying degrees from providing a mere focal point for integration of successful ongoing programs in marine resource development to active cementing togetner of diverse groups and interests with a limited application of budgetary glue and administrative sense. It is this catalytic function which has been instrumental in expanding the sense of community and developing a communality of interests among

the widespread marine oriented programs. Collateral to that has been the mediation function of Sea Grant in defining and implementing broadly stated Federal mandates and policies to achieve reasonable consensus.

Sea Grant Overseas

Having established the operational parameters of the milieu in which Sea Grant has operated so successfully for the last seven years, let us now consider the new environment to which it must adapt if it is to address some of its future efforts to other parts of the ocean world. Three considerations come to mind: the objectives of Sea Grant; the real environments in which these objectives must be implemented; and the limitations which are inherent in the target culture.

The stated objectives and philosophy of the Sea Grant Program have evolved from the essentially narrow national base outlined in the early publication previously referred to[6], through formalized academic involvements in 1971 in which a broader view was implicit[7], to a current view: "Sea Grant is working for sea people, to help them solve the problems of working in the sea and living near its shore[8]" which certainly can be interpreted as a willingness and a need to extend its horizons to shores other than our own. A restatement of the objective, mediated by past experiences, and coached in the needs of the future might then be: "The purpose of the overseas Sea Grant Program is the establishment and development of pragmatically oriented marine resource utilization programs and projects in coastal areas of the world consistent with the environment, social and economic needs, and aspirations of the indigenous populations." The objectives, so stated, seem to expound the philosophy which is the heart of Sea Grant and yet has broad enough parameters to allow the flexibility which the change in the operating environment will require.

There seem to be historically and operationally two conceptualizations of foreign countries (especially underdeveloped areas) which our government, and often our people, sometimes make in developing programs which reach out beyond our national boundaries. The first is generated by high level negotiations and meetings in plush watering places and palaces, based on reams of statistics and reports and visualization of how things "ought to be" or "are done", under our accustomed disciplines. Needless to say, that conceptualization has led to results which have ranged from ludicrous to tragic and happily is becoming less and less of a modus operandus. The second concept, of immediate concern in this paper, is the awareness and analysis of the "way things are" seen from the intimate operational levels of day to day and person to person interaction. This is the real environment in which Sea Grant must operate, as it does now, if the objectives of the overseas program are to be as successfully accomplished. It will be useful at this point to view two examples in terms of Sea Grant and its objectives.

The first of these is the Republic of Haiti. This is the western half of the island of Hispaniola in the Caribbean Sea. I do not have sufficient data to characterize Haiti as "typical" of what are now known as "emerging nations;" and

in any case setting up a stereotype is, at best, poor analytical procedure in this context. The country does, however, have characteristics which are shared by many other smaller underdeveloped nations and can serve well as a model for the purposes of this study. Table 1 summarizes some hard data useful for comparative purposes.

	Population	Population Density	G.N.P. (million)	Unemployment %	Institutions of Higher Educ.
Puerto Rico	2,700,000	790.00	n.a.	12-30 (1)	5
Hawaii	769,913	119.8	630	3	13
Haiti	5,099,520	475.9	352	n.a. (2)	1 (3)
Rhode Island	949,723	905.4	369	6.8	14
Delaware	548,104	276.5	323	3.2	8

	$ Education per cap.	Language	Notes
Puerto Rico	n.a. (high)	Span./English	n.a.-No figures available
Hawaii	367.88	English/ Others	(1) Estimated official and unofficial sources
Haiti	n.a. (low)	10% Frencn 90% Creole	(2) Est. 90%
Rhode Island	160.23	English	(3) Higher Education total enrollment 1,520 students
Delaware	292.00	English	

Table 1 - General data comparing Puerto Rico and Haiti with other Sea Grant institution sites in U.S. network. (World Almanac, 1973).

The real operating environment, that in which Sea Grant will begin, must be visualized functionally to be of value to us. In Haiti poverty is a national mode and hard work is an ethic on a direct and immediate basis; for the average citizen, yesterday is forgotten, tomorrow is an unknown, and only today is important. The government is strong and centric; responsibility and authority do not appear to be closely enough linked to allow for effective decision making. Technological, educational and socio-economic contrasts are the rule. The majority of the population live in deep poverty and many suffer from malnutrition; the elite send their children to Europe and America for education and dine in gourmet restaurants. Power boats and yachts cruise along the coasts while sailboats and skiffs are used with primitive fishing equipment to provide local village needs. Transportation problems and lack of adequate refrigeration impede the effective distribution of food. Education and communication are limited both in quality and quantity further complicated by a language situation and low saturation of news and communication media. It can be seen, I believe, that the interaction of these factors, and others, place most projects and tasks on an immediate strong self-interest basis whether we are considering individuals, villages, government field agencies, bureaus, departments, or other institutions as the operating unit. It would appear that until the standards of living are raised above subsistance levels and the population is confronted with the sophisticated inter-relationships of technology and politics of an industrial society, the concepts of self-interest and immediacy are logical and necessary for functional survival.

Puerto Rico is our second model. Ceded by Spain to the United States by the Treaty of Paris at the turn of the century, the Island has been catapulted in less than three decades from an agrarian economy into an industrial society. The next result, again, only for the purposes of characterizing the real environment in terms of Sea Grant operation, may be simply stated: as industrialization proceeded agriculture decreased, the environmental awareness was lost and the work ethic and mores yielded to the influence of materialism and expediency. The data presented in Table 1 uses some of the generally accepted parameters to establish the social or industrial position of Puerto Rico relative to Haiti on the one hand and to some of the better known current Sea Grant operating areas in the United States on the other.

The level of education is high, but both institution and government tend to go along with inter-agency or cooperative ventures only to the point of implementation. Decision making, for political and social reasons outside the scope of this paper, is diffuse and the bureaucracy is complicated and sensitive to any arrangements which decrease autonomy even slightly. Caught between the precepts of a fading agricultural economy and a booming and complex industrial society, the confused values of the population are evident in the increase of crime, environmental degradation, unemployment and welfare ratios and the prevalence of status symbols. It should be pointed out immediately, however, that this appears to be a transitional stage and that a new generation is appearing which is more action oriented, highly competent and self assured, and considerable progress is being made in the resolution of the transitional problems presented earlier.

What is being said, in essence, in discussing the real environment in which Sea Grant operates is that the two basic elements of Sea Grant Program implementation are missing in both Haiti and Puerto Rico. Both areas lack the overall concept of coherence or "integratability" so characteristic of American University-Industry-Community complexes; in fact, those complexes do not exist. Both lack, in varying degrees, the basic criteria upon which Sea Grant eligibility is predicated, although it must be added that Puerto Rico would have little difficulty in generating many of the standards, once properly coordinated. That both Islands have the need and the potential for marine resource development cannot be easily disputed; nor can the inherent capabilities of the peoples and their leaders to successfully implement a Sea Grant Program, once started, be doubted. Table 2 shows some geographic comparisons which with additional data might provide the basis for more interesting future quantitative study.

	Area (square miles)	Coastline (Linear miles)	Area/Coastline
Puerto Rico	3,435	311	11.06
Hawaii	6,425	750	8.57
Haiti	10,714	1,000	10.71
Rhode Island	1,049	40	2.62
Delaware	1,982	28	7.08

Table 2. Geographic data comparing Puerto Rico and Haiti with other Sea Grant sites in U.S. network.

It would appear then, that both Puerto Rico and Haiti are suitable Sea Grant Program overseas development targets if the basic problem of non-coherence and lack of critical elements could be solved or circumvented.

Oceaneering: A Non-Coherent Approach

Coherence per se among diverse institutions and agencies has never really been the hallmark of developing frontiers. Certainly the opening up of the American West, the Australian Bush or the Matte Grasso did not depend on the formation of a NASA or the resources of a Consortium of "Frontier Developing Institutions;" to the contrary, exploration and settling of these frontiers was by individuals (or the small groups) and highly competitive. It was only with the establishment of settlements that cooperation, division of labor and sharing became necessary to consolidate the new territories. These thoughts, as related to Ocean Resource Development, have been discussed in depth in other papers[9,10] and provide the conceptual basis for the Ocean Resource Utilization Program

(ORUP) of Inter American University of Puerto Rico established in 1970, and the stimulus for the preliminary feasibility studies of a similar operation in Haiti in 1973. In brief, the ocean (for these purposes, the shallow continental shelf areas) is considered a local frontier and involves the utilization of the indigenous population, as individuals, groups or institutions, in implementation of marine resource development projects consistent with the local needs, aspirations,[11] and capabilities. Oceaneering (Oceanography plus pioneering) was defined[11] and programs and studies were developed[12,13,14] for future implementation as resources and funds become more readily available. It will be worthwhile to examine briefly the two cases (Puerto Rico and Haiti) before proceeding to discussion of a generalized program and plan which might be useful in implementing a Sea Grant Program in similar areas.

Case Study A: Puerto Rico

Taking into consideration all the previously mentioned factors on the basis of which we might (for the purposes of this discussion) categorize Puerto Rico as a "technological but unsophisticated" society. Given the lack of coherence or a solid University-Industrial-Community Complex it is not surprising that neither Sea Grant (despite apparent earlier efforts) nor a Puerto Rico and the Sea study has yet resulted in the establishment of any kind of cooperative or joint operations. During the early stages of the Inter American University's ORUP operation an unsuccessful attempt was made to develop an Island Wide Areef (Artificial Reef) project. Preliminary meetings were held and well attended; discussions went well until the organization of a coordinating body was started at which point the imminent loss of some autonomy produced adverse reactions and the project lost momentum. On an individual basis, however, many of the institutions involved in the Areef project discussions, the Sea Grant site committee meetings or the Puerto Rico and the Sea study met (and still meet) most of the basic Sea Grant criteria. It appeared obvious that an individualistic approach might be worth considering. With this point of view in mind the ORUP-IAU operation began to concentrate its efforts in three areas: Awareness development; training and education; Oceaneering Project orientation and implementation. The programs were funded by the University and no overt attempt was made to create any point or cooperative activity with any other institution. However, it was clearly stated that all aspects of the programs were open to all persons regardless of their own institutional affiliations or lack of relationship with Inter American University. Within a short time ORUP was functioning (on a volunteer and even released time basis) with persons from other educational institutions, government agencies and private enterprises and was able to program public lectures and demonstrations, reasonably priced diver training courses, and Oceaneering design and development workshops on Areefs, habitats and mariculture projects. These workshops have resulted in a number of published papers and plans and specifications for projects to be implemented as funds become available. On a more formal basis, popular and undergraduate oceanography courses were made available by the University as part of the regular academic program. At the present writing, some three years after implementation of the ORUP operation, over two hundred divers have been trained and certified; an Areef has been built and another larger one is pending; a number of papers have been published; addi-

tional academic courses have been implemented (at other institutions as well as IAU); and most important, a loose non-official liaison has developed among the Island marine resource oriented agencies. This latter factor became very apparent in the excellent attendance and participation at the First Caribbean Oceaneering Conference held in February of last year. Further details regarding the ORUP operation, Oceaneering projects and educational activities may be found in ORUP Reports[15] available from the University.

Two aspects of this case should be considered as pertinent to the development of a Sea Grant Program. First, that basic facilities, reasonably qualified personnel, and institutional capabilities are more or less available in this kind of environment. Second, that any institution or agency can provide a focal point to start a marine resource development program with the only condition being that it be open to all (institutions and individuals) on a non-committed volunteer basis at least until some natural cohesiveness develops.

Case Study B: Republic of Haiti

As the development of the ORUP Puerto Rican program proceeded, contacts with off island institutions and individuals increased as a matter of course, and were, naturally, encouraged. It should be acknowledged that considerable expertise and encouragement in the implementation of this operation was provided through Sea Grant and the institutions presently in the Sea Grant network. The task would have been much more difficult without this assistance. The attempt at expansion of the ORUP oceaneering concept to other areas began as a natural consequence of the First Caribbean Oceaneering Conference sponsored jointly by Inter American University and the North South Center (an agency of the Puerto Rico Department of State) in San Juan, February 1973. Many of the more than 500 participants were from what can be classified (again for the purposes of this discussion) as underdeveloped or emerging nations whose populations are both technologically and socially unsophisticated. Haiti, as described earlier, falls into this category and a number of Haitians expressed an interest in developing their marine resources in an ORUP manner. Post Conference discussions and meetings, first with individuals, then with Haitian officials resulted in a proposal[16] to send a ORUP-Department of State team to Haiti (at the invitation of the Haitian Government) to explore the possibilities. Because of the Haitian financial situation, the project expenses were carried by the Puerto Rican institutions and the team members volunteered their services. The mission was carried out during June, 1973.

It was obvious from the first day in Haiti that neither the coherence nor the basic requisite for a Sea Grant type of operation existed in the country. It was also very apparent that the needs of Haiti in terms of organized ocean resource development were critical. Contact was made with top officials of CONELDEP which is the economic development agency and visits were scheduled to various departments and agencies to orient executives and middle management people. Due to the fact that our host was the Prime Minister and also the head of CONELDEP all meetings and visits moved smoothly and quickly. There was, however, at the end of various discussions no indication that cooperation among the

agencies would go any further than agreement; implementation of a coherent program would have been only by executive order and would function only as long as the program had immediacy. On the other hand, discussions initiated by our team among private citizens, especially in shoreline areas pointed up the fact that at that level, small cooperative groups could function if their labor would improve their economic lot (on a short term basis) and if they were not confronted with beaurocratic or technological challenges beyond their abilities or interests. In general, but in a much more direct and less sophisticated response, the situation was analogous to that of Puerto Rico; in this case, however, not only was the element of coherence completely missing but virtually all of the standard Sea Grant Institutional and project requisites as well. On the basis of this investigation a report to the University and the Puerto Rico Department of State was made[17] and on our return to San Juan a recommendation for the implementation of a modified ORUP project[18] was drawn up and submitted to the Government of Haiti for action. Details of this document are too lengthy for inclusion in this paper and will be implicit in the methodology to be suggested in the next section of this paper. It is at the recommendation stage that the Haitian program rests at the moment because shortly after our return there was a reshuffling of the power structure and our liaison and potential collaborators were no longer viable. It is hoped that the new government will revive the project and attempt its implementation. The basic plan was to begin an awareness program; develop simple small group mariculture and Areef projects and attempt to initiate cooperative action on a non-committal basis among the concerned agencies. Later, as results would become apparent an attempt would be made to consolidate activities and purchasing power to begin developing basic diving and offshore operations. Development of a coherent structure and acceptable (to U. S. standards) criteria would, at this time, remain a challenge for the future. In view of the excellent work ethic and aspirations of the population, this future may be closer than it appears.

Methodology and Conclusions

From the necessarily brief discussion of the two potential Sea Grant implementation areas, it can be seen that the basic impediments are lack of coherence and difficulty in meeting basic operational criteria. As has been suggested at the beginning of this paper, these factors are an integral part of the real environment in which Sea Grant overseas will have to operate. It is possible then, that a pre-Sea Grant operation may be advisable to initiate the development of coherence and assist in up-grading local facilities to meet Sea Grant basic criteria. It is my opinion that the following procedures could effectively pre-condition a Sea Grant target country so as to assure acceptance and success for a later standard Sea Grant Institutional Program:

1. Exploratory, non-official team visits to develop liaison and institutional contacts at all levels both within and outside of establisned institutions or agencies.

2. Development of an awareness program to educate first, high level officials and then, general population to their marine potential and their role in its development.

3. Initiation of training programs and short term oceaneering projects such as diving, areef construction, and simple estuarine mariculture activities.

4. Establishment of ocean oriented courses and lecture programs, with demonstrations to develop a wide spread enthusiasm and local identification.

5. Establishment of a core organization (perhaps similar to ORUP) which could act as a focal point, but not committed or related to any other organization on any but a volunteer basis.

6. Introduction of better technology and the demonstration of the obvious need for cooperative action to handle it.

7. Further development of the concept of coherence.

8. Introduction of multiple use equipment and need for central organization to coordinate its use.

9. Application of increased funds to encourage joint projects.

10. Promulgation of Sea Grant Institutional criteria and concepts to expand programs to full operation and levels.

There is no way in which either a time table or even a sequence for the above operations can be suggested. Each area has a set of problems peculiar to its culture and the only realistic statement that can be made is that no two areas will be alike either qualitatively or quantitatively. Implementation of a pre-Sea Grant program similar to that outlined above will require patience, motivation, and above all the ability to move and act flexibly, almost at times to the edge of legality and custom. In view of the rapidly increasing urgency for making maximum effective use of, but still protecting, the marine resources of our planet, any realistic effort to expand the Sea Grant program to the third world almost nearly justifies the means. It is hoped that the material presented here has been useful, or at least, somewhat stimulating.

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Improving the Management of the Great Lakes Of the United States and Canada: A Case Study of International Cooperation At Government and University Levels

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Introduction

Canada and the United States have, since 1909, entrusted the examination, and sometimes the management, of boundary water problems including those of the Great Lakes to the International Joint Commission. During more than sixty years of activity the Commission has established an impressive record of ameliorating issues referred to it by the two countries. But on some issues Commission recommendations have not been followed; on others, the Commission was not used; and on still others, the countries have, until recently, shown no inclination to be engaged.

Challenges to United States-Canada arrangements to settle boundary water problems have been rare. In 1913 Senator Borah of Idaho showed his impatience at lack of Commission reports and "consummation...of final settlement." In 1957 Senator Neuberger, Oregon, challenged the appointment process of I.J.C. Commissioners. In their 1965 statement, Canada and the United States-Principles for Partnership, Ambassador A.K.P. Heeney (Canada) and Livingston T. Merchant (United States) recommended to their governments that they "examine jointly the wisdom and feasibility of"..."extension of the Commission's functions." Shortly thereafter, ten Republican House members inserted into the Congressional Record (1965) an extensive statement on United States-Canadian relations which sought "...expansion of the authority of the International Joint Commission..." to "enhance the capacity of the two North American nations to establish a model of relations between independent states."

In the Spring, 1971, a graduate seminar under my direction initiated an investigation of water management problems in Lake Ontario, one of the Great Lakes. This led to the formation of the United States-Canada inter-university seminar (some twenty universities) co-chaired by Professor George Francis (Waterloo University) and myself and the publication of a seminar report, A Proposal for Improving the Management of the Great Lakes of the United States and Canada. In 1972 Canada and the United States concluded an Executive Agreement on Great Lakes Water Quality, the effectiveness of which has been under continuous question. In May, 1973

the House of Representatives Committee on Foreign Affairs, Subcommittee on Inter-American Affairs, under the Chairmanship of Congressman Dante Fascell (Florida), examined the role of the International Joint Commission in managing flood waters as well as strategies for improving the management of the Great Lakes. In 1974 the International Joint Commission in an historic meeting held a special in-house seminar with invited participants in Montreal to examine its role in boundary water matters.

This paper orovides a brief description of the Setting and Problems confronting the International Joint Commission and others on the Great Lakes; examines Recent Actions of the Universities, the Governments and the International Joint Commission concerned with improving the management of the Great Lakes; and concludes with a Summary of the Current Situation on the Great Lakes within the context of Canada-United States boundary water problems.

Setting and Problems

Canada and the United States meet at a boundary line that stretches across the continent from the Atlantic Ocean to the Pacific Ocean for a distance of 3500 miles. In terms of population and industrial activity the most important segment of that long international boundary is the Great Lakes section which extends from the northwestern shore of Lake Superior to Cornwall, New York, a span of some 1400 miles. The Great Lakes and their connecting waterways form the largest group of lakes in the world. It is in the Great Lakes Basin that the huge urban and industrial complex of the north central United States adjoins the most populous and most productive region of Canada. Although the Basin is bisected by a political boundary line, the geographical relationship of these Canadian and U.S. urban/industrial centers results in a substantial regional interaction irrespective of national boundaries. The Canadian and U.S. citizens living and working in the Great Lakes region share in the benefits derived from a highly productive economy sustained by the most important system of inland water transportation in the world.

While significant economic progress has been achieved in the Great Lakes region, such progress has not been without social and environmental costs. It has been amply demonstrated in recent years that the other side of the development coin is environmental degradation, natural resource depletion and land use mismanagement. One well-publicized manifestation of this phenomenon is the serious deterioration of water quality in the Great Lakes. Municipal and industrial pollution of the waters of the Great Lakes has been a long-standing problem with government concern dating back to 1912. Government awareness and interest notwithstanding, the plain fact of the matter is that the water quality problem persists and grows.

Water quality is not the only resource management problem facing the people of the Great Lakes region. Other facets of the resource management picture include: lake levels, industrial and municipal water supply, navigation, water-based recreation, shoreline protection and development, hydropower and fish and wildlife protection. There are other concerns, but these, along with degradation of water quality, are the main ones. It is important to take note of the fact that these various facets of the total problem are all interrelated. Lake levels affect navigation, hydropower capacity and shoreline use; industrial and muni-

cipal dumping of wastes interferes with the supply of water for industrial and municipal purposes, not to mention recreational use and shoreline development; navigational facilities compete with other uses including water-based recreation and alternative shoreline development; and fish and wildlife are threatened by pollution and by uncontrolled use of wetlands and shorelines. This is the barest suggestion of the problem; the actual interrelationships are far more complex.

In national terms the need for governmental action and involvement in resource planning and management has been recognized by some for many years. The heart of the problem for both countries seems to have been until recent years a definite reluctance on the part of both governments to organize more effectively for water and land resources management. The situation appears a little brighter in Canada as the result of cabinet reorganization during recent years at the federal level and similar actions by the Ontario Government.

For the United States, too, the situation seems to be improving. A succession of administrations since the days of Theodore Roosevelt has sought to bring a semblance of order to the exploitation of the country's resources by, among other things, establishing a separate federal department for natural resources or a similar national-level coordinative mechanism. While major institutional changes have not met with agreement in the U.S., significant improvements are reflected in the establishment since 1965 of such instrumentalities as the Federal Water Resources Council, the Great Lakes Basin Commission, and the Environmental Protection Agency. On the international level, the creation in 1972 of the joint Great Lakes Water Quality Board was a definite step forward.

Progress, however, has not kept pace with resource management needs. The story is a complicated one, and it has often been defined in terms of the advantage enjoyed by influential special interests, public and private, over the diffused public interest. More fundamental, perhaps, has been the lack of effective action to impress on legislative bodies and executive agencies the urgency of creating improved instruments to strengthen the management of our natural resources. Unusable water and air and insufficient or costly fuel for home and car have a way of sensitizing even the most unconcerned citizen and, in recent years, a refreshing surge of awareness on the part of government and the public has occured.

While this paper is aimed generally at presenting a case study of international cooperation of government and university levels, it has a specific objective of continuing our efforts to stimulate public interest and debate on ways in which the management of the Great Lakes of the United States and Canada can be improved to attack current problems and be better prepared to meet those of the future. A central concern is on the institutional factors that affect the management of the land, air, and water resources of the Great Lakes region. The institutional problem is defined as that of determining what kinds of government organizations are needed and how these organizations should be related to each other in order to achieve the most effective management of the natural resources of the Great Lakes region at the lowest possible economic, political and social costs.

There is, of course, an existing institutional apparatus for managing the Great Lakes involving all levels of government in both Canada and the United States. This present structure, however, is not the product of any carefully devised United States-Canadian long-term plan for the Great Lakes region. On the contrary, the present mix of governmental departments, agencies, boards and commissions evolved over the years at a rate, and to an extent, that was determined by the ever-changing limits of political feasibility in each country. In its present state, we consider the present mix of institutions inadequate and in need of fundamental revision.

In summary, we believe the rigidities of present institutional arrangements are blocking progress toward the efficient use of our resources. Canada and the United States must act now, individually and jointly, to remove these obstacles if the resources of the Great Lakes region are to be preserved and enhanced for this and future generations.

The difficulties of organizing governments to cope with resource management problems on a national or regional scale are, of course, encountered elsewhere than in North America. The matter is especially acute in the industrialized countries. It is an international problem in at least two important ways. First, while every country is faced with its own unique set of resource management or environmental problems, no country has developed as yet an effective institutional apparatus for dealing with them. Second, certain resource/environmental problems are transnational and even intercontinental in scope, in that certain acts or the failure to act on the part of one country may affect adversely the citizens of one or more other countries.

The United Nations attempted to deal with these concerns when it convened the United Nations Conference on the Human Environment in June 1972 in Stockholm, Sweden. It is of interest to note how far the Conference was prepared to go regarding transnational or international water resource issues. The opening paragraph of Recommendation 51 of the Conference is quoted because of its interest to Sea Grant interests.

> "It is recommended that Governments concerned consider the creation of river-basin commissions or other appropriate machinery for cooperation between interested States for water resources common to more than one jurisdiction."

Recent Actions

Our experience in international cooperation at government and university levels on the matter of improving the management of the Great Lakes has been good; indeed so good that I found it difficult to separate sharply university and government actions. This description of recent actions focuses first on the universities, then on the Governments of Canada and the United States; and finally on the International Joint Commission.

The universities. Until the 1970's, the universities in the Great Lakes Basin made visible their major contributions in the physical, chemical, biological and social sciences through the medium of the annual conferences of the International

Association for Great Lakes Research. In seventeen annual conferences through 1974, university and government personnel and research interacted to develop a massive body of knowledge about the lakes and its lands. Aware of the uncoordinated nature of this knowledge and the limited use to which it was being put to solve problems in the Great Lakes, a small group of university and government leaders formed a coordinating committee to attempt to relate research to problem situations.

The purposeful development of knowledge in relation to problems of society in the Great Lakes Basin received a major forward thrust in the 1970's through the Sea Grant Program. The Universities of Wisconsin and Michigan Sea Grant activities at Green Bay and Traverse Bay and elsewhere exemplify this effort in the Western Great Lakes. In the Eastern Great Lakes, particularly Ontario, the New York Sea Grant Program Consortium of State University of New York and Cornell University, too, is actively engaged in bringing to bear their research skills against real world problems. (As an aside, I take great satisfaction in having initiated in 1967-68 the formation of a Marine Sciences Center as part of the Cornell Water Resources Center in collaboration with then Vice-President for Research, Franklin Long, in preparation for future participation by Cornell in the Sea Grant Program.)

For over a decade, I have raised questions about the management of the Great Lakes. Earlier, I had been involved in water management problems in the Columbia River Basin as member and chairman of the Columbia Basin Interagency Committee (forerunner to the current Pacific Northwest River Basin Commission) and chairman of the Pacific Northwest Pollution Control Council which included representation from the Canadian Federal and British Columbia Provincial Governments. Using this experience and interest, I attempted with little success to have the Federal Government undertake a review of the water management problems of the Great Lakes when I was assigned during 1967-68 as senior staff assistant for water resources to the President's Science Advisor in the Executive Office of the President.

Since the Boundary Water Treaty of 1909 between the United States and Great Britain (acting for Canada at that time), the International Joint Commission has been actively engaged in helping to resolve water related disputes in nearly 100 cases. During this entire period, no substantial review had been made of the International Joint Commission, nor had substantial consideration been given to improving the management of the Great Lakes. It was my belief that the International Joint Commission was the proper agency to study if an attempt was to be made to find ways to improve the management of boundary waters, and particularly the Great Lakes.

In 1971 I organized a graduate seminar at Cornell University on problems of the Great Lakes. Together with Professor George Francis of the University of Waterloo, Ontario, we organized a twenty-university seminar during late 1972 and 1973 to address the question of improving the management of the Great Lakes. The report prepared by the seminar and the succeeding implementation efforts have been aimed at encouraging and stimulating debate on how to improve the management of the lakes in order to make it more effective to meet current and emerging problems. A second objective was to attempt an inquiry into an international water

and land resources problem with the hope that such an examination would prove a useful guide in resolving or strengthening other similar international questions.

The International Joint Commission, the only existing formal arrangement between the United States and Canada broad enough to consider comprehensive action on water and associated land resources, was formed in 1912 to carry out the purposes of the Boundary Waters Treaty of January, 1909. The purposes of the Treaty are: "...to prevent disputes regarding the use of boundary waters and to settle all questions which are now pending between the United States and the Dominion of Canada involving the rights, obligations or interests of either...along their common frontier, and to make provision for the adjustment and settlement of all such questions as may arise."

The Commission consists of six members, three from each country. The United States Commissioners are appointed by and serve at the pleasure of the President. The Presidential appointment of U.S. Commissioners is not subject to Senate confirmation. The Canadian Commissioners are appointed by Order in Council of the Canadian Government and serve at the pleasure of the Government.

The 1909 Treaty gives the Commission responsibility in two general categories.

The first of these responsibilities is to approve or disapprove of all proposals for use, obstruction, or diversion of boundary waters on either side of the boundary which would affect the natural level or flow of the boundary waters on the other side.

The second general responsibility of the Commission - which is becoming its major work - is to investigate and make recommendations on specific problems referred to it by either or both Governments. It is under this provision of the treaty that requests - or "references" - by the two Governments have been made on such varied subjects as water pollution, air pollution, regulation of the levels of the Great Lakes, preservation of the American Falls at Niagara, and others.

As of July 1972, the Commission had received a total of 94 dockets - 58 applications and 36 references. As of July 1972, the Commission had fourteen boards of control, five boards of investigation, and nine surveillance boards under it. This does not include the new Great Lakes Water Quality Board established by the Commission pursuant to the Great Lakes Water Quality Agreement signed April 15 by President Nixon and Prime Minister Trudeau. The new Water Quality Board will have responsibilities for both investigative and surveillance activities.

A summary assessment of the Commission would note:

- The Commission has been on the scene for sixty years;
- The original purpose was to provide a rapid mechanism for the resolution of complications which would likely be delayed and lead to serious controversy if handled through diplomatic channels;
- The Commission has met this purpose, and it has persisted because it has successfully met a real need of both countries;

- The Commission has been important. Majority rule has been employed and respected;
- The Commission has been non-political. New Commissioners have not been appointed to follow new governments;
- The Commission was not granted a planning role by the treaty: it has neither the authority nor resources to develop a planning function; its contribution has been to resolve problems case by case as assigned by the two governments;
- The Commission has no fiscal control or continuous supervisory control over the work done in its name by the agencies assigned to tasks;
- The Commission is not well known; it tries quietly and effectively to carry out its mandate in the presence of public apathy and government indifference.

The issue confronting investigators interested in the management of the Great Lakes is the character and adequacy of the institutions that manage the lakes. While technical uncertainties remain, there is a wide body of knowledge about the various uses for which the lakes are employed, and about the natural systems of the lakes. Since the Great Lakes are international, it was not deemed productive to look at the several national institutions without first giving attention to the international body established by the two countries. Thus, from the beginning of the current inquiry, the International Joint Commission was of major concern.

The program of inquiry initiated at Cornell University and extended to a multi-university seminar involved, at one time, representatives of twenty universities in Canada and the United States and representatives of Governments, Federal-States, local and international. Using a binational planning committee, background reports, discussion groups at three seminar meetings, organized to consider progressively more precise responses to the organizational question and planning committee redrafting efforts between meetings, a final report was adopted January, 1973.

Several actions have resulted from this report: (1) At the request of Congressman Dante Fascell (Florida), Chairman of the Subcommittee on Inter-American Affairs, House of Representatives, Foreign Affairs Committee, Professor Francis and I testified before the Subcommittee in May 1973; (2) several bills have been introduced in the House and Senate to require Senate confirmation of I.J.C. Commissioners;[1] (3) the Great Lakes Fishery Commission has acted to review its charter in relation to other activities on the Great Lakes; (4) a series of detailed reports on Great Lakes management matters were produced by an expanded graduate seminar at Cornell University under a simulated "Great Lakes Experimental Operations Office."

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[1] 93rd Congress First Session
H.R. 9858, August 2, 1973
S2797 by Senators Nelson, Hart, and Hathaway, Dec. 11, 1973

The findings of this process were contained in two recommendations: (1)strengthen the IJC; or (2) establish a new treaty for the Great Lakes apart from the IJC. These alternatives imply or provide for:

- Establishing a joint Canadian-United States management body for the Great Lakes having surveillance and mediation functions;
- Joint agency budget and administrative procedures;
- Initiatory authority for such matters as planning, surveys, investigations and research under carefully specified guidelines established by the two countries;
- Program responsiveness by requiring that the activities of the joint management body be subject to program and budget authorization and review on, for example, a biannual basis;
- Facilitating joint planning on a multiple purpose basis;
- Stressing intensive regional and transborder collaboration among state/provincial governments;
- Developing a more comprehensive and systematic approach to the management of the Great Lakes;
- Joint information collection and analysis; and,
- Public reporting.

The alternatives recommended do not provide for:

- Changing the equality status of the two countries in matters concerning Great Lakes management;
- Establishing a supranational decision-making authority;
- Changing the basic authority of existing national, provincial, or state responsibilities; nor,
- Displacing existing agencies.

During 1973 and 1974 we have been engaged in undertaking whatever actions seem useful to bring the findings of our efforts to the attention of those in positions of responsibility. The response of the Subcommittee on Inter-American Affairs of the House Committee on Foreign Affairs under the Chairmanship of Mr. Fascell provided great encouragement to us. With his support and the support of other members of Congress such as Congressman Charles Vanik (Ohio) the Department of the Interior has funded a two-year implementation phase to our original project ($80,000). Under this expanded regional program two projects have been financed at the University of Wisconsin (Madison) concerned with IJC and (1) Institutions and Great Lakes Levels, and (2) Land Use Controls. Another project is concerned with assessing the activity of the Executive Water Quality Agreement. In cooperation with the Joint Canada-United States Water Quality Office at Windsor, Ontario, a study is underway of water quality institutions in Western Europe. These and other scheduled projects will provide the working documents necessary to the development of adequate discussion by the persons participating in the implementation phase of the project.

Under an expanded regional United States-Canada planning secretariat comprising University persons, with assistance from governments, we propose to continue a research program addressed to questions that will clarify specific transboundary issues and relate organizational opportunities to them and their solutions.

During the next two years a concurrent program of information transfer will be carried out through working conferences of University, government and other persons with the view of facilitating the adoption of improved management arrangements for the Great Lakes.

Governments. There is no doubt that the Governments of Canada and the United States are becoming increasingly concerned and active about the future of the Great Lakes. Yet, this observer finds little expression of satisfaction on the part of the public: problems still abound; progress is slow; response and coordination are lacking; public expectations are not being met.

Organizationally, both Canada and the United States have moved to bring environment into the first line of decision-making through the Federal Environment - Canada and the Ontario Provincial Environment Ministry. Similarly the U.S. Environmental Protection Agency and the National Oceanic and Atmospheric Administration provide strong organizational arrangements to facilitate Great Lakes management. Concurrently, U.S. states under guidelines resulting from congressional action and EPA regulations have strengthened their activities. The acquisition of new knowledge has also been increased by the establishment of the Canada Centre for Inland Waters at Burlington, Ontario and the E.P.A. and N.O.A.A. laboratories at Detroit and Ann Arbor, Michigan, respectively.

The Great Lakes Water Quality Agreement is, without doubt, the most significant action taken by the two governments on the matter of water pollution since the Boundary Water Treaty was signed. Yet, two other exhaustive surveys initiated in 1912 and 1946 brought little progress and we would be wise to observe carefully what actually happens before acclaiming the current agreement as a success. During the May, 1973 Hearings before the House Subcommittee on InterAmerican Affairs Congressman Steele asked how effective the joint action has been at the present time. Responding, we said that:

- The water quality agreement was a sound technical document;
  The persons developing the objectives and the agreement were highly qualified;
- The effectiveness of the agreement will depend on what the governments do and not in terms of science and technology; specifically, success will depend on appropriations, priorities for the Great Lakes, Federal-State and Federal-Provincial relations and the like.

Since 1972 the news has been filled with conflicts between the U.S. Congress and the Executive Branch over allocations of money to control water pollution in the Great Lakes. The role of the courts in enforcing pollution control has been severely tested as a result of the Reserve Mining case, and the willingness of government at all levels to relate land use to planning for the control of water pollution has not been given the attention it deserves. Finally, it should be remembered that it was not until April 15, 1972 that the two governments of Canada and the United States authorized the I.J.C. to examine the question of water pollution in Lakes Superior and Huron. Clearly we are late, and the future is still uncertain as to whether we will be able to make sufficient progress on

both sides of the border to meet public expectations as expressed in the Executive Agreement, in the U.S. Federal Water Pollution Control Act (P.L. 92-500), and in the Canadian water pollution control program designs.

Three other issues merit discussion but can only be referred to in this paper. The first is the problem of high water levels in the Great Lakes. Congress has held several hearings on this matter during the past two years and the matter is far from resolved. It is worth noting that the two governments referred the question of the lake levels to the I.J.C. in 1964 "...in view of the then prevailing extreme low lake levels and the highs of 1952...". The Synopsis of the 1974 Report of the International Great Lakes Levels Board includes the cryptic remark. "This committee began its work on January 6, 1965, and completed its report nine years later." So disturbed has the Congress been by the lack of adequate current information on this matter that the House Committee on Public Works, at the request of members of Congress, took the unprecedented action of proposing to hold hearings on *enlarging* the Chicago diversion out of the Great Lakes into the Mississippi River System. Only President Ford's intervention at the last moment citing a concern received from Canada on the matter of further Great Lakes diversion through Chicago brought this matter to a halt.

If hearings had been held I proposed to seek as a second issue, the inclusion of considering diversions out of and into the Great Lakes Basin as a matter of vital interest in utilizing the resources of the Great Lakes in the northcentral and northeast states and Canada, as well as considering navigation, hydro-power, shore properties and the effects of lake levels on biological life.

A third issue involves the problem of joint planning for the management of the Great Lakes. The U.S. Great Lakes Basin Commission has just completed and published its Great Lakes report. Canada has no counterpart arrangement for the development of such a comprehensive view of the Great Lakes. How well can we plan for one-half of the lakes around a national boundary axis? In addition, the Great Lakes Basin Commission has studied opportunities for organization to improve the management of the Great Lakes. Appropriately, such studies were concerned only with the United States. Can we continue to have the United States and Canada organize unilaterally for the effective management of a great common resource? This, of course, is a major question posed by our inter-university study, and our general conclusion is that joint effort and action is to be preferred.

The International Joint Commission. "The Commission looks forward to meeting with you in June (1974) and exchanging views on this historic and important Canadian-United States experience." Accepting this invitation I participated in the I.J.C. Seminar on The I.J.C.: Its Achievements, Needs and Potential in Montreal June 20 - 21, 1974. The purpose of the Seminar was "to examine, in the light of past and present experience, the Boundary Waters Treaty of 1909 (and related instruments of agreement), and the International Joint Commission's capacity to deal with anticipated or potential needs and problems along the Canada-United States boundary -- bearing in mind the changing priorities, values, technologies and political situations in both countries." With the permission of the I.J.C. Office in Washington, D.C. I am pleased to share some of the ideas proposed at the Seminar reported in a summary distributed in August, 1974:

- "A new treaty is not needed. What is needed, however, is the political will of the two Governments along with a better understanding of the I.J.C. and its capabilities and commitment of more resources to enable the Commission to carry out its responsibilities."
- "...the I.J.C. is only as good as its Commissioners and that both Governments have been less than diligent in this regard."
- "...the Commission is often hurt in the public eye when it makes recommendations and no action is forthcoming...The Commission should be more aggressive in following up its recommendations by asking for explanations when no action is taken."
- "The idea of giving the Commission a broad monitoring or watch dog role was discussed. On the one hand, it was argued such a role could jeopardize the continued effectiveness of the Commission...On the other hand, if the Commission is to be an effective institution in the future, it must be structured to deal with existing and future problems. A watchdog role would help the Commission foresee future problems."
- Throughout the discussion it was emphasized that, from the point of view of the two Governments, the I.J.C.'s great utility was its capacity for common fact-finding, and for presenting to Governments agreed-on facts as a basis for action. Nonetheless, a broad consensus emerged that the I.J.C. should have the power (which some believe it now has) to point out to the two Governments potential sources of trouble and dispute between the two countries and to suggest that a reference be made. It was noted that the Commission has used this procedure in the past with positive results.

I was asked to lead the discussion on the matter "Should the I.J.C. be given "managerial" and/or additional "planning" authority to deal with water levels, flows and pollution, wherever the situation demands bi-national management or planning (e.g. Great Lakes levels; Great Lakes clean-up programs): Has the Great Lakes Water Quality Agreement now opened the door for managerial and planning roles which can be developed by the Commission itself and should should this be encouraged by the Governments?" The subsequent discussion focused on the possibility of the I.J.C. becoming an information gathering body along the U.S.-Canadian border which would play a larger role in encouraging the Governments to improve the level of interest in the environment rather than a bi-national management or planning agency.

"It was agreed that there is a tremendous need for information on both sides of the boundary. There is a great deal going on in both countries without knowledge of how it affects others. The information gap includes data on economic development, land use planning, environmental matters, etc. It was suggested that the I.J.C. could play a large role in bi-national planning. For example, it could have a surveillance and mediation role with regard to water quality standards, development schedules, etc. Such a role would not eliminate existing government control over planning. The Governments would continue to control the extent of the I.J.C.'s involvement through funding of the I.J.C. and a continual review of its programs. It was suggested that it is important to have an organization which looks forward and is not simply reactive. To date, Governments have been involved in remedial programs, and have not established adequate mechanisms to anticipate future problems. It is also important to deal with areas along the boundary as a whole. For example, on the Great Lakes, the Great Lakes Basin

Commission cannot plan for the entire area as its authority ends at the International Boundary. It would be useful to have a counterpart agency in Canada and to have the two coordinate their efforts. The Governments could build upon the Great Lakes Water Quality Agreement and establish the Commission as the necessary bi-national coordinating committee."

Summary of the Current Situation

This case has examined some of the management problems of the Great Lakes from the vantage point of universities, governments and I.J.C. Of necessity, much significant work and interests have not been touched. At the university level the activities of the University of Toronto, Queens University, Kingston, Ohio State University, Case-Western and the several units of the State University of New York among many others have not been mentioned. For governments, the outstanding work of the International Geophysical Year as well as the extensive work of the Canada Centre for Inland Waters has not been detailed. Finally, Congress, the States, the Parliament and the Provinces have all increased their activity in relation to the Great Lakes. This is true, too, for the I.J.C. as the results of the Montreal Seminar indicate.

From my vantage point a few items are worth noting in a summary. The first concerns a recommendation made by Professor George Francis (University of Waterloo) and myself before the House Foreign Affairs Committee; the second concerns the opportunities before the I.J.C. to strengthen itself; the third concerns a letter addressed to President Ford by Congressman Fascell in his capacity as Chairman, Subcommittee on Inter-American Affairs of the House Foreign Affairs Committee, and some pending actions by the House Public Works Committee under the leadership of Congressman Blatnik to evolve a public works investment policy in relation to a population distribution strategy.

In the Francis-Dworsky testimony of May, 1973 to the Subcommittee on Inter-American Affairs we recommended the following: "This proposal, at the end of our statement, is our recommendation for action by this committee, and a recommendation, of course, to the full Foreign Affairs Committee and, ultimately, to the House."

"We believe that a resolution ought to be prepared and enacted by Congress that would say: The Congress of the United States is deeply concerned about the need to strengthen the management of the International Great Lakes in order to conserve, develop, and use that unique resource for the benefit of its citizens. The Congress believes that this concern is shared equally by the Government of Canada. The Congress, accordingly, requests the President to initiate new discussions with the Government of Canada with the objective of: (1) Developing a joint comprehensive examination of the problems associated with the multipurpose management of the Great Lakes and associated lands; and (2) using this examination to determine ways to strengthen significantly the joint multipurpose management of the Great Lakes. Among other opportunities, the alternative proposals formulated by the Canada-United States University Seminar should be used as a basis for initiating such discussions." We would like to see this recommendation supported in order to initiate a process that will involve the Governments of the United States and Canada in a new dialogue about the management of the Great Lakes.

The I.J.C. Seminar has laid a basis for (1) modest internal changes within the existing I.J.C. structure, and (2) proposals to the two Governments for more substantive changes. The latter may be proposed by I.J.C. Without question, the public - ourselves - need to consider what role we will take in facilitating changes both of I.J.C. and specifically in relation to Great Lakes management.

The Congress has taken a number of significant steps about which we should be aware. On August 14, 1974 Congressman Fascell wrote President Ford with respect to his particular area of interest, Western Hemisphere affairs. Among a number of matters, Mr. Fascell pointed out to the President, regarding Mexico, that "The Mexicans must be reassured that our agreement to resolve the Colorado River salinity dispute will be carried out as rapidly as possible." With respect to Canada, Mr. Fascell wrote, "No country appears closer to the average U.S. citizen than Canada. The bulk of Canada's population and a substantial part of our own are neighbors in the fullest sense of the word. The problems of one people literally are the problems of the other. While respecting Canada's wish to remain separate and culturally distinct it would appear that initiatives to address common problems on the highest level are long overdue. Problems of flooding and pollution on the Great Lakes thus far have been addressed only in a piecemeal way. Likewise, talk of U.S.-Canadian cooperation in energy appears to have remained just that as the need for cooperation has become clearer and clearer." In closing his letter Mr. Fascell called attention to another question of importance to all of us. "One additional Inter-American problem which is in its formative stages concerns the sufficiency of North American water resources. It appears that entirely new institutional arrangements may be needed to insure adequate supplies. To this end it would be useful to initiate joint U.S., Canadian and Mexican planning on a North American regional basis. This would be a real first in world resource management."

In March, 1974 the Committee on Public Works of the House of Representatives, under the Chairmanship of Congressman John A. Blatnik, appointed a Science Advisory Panel to inquire into some of the fundamental questions before our society. In the introduction to a report on the Proceedings of the Science Advisory Panel, Congressman Blatnik identified some of these questions: "The need for development of a population distribution policy and the creation of strategies for the distribution of population; the application of a modified concept of "carrying capacity" as a tool in the development of population strategies; the role of population distribution in the enhancement of the quality of life in the United States; the need to improve the function and effectiveness of substate regional units of governance; the role of transportation technology in regional economic development; and the relationship between the foregoing issues and public works in the development of a public works investment policy."

These new initiatives at University, I.J.C., and government levels merely illustrate the great opportunities we have to develop a constructive agenda for the National Sea Grant Program in the international arena. We are needed and can be of significant assistance to society. I expect this session to be an important starting point in developing such an agenda.

Bi-national Planning Along the Coastal Zone of Texas and Mexico: A Case Study in Bi-national Transportation Planning Brownsville, Texas and Matamoros, Mexico

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Abstract

The coastal zones of South Texas and Northeastern Mexico have much in common geographically, ecologically, geologically, biologically, and agriculturally - in other words, nature has made them very similar. However, after a close look at the people, their way of life, and their standards of living, one is made painfully aware of the great contrasts in the lifestyle of the people of these two great nations. One hundred and thirty years of living under different systems of government is perhaps the greatest reason why.

Today, however, both federal governments are focusing their attention on their border peoples in efforts to help them improve their standards of living. For both countries, the border areas are their so-called "depressed areas."

Recent urban studies reveal that urban problems do exist and their size is in direct proportion to the difference in the two standards of living. In order to improve the lot of the South Texan it is necessary to improve the living standards and conditions of the Northern Mexicans at a greater pace in order to close this gap.

Effective programs are presently underway in the areas of public health, education, basic utilities services, and industrial development. However, a big vacuum still exists in three major areas necessary for good economic development and balanced growth - they are improved transportation facilities, effective pollution control programs, and proper land use planning of the coastal zone. This paper focuses attention on these three vital areas.

Already, there is a "demonstration project" in bi-national transportation planning underway, and since it involves the efforts of the Port of Brownsville to improve the link between the land transportation system of Mexico and the water transportation system of the U.S., all three subjects fall into the area of marine related interests of the Sea Grant program.

During the past two years the sister cities of Brownsville, Texas and Matamoros, Mexico have worked together to bring about an improvement in marine related transportation, economic efficiency, and the environmental quality of their respective communities. This paper documents the step-by-step approach to the development of a coordinated effort to bring together federal, state, and local

levels of government, on both sides of the international border to plan, fund and implement a major modification in the total transportation system serving the area. Since this project is funded as a "demonstration project" the results of this effort shall provide a model for other international sister cities.

A major section of the paper is devoted to an analysis of the reasons for the lack of coordination in bi-national planning of transportation related facilities and how this problem was overcome in the case of Brownsville-Matamoros. One co-author is the Director of the Port of Brownsville who has served on the Sea Grant Advisory Council of TAMU since 1971 and as a lay member of the Texas legislative Interim Committee on Coastal and Marine Resources. The other author has conducted research under the Sea Grant Program at Texas A&M University and has assisted in the development of the Brownsville-Matamoros transportation study. This experience has provided the authors with a unique opportunity to relate the need for other coordinated efforts in bi-national planning in programs such as Environmental Protection and Coastal Zone Planning and the role (or roles) of the Sea Grant Program in these efforts.

Observations and Conclusions

Northern Mexico and Southwestern United States are experiencing accelerated economic and population growth. As a result, the movement of goods and people across the international border is increasing rapidly. To meet this increasing demand, well formulated plans for the expansion and improvement of transportation facilities must be developed jointly by both countries. A significantly large portion of the international commerce moving between the U.S. and Mexico passes through the gateway of Matamoros and Brownsville in order to benefit from low-cost water transportation. A thorough study of the problems here will help set a pattern for solving similar problems elsewhere.

Although the governmental processes of the United States and Mexico do not function in the same manner, the Brownsville-Matamoros experience demonstrates that coordinated planning is highly desirable and greatly needed. However there are many facets of these problems that require identification and documentation. It is the conclusion of the authors of this paper that the Sea Grant Program can act as a catalyst to combine the capabilities of institutions and agencies on both sides of the international border to achieve coordination in planning the expansion and creating the improvements needed by the people living along the coastal zone of Texas and Mexico.

Marine Advisory Opportunities Beyond PASGAP's Edge Of the Pacific Rim

John Ball

University of Hawaii

April Fool's Day, 1946 was another day in the dawning of ocean-wide interest in the Pacific. April 1, 1946 was the day of the Great Eastern Aleutian tsunami. Almost 180 Americans lost their lives in this series of waves and tens of millions of dollars of damage was sustained.

This event catalyzed the formation of the Tsunami Warning System (TWS) under the auspices of the Coast and Geodetic Survey. In the beginning the focus was on the Hawaiian Islands which had recently suffered from tsunamis generated in many different locations around the Pacific Rim. The system required the development and placement of sensing equipment, and an ability to link these stations to the TWS center in Honolulu. Such a communication system could not be justified solely on the basis of tsunamis, so it was necessary to secure the cooperative use of the communications systems of the armed forces and the Civil Aeronautics Administration. The necessary relationships were worked out and the system exists today.

Two more major tsunamis occurred after the Hawaii-based warning system was initiated and each had an effect upon the further development of the Pacific-wide system. The Chilean tsunami of 1960 crystallized the future participation of a number of foreign countries and territories. The 1964 Prince William Sound tsunami (the most devastating to affect this country) reinforced the concept of regional information dissemination systems such as the one that does exist in Alaska.

Currently (as of the 1971 communication plan) the system receives information from twenty-seven seismological stations and forty-six tide stations and is prepared to disseminate tsunami warning information to forty-six participating agencies around the Pacific. Foreign participants are required to support the cost of their communications and all of the participating agencies are responsible for their own local dissemination of tsunami information.

It would be helpful to reflect that the formation and improvement of the tsunami system occurred in three stages. The first stage was a crystalization of a warning system which brought people with needs and desires together with the technical and fiscal capabilities to form the first module. The second stage, the expansion to other areas of the Pacific Basin, again was based on recognized needs and desires and now a tried and true system. The third stage was one of

strengthening the local dissemination systems which are in different phases of development at the present time.

Obviously there are greater and more important (if less dramatic) issues than tsunamis that need the attention of the Pacific marine community. In his paper on the Pacific Sea Grant Advisory Program (PASGAP), Bill Wick has discussed how many of our region's problems were identified and attacked on a cooperative basis. Another activity of PASGAP was the production of a report entitled "Marine Advisory Programs for Pacific Rim Countries." In it Bill and Graham Drew recorded the results of a consultative visit with marine advisory educators in Japan, Hongkong, Singapore, Australia, and New Zealand. It contains detailed lists of problems and resources, and it documents the universal enthusiasm that greeted the idea of wider cooperation in the sharing of marine information and technology.

It is important to remember that despite the PASGAP experience, we are on the verge of a new era of wider cooperation and not yet in the midst of a functioning Pacific-wide system. From the description that Bill Wick has given of the history and status of PASGAP it appears that we are well through the equivalent of the first stage in the development of the Pan-Pacific marine advisory program, that of the crystalization of an idea which brought people with needs together with the technical and fiscal capabilities to form the first unit - PASGAP. Bill and Graham Drew, with help from John Doyle, began work on the second stage, that of expanding the international coverage.

The easiest way to get a picture of the sort of activities that a functioning Pan-Pacific Marine Advisory Program might be engaged in is to run down the list of PASGAP's current objectives and project a few activities related to each as they expand to meet wider needs.

1. Provide support for development, activation and refinement of marine advisory programs.

There is considerable experience in marine extension in several areas of the Pacific. Japan and Hongkong both could contribute significantly to the rest of us. However not all of the Pacific has the intensive populations and marine resource dependence (or, for that matter, the requisite fiscal support) to develop large advisory programs. We will also build systems that can service scattered populations and small income bases that typify the islands of Oceania. There will need to be a lot of talent and experience sharing at this level as well as the more technical level discussed below.

2. Make specialized expertise available to members through sharing of talent.

This is one of the greatest driving forces behind an expanded sharing of marine information and technology. Hidden behind rather effective barriers of language, time, and distance are potentials for considerable breakthroughs in a wide variety of areas. For example, we are now working with new processing methods, borrowed from the Japanese, that may open up entirely new fisheries. With the concern for coastal zone management throughout the Pacific, there will be considerable demand for talent in this area, from planning to environmental

impact and pollution control. In the areas of fisheries biology and plant and animal aquaculture, we are certain that there is a great potential for the use of the talent in the Pacific region. And there could be an expanded sharing of talent outside the Pacific region along subject matter lines such as those represented in the Arctic Environmental Information and Data Center, at the University of Alaska. Talent sharing on the basis of the problems in other climatic zones, such as with salmonid fishes in the temperate zone and coral reef management in the tropics, are already underway and could be accelerated through regional (and supra-regional) organizations.

New technologies and older ones that are affordable on a larger scale promise to make an impact in this system. It will be a system capable of locating and inventorying talent and providing the mechanism and translative functions that enable old barriers to be overcome.

3. Systematically assess the need for and develop publications and other media materials to support regional programs and problem solving.

This is a critical need that PASGAP has informally helped with already in trying to provide materials for a new reference collection in Singapore. For the entire Pacific this will be a vital and challenging counterpart to the sharing of talent across international barriers. There is already an immense backlog of very relevant marine information in a published form that is unavailable to the wider public. Translation is expensive work, but the right information is much cheaper to translate than to produce. So one job may be to find and transform the most relevant pieces of information to meet regional goals. A closely allied need is for properly done packages of information that can present the latest methods and equipment in plant aquaculture to Samoans and Indonesians; fishing and fish handling to villagers in Korea and Singapore; coastal environment management to planners and industrialists in Japan, New Zealand, and the United States; and fisheries management and resource development to Australians and Micronesians.

These are complex jobs, but ones that need to be done properly. Again, new technologies offer themselves and cooperative programs can share costs.

4. Conduct, in association with the Pacific marine community, program input conferences.

In PASGAP these conferences have been opportunities to periodically reassess directions and progress and to define new priorities for the attention of researchers, educators, business people, and government agencies, as well as the local marine advisory program. Throughout the Pacific there seems to be universal agreement in the value of this sort of process no matter how developed or underdeveloped the marine activities are. This is the way we have formally documented needs, and organized problem solving resources throughout the PASGAP region.

5. Develop and conduct workshops in response to identified needs.

These have been highly successful on the geographic (and cultural/language) scale that PASGAP represents. They are intensive, single subject programs that can take advantage of an inventory of talent and expertise applied on a local basis. They will be the way that Samoans, Indonesians, Koreans, and all the rest of us get a large share of the useful marine information and technology. They will be primarily a local function, that can take advantage of appropriate outside expertise and methods. The follow-up will be the one-to-one technique of extension workers everywhere.

6. Provide training opportunities in extension educational techniques applicable to marine advisory programs.

There are a number of existing programs and agencies that share common interests and would be willing to cooperate with this program. This is especially true in the training and education of extension personnel. Our job is to be sure that we have the best trained and equipped personnel possible. We see emerging in marine advisory programs in Sea Grant, a need for training and re-training of subject matter specialists. In appropriate regional training programs there should be attention given to specialties as well as educational techniques.

It is my contention that we are ready to embark on the second stage, that of expanding the coverage of a cooperative, international sharing of marine information among the peoples of the Pacific. We have a viable model and considerable interest on the part of several other areas. We have problems of a strictly local nature and questions where decisions will increasingly affect wider segments of our ocean. Against both types of problems we hope to apply an expanding inventory of information, expertise, and research capability. We also will take advantage of the recent communications developments and the economies of large scale operations and cooperative piggy-backing. There are new jobs in a wide variety of backgrounds.

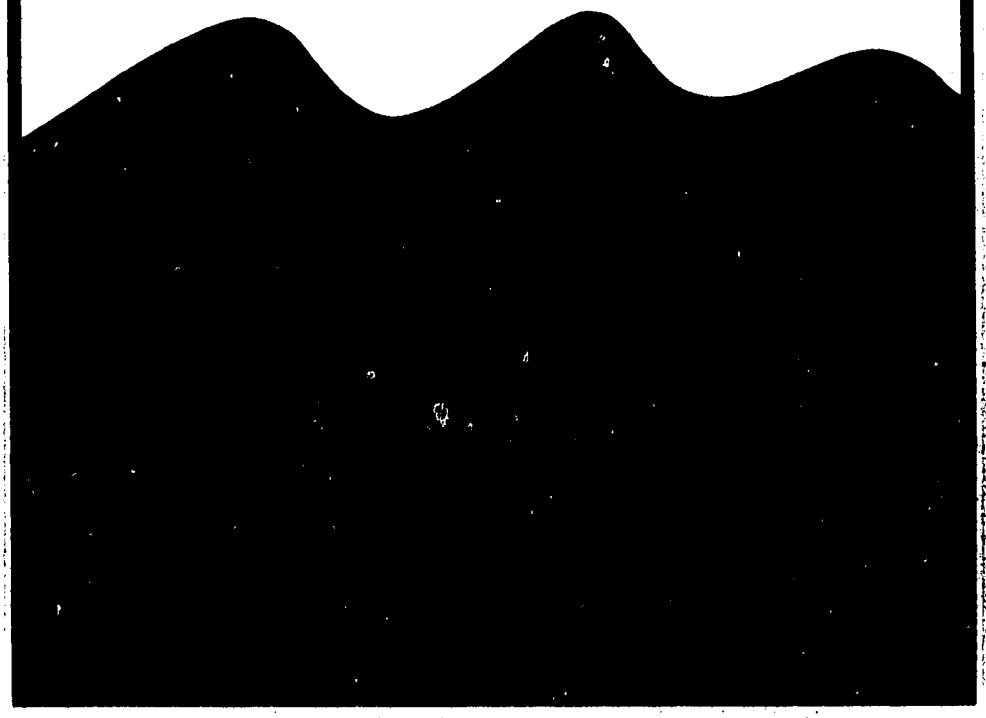
But the expansion of the coverage of marine advisory cooperation will not occur automatically. Recognizing this, PASGAP prepared a plan and a proposal for the consideration of the Office of Sea Grant. This proposal, as everything else connected with PASGAP, places heavy emphasis on the development of the local marine advisory program. It is our hope that concurrent with the expansion of the Pan-Pacific Marine Advisory Program, we can foster and strengthen the local marine advisory programs.

As the program unfolds centers for a number of different purposes will develop. Among these will be regional and subregional coordination points and geographic/climatic subject matter centers. There will be places we turn to for specialties in extension and communication as well as for talent in fisheries processing, aquaculture, coastal environment management, recreation, economics, engineering, safety and the like. We will need to develop new communication links and the ability to transform and transmit new ideas across old barriers. We will need to concentrate on the improvement of the marine advisory person, the local information dissemination and problem identification point. We will see better coordination of research efforts and the decisions of countries and territories that affect a wider area.

Where to from here? Will all the talk and concern for international sharing be just so much ho'omalimali? Or will we bring the Pacific family together in a true Ho'oponopono, a constructive, corrective agreement that will allow us to work and live in harmony?

I mua!

Appendixes



Business Meeting

A number of important items resulted from the 7th annual meeting of the Sea Grant Association, including election of officers, adoption of five resolutions, and revision of the Association's Articles of Organization.

1974-75 Officers

President: Mrs. Leatha F. Miloy, Texas A & M University

President elect: Dr. Stanley R. Murphy, University of Washington

Executive committee:

Dr. Jack Davidson, University of Hawaii
Dr. B.J. Copeland, University of North Carolina
Dr. Bruce Mattox, Mississippi/Alabama Sea Grant Consortium

Beginning the second year of two-year terms on the Executive Committee:

Dr. Edward Chin, University of Georgia
Mr. Ronald Linsky, University of Southern California

Resolutions Adopted

1. A resolution urging the Department of Commerce to designate new Sea Grant Colleges as they qualify until each coastal and Great Lakes state is part of the Sea Grant College system.

2. A resolution offering assistance to the National Ocean Policy Study Committee in the development of policy statements and long-range plans for this country's coastal, Great Lakes and deep ocean resources and urging the continued concern of the Congress and the federal government in this important task.

3. A resolution encouraging the National Science Foundation to recognize the increasing needs for coastal and estuarine vessels; urging that federal funding be made available to NSF in order to provide for coastal research vessels in the Great Lakes and coastal regions; and seeking Congressional support in the earliest possible budget year for this purpose.

4. A resolution strongly urging that the National Oceanic and Atmospheric Administration reconsider its internal budgeting so that the National Sea Grant Program budget not be reduced below the Congress' recommended allocation for fiscal year 1975.

5. A resolution calling for the Association executive committee to carefully examine and report to the membership the pros and cons of transferring the National Sea Grant Program to another administrative agency.

Articles of Organization

The Association's Articles of Organization were revised to permit more efficient operations and to change the organization's name from the Association of Sea Grant Program Institutions to the Sea Grant Association.

Association Committees

Chairmen for the following Standing Committees were appointed:

Program Committee: Dr. Bruce Mattox, Mississippi/Alabama Sea Grant Consortium

Nominating Committee: Dr. William S. Gaither, University of Delaware

Legislative Affairs Committee: Mr. Stuart O. Hale, University of Rhode Island
Dr. Louie Echols, University of Wisconsin

Following the meeting in Seattle, the President asked each voting representative to suggest individuals from his institution to serve on several special interest councils. Results of this action were not available before proceedings went to press.

Washington, D.C. Representative

Daniel F. McGillicuddy was retained for another year as the Sea Grant Association's representative in Washington, D.C. Mr. McGillicuddy can be reached through his offices at 1730 Rhode Island Avenue N.W., Washington, D.C. 20036, (202) 785-1155.

Sea Grant Association History

October 28-29, 1965--Newport, Rhode Island
First Sea Grant Conference
Plans made for campaign supporting Sea Grant legislation

October 17, 1969--Newport, Rhode Island
Second Sea Grant Conference
First Sea Grant Award presented to the late Wilbert M. Chapman, Director of Marine Resources, Ralston Purina Co.

March 5-6, 1970--Portland, Oregon
Third Sea Grant Conference. Plans for association formation discussed.

October 6, 1970--Washington, D.C.
Organizational committee meeting

November 19, 1970--Washington, D.C.
Association formed

October 12-13, 1971--Madison, Wisconsin
Fourth Sea Grant Conference
Second Sea Grant Award and first given by Association. Presented to Lauren R. Donaldson, Professor of Fisheries, University of Washington

October 10-12, 1972--Houston, Texas
Fifth Sea Grant Conference
Sea Grant Award presented to Athelstan Spilhaus, Fellow, Woodrow Wilson International Center for Scholars

October 8-10, 1973--Newark, Delaware
Sixth Sea Grant Conference
Sea Grant Award presented to Wayne H. Tody, Chief, Fisheries Division, Michigan Department of Natural Resources

October 29-31, 1974--Seattle, Washington
Seventh Sea Grant Conference
Sea Grant Award presented to John A. Knauss, Provost for Marine Affairs, University of Rhode Island

Association Presidents

1970-71 *Dr. John A. Knauss*, University of Rhode Island
1971-72 *Dr. Herbert Frolander*, Oregon State University
1972-73 *Dr. Robert Ragotzkie*, University of Wisconsin
1973-74 *Dr. Willic. S. Gaither*, University of Delaware

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