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**AUTHORIZATION OF THE NATIONAL
SEA GRANT PROGRAM**

APR 24 1978

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**JOINT HEARING
BEFORE THE
COMMITTEE ON COMMERCE,
SCIENCE, AND TRANSPORTATION
AND THE
SUBCOMMITTEE ON
EDUCATION, ARTS, AND HUMANITIES
OF THE
COMMITTEE ON HUMAN RESOURCES
UNITED STATES SENATE
NINETY-FIFTH CONGRESS**

SECOND SESSION

ON

S. 2938

TO IMPROVE THE OPERATIONS OF THE NATIONAL SEA GRANT PROGRAM, TO AUTHORIZE APPROPRIATIONS TO CARRY OUT SUCH PROGRAM FOR FISCAL YEARS 1979 AND 1980, AND FOR OTHER PURPOSES.

APRIL 7, 1978

Serial No. 95-82

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REAUTHORIZATION OF THE NATIONAL SEA GRANT PROGRAM

FRIDAY, APRIL 7, 1978

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION;
AND COMMITTEE ON HUMAN RESOURCES,
SUBCOMMITTEE ON EDUCATION, ARTS, AND HUMANITIES,
Washington, D.C.

The subcommittee met at 10:00 a.m., in room 235, Russell Senate Office Building, Hon. Claiborne Pell (chairman of the Subcommittee on Education, Arts, and Humanities) presiding.

OPENING STATEMENT BY SENATOR PELL

Senator PELL. This joint meeting of the Subcommittee on Education, Arts, and Humanities of the Senate Human Resources Committee and the Senate Committee on Commerce, Science, and Transportation is open.

We will be concerned today with the authorization of the sea grant college program.

Senator Hollings, my distinguished colleague, and chairman of the Senate National Ocean Policy Study, expects to be joining us shortly. He is tied up in another markup, and he asked me, on his behalf, to start the meeting off.

This, as I mentioned, is a joint hearing of both our committees, since we are both charged with the responsibility for the sea grant legislation. As the original author of this legislation, together with Representative Paul Rogers, of Florida, I have followed closely the development and accomplishments of the program.

As chairman of the Education, Arts, and Humanities Subcommittee, I have had both the opportunity and responsibility to conduct periodic reviews of the program and to recommend to the Senate improvements in the program and appropriate levels of authorization of funds for the program.

Today we will be conducting another such review of the sea grant college program. I would like to add that I am convinced, with my close observation of the program through the years for more than a decade now, that it is a good program playing an indispensable role in our overall national oceans program.

I am particularly aware of the sea grant program, as conducted in my own State of Rhode Island at the University of Rhode Island.

There is no question that the sea grant program has been very helpful to our own fishing industry; and that without the sea grant program, our State and local government in Rhode Island would be very seriously handicapped in coping with the environmental, energy, and coastal resources questions that have arisen with increasing frequency and urgency during the past decade.

I certainly believe that the program has been a good investment of the taxpayers' dollars—and that was the original concept behind this program: that this was supposed to be an applied research program, to take the knowledge we already have and convert it into real production and dollars for the American people.

I would add that my objective is to see that the sea grant program is not only a good one but one in which excellence is achieved.

Second, Congress has added two new dimensions to the program in recent years: a national needs program, and an international sea grant program.

Each of these new initiatives have been funded at modest levels, and each is still in the implementation stage. I will be interested in the witnesses' observations of the progress and prospects for the future in these areas of the program.

[The bill follows:]

1 SEC. 3. The National Sea Grant College Program Act
2 (as redesignated by section 2 of this Act) (33 U.S.C. 1121-
3 1131) is amended—

4 (1) by amending section 204 (d) —

5 (A) by striking out “and” at the end of para-
6 graph (5),

7 (B) by redesignating paragraph (6) as para-
8 graph (7), and

9 (C) by inserting immediately after paragraph
10 (5) the following new paragraph:

11 “(6) accept funds from other Federal departments,
12 agencies (including agencies within the Administration),
13 and instrumentalities to pay for grants made, and con-
14 tracts entered into, by the Secretary under section 25
15 (a); and”;

16 (2) by striking out the period at the end of the last
17 sentence of section 205 (a) and inserting in lieu thereof
18 the following: “; except that this limitation shall not
19 apply in the case of grants or contracts paid for with
20 funds accepted by the Secretary under section 204 (d)
21 (6).”;

22 (3) by amending the first sentence of section 26
23 (c) to read as follows:

24 “There are authorized to be appropriated for purposes of
25 carrying this section not to exceed the following amounts:

1 “(1) \$5,000,000 for each of fiscal years 1977,
2 1978, and 1979.

3 “(2) \$7,000,000 for fiscal year 1980.”;

4 (4) by amending section 211—

5 (A) by striking out “ANNUAL” in the section
6 heading and inserting in lieu thereof “BIENNIAL”;

7 (B) by amending subsection (a) to read as
8 follows:

9 “(a) BIENNIAL REPORT.—The Secretary shall submit
10 to the Congress and the President, not later than February
11 15, 1980, and not later than February 15 of every even-
12 numbered year thereafter, a report on the activities of, and
13 the outlook for, the national sea grant program.”; and

14 (C) by amending the last sentence of subsec-
15 tion (b) to read as follows: “Such material shall be
16 submitted to the Secretary not later than Febru-
17 ary 1 of the year in which the report concerned is
18 to be submitted under subsection (a), and the
19 Secretary shall cause it to be published as a separate
20 section in such report.”; and

21 (5) by amending the first sentence in section 212
22 to read as follows:

23 “There are authorized to be appropriated for purposes of
24 carrying out the provisions of this title (other than section
25 206) not to exceed the following amounts:

1 “(1) \$50,000,000 for each of fiscal years 1977 and
2 1978.

3 “(2) \$55,000,000 for each of fiscal years 1979 and
4 1980.”.

5 SEC. 4. Section 3 of the Sea Grant Program Improve-
6 ment Act of 1976 (33 U.S.C. 1124a) is amended by amend-
7 ing the first sentence of subsection (c) to read as follows:

8 “There are authorized to be appropriated for purposes of
9 carrying out this section not to exceed the following amounts:

10 “(1) \$3,000,000 for each of fiscal years 1977, 1978,
11 and 1979.

12 “(2) \$5,000,000 for fiscal year 1980.”.

Senator PELL. Our first witness is Dr. Ostenso, who is now running the program and who succeeded Dr. Abel who ran the program for the first decade.

I wish Dr. Ostenso success, and may he do as well in the second decade of the program.

STATEMENT OF DR. NED A. OSTENSO, DIRECTOR, NATIONAL SEA GRANT PROGRAM, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, DEPARTMENT OF COMMERCE

Dr. OSTENSO. Thank you, Senator Pell.

Indeed I do have a very tough act to follow, following Bob Abel.

I am pleased to appear before you today, Mr. Chairman. As you know, this is my first appearance before these two committees, and these are the first Senate hearings we've had since the Sea Grant Improvement Act of 1976. This is also the first sea grant appearance before these committees in 2 years.

I have taken the liberty of preparing detailed formal testimony that I would like to submit for the record, and I will summarize it in my oral testimony.

Senator PELL. It will be inserted in full in the record.

Dr. OSTENSO. Thank you, sir.

I would like to do the following today:

First, to give you an overview of my philosophy of the sea grant program as the program achieves maturation.

Second, to discuss some of the accomplishments that have been achieved over the past 2 years.

Third, to give you some vignettes of specific programmatic accomplishments in various generic groups.

Fourth, to give you a brief report on the initiatives in education and advisory service that came about as a result of the 1977 appropriation legislation.

And, finally, to discuss briefly the new programs established by the 1976 act. I intend to be brief, in order to leave myself open for questions.

As the sea grant program enters its 12th year, there are pressures from within our office to make sea grant become something more than it has been. The sea grant program has been a central focus for capability development in our academic institutions. As we look to change, I think there are essential qualities of the sea grant program that we have to be very careful to preserve, and I would like to summarize what I feel these qualities are.

First, the sea grant program represents—I believe it is unique in this—the capability for linking the Federal Government to an institution, and in turn encouraging the institution to involve industry, State and local government, and the population at large in its activities.

The essential element is the linking of relationships. First, there is agency-to-institution linkage. The normal method of research funding from the Federal Government is from an agency to an individual, with the agency dealing with the principal investigator. Since World War II, this process has been instrumental in changing our universities from holistic educational intellectual institutions, to holding corporations for a large group of individual entrepreneurs who develop direct relationships with the various Federal funding agencies. The loyalties of academic investigators are split; they have to jump through separate hoops to get the resources they need.

One of the strengths of the sea grant program is that it does tend to bring universities back together. I believe that sea grant is the only Federal source of funding to universities that does this.

Senator STEVENS. How many universities now are designated as sea-grant colleges?

Dr. OSTENSO. There are 12.

Senator STEVENS. What are they?

Dr. OSTENSO. Four have been designated since our last Senate hearings, 2 years ago. They are the University of Delaware, North Carolina, the State system of Florida, and Massachusetts Institute of Technology.

Senator STEVENS. What were the original eight?

Dr. OSTENSO. The University of Hawaii, the University of Washington, Oregon State University, the University of California, the University of Wisconsin, the University of Rhode Island, Texas A. & M. University, and the State University of New York/Cornell University.

Senator STEVENS. I have not heard that magic word, yet.

Dr. OSTENSO. Alaska is one of our strongest institutional programs.

Senator STEVENS. It does not get designated as a college?

Dr. OSTENSO. Not yet. It is on its way.

Senator STEVENS. What has to be done for that to be accomplished? I'm a little provincial. Of course we do have half the ocean that is

the sea coast of the United States, and 70 percent of the Outer Continental Shelf. I think we ought to be designated as a sea grant college.

Dr. OSTENSO. By way of answering your question, Senator, I would like to discuss the difference between the land grant college system, and the sea grant college system.

The land grant system is campus oriented. Michigan State is, the University of Michigan isn't, for instance. Land grant colleges were established by legislative fiat and were thus instantly in place.

Sea grant college status was conceived as being an achieved designation. There is a hierarchy of steps to achievement of sea grant college status. A university program usually begins as an individual project, evolves into a coherent area program and then an institutional program. Once an institutional program is proficient in education, research, and advisory service has demonstrated this proficiency for a minimum of 3 years, it is then eligible for designation as a "sea grant college" by the Secretary of Commerce.

Senator STEVENS. How far along is the University of Alaska toward reaching that objective?

Dr. OSTENSO. It is coming along very nicely. It is a strong program, although Alaska got a late start. We look forward to their becoming a sea grant college in the normal course of events.

Senator STEVENS. My memory was that there was some legislation that designated some universities. Wasn't Michigan designated by an act of Congress?

Dr. OSTENSO. No; in fact, Michigan was one of the sea grant institutions that was retrograded. It has now picked up steam again and is back on track with a very strong program.

Senator STEVENS. They have an oceans program, not a sea grant designation?

Dr. OSTENSO. No.

Senator STEVENS. What is the difference, in terms of funding?

Dr. OSTENSO. The funding has no direct relationship to the hierarchy of achievement. In part, the amount of funding is a function of the capacity of the State to utilize sea grant funding effectively.

For example, the University of Wisconsin, which was one of the early sea grant colleges now operates at the \$1.4 million level. It is probably fully developed for that State. The University of California, is a larger program. It is a larger State with a larger gene pool to work with and a larger coastline.

The funding at the University of Alaska right now. I'm not sure I have that data with me, but there isn't a direct relationship between funding and designation. A very general rule-of-thumb is that a university is not designated as a sea grant college until it is at least up to the million-dollar level.

Senator STEVENS. But is it a zero-budgeting concept for all others in the sea grant colleges? Is there an implied formula for designation for sea grant colleges?

Dr. OSTENSO. No. The sea grant college achieved that designation by a demonstrated capability. So, in the sense that they have developed a demonstrated capability, they have a competitive advantage for funding.

Senator STEVENS. Could you give us the funding? We are dealing with a review here. Could you give funding levels for a period of years for the various designations—the colleges, and those that have been designated, say, for the 2 to 3 years?

Dr. OSTENSO. I could submit that for the record, if you like, sir.

[The following information was subsequently received for the record:]

The following table indicates the level of funding for each type of program for the last 3 fiscal years:

	Fiscal year—		
	1977	1976	1975
Sea Grant Colleges:			
Texas A. & M. University	1,376,700	1,360,000	1,353,250
Oregon State University	1,568,400	1,550,000	1,550,000
University of Washington	1,801,300	1,553,000	1,422,800
University of Rhode Island	1,310,000	1,130,000	1,102,000
University of Hawaii	1,362,400	1,388,600	1,333,700
University of Wisconsin	1,400,000	1,131,300	1,159,700
University of California	2,380,000	1,850,000	1,661,200
State University of New York	1,496,100	1,102,700	1,053,198
University of Delaware	770,000	771,200	658,000
SUS/Florida	1,180,400	995,200	900,000
University of North Carolina	431,000	835,000	535,000
Massachusetts Institute of Technology	1,115,000	998,600	719,400
Institutional programs:			
University of Georgia	630,000	583,000	506,900
University of Maine/New Hampshire	1,036,400	875,000	1,500,000
University of Southern California	550,000	435,500	327,300
University of Alaska	783,200	559,100	485,500
Louisiana State University	840,000	700,000	575,000
Coherent area programs:			
University of Michigan	721,000	464,800	750,000
University of Maryland	447,400	475,000	485,000
Mississippi/Alabama	500,000	495,000	429,200
Marine Research Center—South Carolina	419,500	360,000	495,000
Virginia Institute of Marine Science	508,400	405,000	370,700
University of Miami	291,200	335,700	374,000
Woods Hole Oceanographic Institute	425,000	425,000	516,200
University of Minnesota	107,500	464,600	431,700
New Jersey Marine Science Consortium	299,200	220,100	43,200
University of Guam	53,700	125,000	75,000

¹ Maine.

² New Hampshire.

³ Institution.

⁴ Project.

Senator STEVENS. Has the University of Alaska applied for a designation as a sea grant college?

Dr. OSTENSO. It is on the way to such designation. It is in an institutional status now, and has been in an institutional status.

Senator STEVENS. Could you give us your name for the record, please?

Dr. OSTENSO. This is Mr. David Duane, the program monitor in the Office of Sea Grant for the Alaska program.

Mr. DUANE. The current level of funding for Alaska is just slightly less than \$1 million from the national office, Senator. Alaska is in its second year at the institutional level. They are in the process of putting together their program proposal for presentation to us. That will take place in June, and it will represent their third year in institutional status.

The funding of the University of Alaska program over the past 3 years has increased markedly, demonstrating the perception of our office that they are doing well in all aspects of the sea grant concept—research, education, and advisory service.

The present level of funding, as I said, is slightly under \$1 million. Three years ago, Alaska was at approximately a half million dollars.

Senator STEVENS. Just one more question, if I may, Mr. Chairman.

What is the orientation of sea grant toward fisheries and the commercial side of fisheries? Let me preface that by saying I took a trip over to look at fisheries training schools in Portugal, and I went to Russia and looked at their fishery schools, and they have the equivalent of our Naval Academy for people who are going into commercial fishing.

It seems to me that we have a complete lack of that kind of training. They deal with the dynamics of various types of gear, and what effect that has on a vessel of one type of propulsion or another in terms of turning radius and total handling techniques of operation of a vessel while it is towing gear, and the effects of wind and sea conditions on discharging of cargo at sea. I was really deeply impressed with the scientific approach and their total use of technology in connection with their fisheries education programs.

Do we have any of that going on, yet, in the sea grant orientation toward the needs of the basic U.S. fisheries industry?

Dr. OSTENSO. We have significant program support in support of fisheries—all aspects of it—including basic biology, economics, fishery gear technology, and so forth. We also have an extensive educational program. In fact, that was one of the things you asked us to pay special attention to 2 years ago, and we did.

We increased the size of our educational program significantly. Our educational program has many facets, including technology training for fishermen, fishery gear handling and maintenance, diesel engine repair, et cetera, all the way up to advanced studies of biology.

One of the newest and most interesting programs we have is at the University of Rhode Island which is training the observers who will go out and monitor foreign fishing catches.

Because we are a State-oriented program, the nature of the educational effort very much takes on the complexion of the individual States and their own needs. The Office of Sea Grant is not positioned, institutionally, to set up a National Academy for Fisheries Training.

Senator STEVENS. Well, I realize that, but I wonder if there isn't some way we could meet a void by programs similar to the Western Institute of Higher Education, combination of State efforts to meet some of the needs of the smaller States in the West. And as a consequence, if we just take medicine, for instance, if a student is seeking a medical career, they might spend a year at Idaho, a year at the University of Alaska, and a year at the University of Washington, and end up by doing your internship in Portland.

Now I wonder if it isn't possible for us to use the sea grant concept to, in effect, work together, make some of these universities work together to meet these needs?

You know, I am familiar with the observer program at Rhode Island, but I don't know of any place where we have the training that is necessary for students to obtain the equivalent of a degree from the

Merchant Marine Academy, or from the Coast Guard Academy. The vessels that are operating off our shores now are up to 360-footers, and they are manned by the merchant marine, who have no experience in fisheries.

They are getting capable officers to run the vessels, but they are not getting capable fishermen. And that is the difference, in terms of the training that is available in the Soviet Union, in Portugal, in Germany, and in the areas where our fishermen are competing.

I certainly know I speak for the members of the Commerce Committee, and Senator Magnuson, and Senator Hollings, when I say I would welcome the opportunity to work with you to put together either the legal framework or the financial assistance that would be necessary to tie together some schools so that a person who really wants a career as a fisherman on one of these larger vessels, these bottom fisheries vessels in particular, could obtain the necessary education and could go out into the world knowing that he had the best technology as far as his training is concerned.

Senator PELL. I would interrupt here to say that we have, at URI, not in the sea grant program but in another program started originally by Congressman Fogarty, a 2-year course where they give an associate degree in fishing techniques. That could be combined with what you are talking about, with more experience on large vessels. Their training is mainly for inshore vessels and small vessels.

Senator STEVENS. Well, when the Russian student comes through, he ends up with the equivalent of a naval commission.

Dr. OSTENSO. Right.

Senator STEVENS. He is commissioned to operate on a trawler or another ship and, really, believe me, the level of their training far exceeds ours, and the Portuguese, too.

Dr. OSTENSO. We do fund two efforts that relate to what you're talking about, Senator. One is an effort to develop a central fisheries curriculum for the industry, which is in the advanced stage of development. We haven't gotten to the point of determining whether or not this is a curriculum that can be taught at a number of institutions or whether it should be a curriculum that, as you mentioned earlier, would allow the students to move from institution to institution.

Also, we have a joint program with MIT and the Massachusetts Maritime Academy that is training fishermen as boat handlers.

It is hard to make an analogy with the Soviet Union, which has a large state-controlled fisheries enterprise and an academy career that fishermen can go through, and our highly decentralized fishing community. I think this is something we will look at.

Senator STEVENS. Well, I agree, and that is why I went to see the Portuguese, too. They have a very fine educational system and are training people for service in the fisheries fleets of the world. They are very much a multinational institution.

I do think that we have still got a void.

Again, half the coastline of the United States is off my State—and more than half the fisheries' potential is off my State—we don't have any of this kind of support, that I know of.

A young Alaskan that wants training in fisheries must, in effect, come to the east coast to get it, and there are not many of them that can afford to do it.

Dr. OSTENSO. I agree with you, Senator, and this is one part of a larger matrix of extended jurisdiction and the implications that have come with it, which hopefully involve a revitalized fishing industry in the United States.

We are very sensitive to the new opportunities that have come as a result of extended jurisdiction, and particularly the new opportunities for the sea grant program because we are in a unique position to do many of these things.

Senator STEVENS. Well, under your existing authority, can you fund a university, such as the University of Alaska, to assist in the cost of establishing a curriculum for fisheries education?

Dr. OSTENSO. Yes; we can do that.

Where we have traditionally drawn the line is in supporting classroom education in perpetuity. That is the State's responsibility. But we are extensively involved in curriculum development, and we are doing that specifically in fisheries in a number of places.

Senator STEVENS. Thank you very much, Mr. Chairman.

Thank you, Mr. Ostenso.

Dr. OSTENSO. And, specifically, in Alaska—would you like to elaborate on that?

Mr. DUANE. If I can address the question you raised with respect to your university system.

Two years ago sea grant initiated a program to support the development of a fisheries curriculum at the university, and the program was organized with fresh water fisheries activities centered at the Fairbanks campus and the saltwater and marine fisheries centered on the Juneau campus, with some technology aspects entered at the Kodiak Community College.

Prior to that developmental program we had supported technology programs at the Kodiak Community College, and we still support the curriculum development at Juneau. They are adding staff, and as the State and the university are able to cycle into the normal budget sequence, the State is picking up and maintaining the support of these people while we assist in the addition of new staff and new course development, principally now in fisheries biology, not necessarily gear handling.

Senator STEVENS. It is very embryonic, as far as education for a career in fisheries, as I understand it.

Mr. DUANE. I would say that is correct, sir.

Senator STEVENS. Thank you, Mr. Chairman.

Senator PELL. Thank you.

I would like to place in the hearing record a report by Dr. Rorholm, director of the sea grant program at the University of Rhode Island on the direct cost-benefit ratio of two projects they have conducted.

One project, conducted by the URI sea grant program, started with about \$2,500 in introducing new fishing techniques. The project realized a direct benefit of \$50,000, and the potential benefit, just for our own Rhode Island fishery, is \$176,000, indicating a benefit-cost ratio of better than 70 to 1.

In another project, URI sea grant developed an electrotrawler for harvesting offshore lobsters, and that system produced a 50-percent in-

crease in the catch per unit of effort, and the benefit-cost ratio for Federal expenditure through sea grant is estimated at nearly 40 to 1.

This is the kind of project that we had in mind when we originally drew up sea grant. It was to take the knowledge that we had and apply it and use it with a vast return in dollars, in this case, or in increased nutrients, whichever way you wanted to look at it, for our people.

And I would put these two in the record, and would hope that the sea grant would concentrate very much on this kind of program.

[The material referred to follows:]

URI SEA-GRANT BENEFIT ANALYSIS

REALIZED AND POTENTIAL BENEFITS FROM INTRODUCTION OF TWO-BOAT PELAGIC TRAWL

Introduction

During a time in the fall of the year, the Sea Herring (George's Bank stock) moves inshore where it can be taken by bottom gear. In early winter, however, it moves somewhat away from shore and into midwater (particularly the larger fish). That is at a time when the herring commands a good price, and when there is slack capacity in the processing plants. Some of this fishery takes place inside and some outside the three-mile limit. There is some questions, at this time, whether fish caught inside the three-mile limit is subject to the quota which has recently been put on the sea herring.

Gear demonstration and immediate benefits

Working with the Point Judith Fisherman's Cooperative, the URI Sea Grant Marine Advisory Service arranged, in February of 1972, to bring an expert in the handling of the two-boat pelagic trawl from Ireland to Point Judith (see drawing) in order to teach fishermen how to use this gear. Representatives from other New England states were invited also. Two boats at Point Judith immediately adopted the gear and, at season's end, 2.5 million pounds of herring had been landed, which would not otherwise been caught by U.S. fishermen. This represents an additional value landed of \$50,000. The cost to the Sea Grant Program was approximately \$2,500. Thus, the initial investment in this effort has been paid off many times already.

Longer run estimated benefits

In the longer run, the fact that there is a quota on the fishery means that one cannot realistically count the catch as an addition, since presumably the quota will be reached in any event. Under those circumstances, one must measure the benefits as cost reductions instead.

The table, below, indicates comparative cost distributions between a typical bottom trawl and the midwater, two-boat pelagic trawl in question:

RETURNS AND PERCENTAGE DISTRIBUTION OF COSTS FOR 2 KINDS OF FISHING GEAR, POINT JUDITH, R.I.

	Otter trawl percent	2-boat pelagic per vessel percent	Difference
Gross stock (return).....	100	100	
Trip expenses.....	11	7	-4
Labor (plus captain).....	57	59	+2
Boat cost.....	23	21	-2
Interest plus profit.....	9	13	+4

Source: Dr. Andreas Holmsen, Department of Resource Economics.

It will be seen that in the case of the pelagic trawl there is a 6 percent (of gross stock) increase in the personal income component of the cost distribution (labor, interest and profit).

Thus, one might ask what would it mean if the quota for this area (4,000 metric tons) were caught with this gear. The calculations are indicated below:

Value of catch (8,800,000 lb at \$0.02)-----	\$176,000
Increase in personal income (6 percent)-----	10,560
	<hr/>
Present value (6 percent discount)-----	176,000
Cost of innovation (Demonstration)-----	2,500
	<hr/>
Net benefit-----	173,500
	<hr/>
Benefit/cost ratio-----	70.4

These potential net benefits exceed the total Marine Advisory Service budget for FY 72 by 29 percent.

The analysis has assumed that the pelagic trawl will be used only in the immediate area. Were it to be used in the Gulf of Maine fishery, where there is a quota of 21,000 metric tons, much higher benefits would accrue. Fishermen in that area have indicated an interest in trying the gear in their next season. Our people are working with personnel of the Maine Department of Sea and Shore Fisheries to bring that about.

There are two additional benefits from the present use of the gear that have not been accounted for:

1. The processing is done in Gloucester, Mass., during a season when the processor would otherwise have problems keeping his plant going for lack of fish.
2. The herring is exported from Gloucester with a resulting improvement of our balance of payments.

It should be mentioned that the only alternative to the two-boat pelagic trawl for catching herring with towed gear is the Wing Trawl, which was also introduced to the fishery by the U.R.I. Program in cooperation with Point Judith fishermen in 1969.

The use of this gear is now so widespread that it would take a fairly thorough study to measure benefits from it. It is now used from Maine to North Carolina on herring, sea trout, striped bass, scup and some other species. Twenty-five such trawls have been sold by a Boston firm, and numerous fishermen have built their own.

THE POTENTIAL RETURN TO URI SEA GRANT RESEARCH-DEVELOPMENT OF AN ELECTRO-TRAWL FOR THE HARVESTING OF OFF-SHORE LOBSTER

This analysis is limited to Rhode Island landings of off-shore lobster caught by trawl. This is but a small part of the total landings, but this limited analysis serves to illustrate the point that it requires a very small increase in catch, or reduction in towing time for a given catch, to return to the fisherman the equivalent of the cost of the gear.

Although the researchers, based on the experiments and subsequent statistical analysis, estimate that in practice the increase in catch per unit of effort may be as high as 50 percent, a conservative 15 percent is assumed for this analysis.

The cost of the extra gear is approximately \$3,000; annual operating expense is estimated at \$650. Both depreciation and operating expense are functions of use rather than of time.

Costs:

Investment \$3,000 life 2 years=\$1,500 annual depreciation for each of 35 vessels-----	\$52,500
Operating cost at \$650 per vessel (35)-----	22,750
	<hr/>
Total, annual cost for fleet landing in Rhode Island-----	75,250
Present value at 6-percent discount rate-----	1,254,166
Benefits at 15-percent increase in catch per unit effort:	
Value of catch (\$3,038,646+15 percent)-----	3,494,442
Increase-----	455,796
Present value at 6-percent discount rate-----	7,596,600
Net benefit (\$7,596,600-\$1,254,166)-----	6,342,434

Cost of research:	
Federal -----	\$160,000
Total -----	300,000
Net benefit above Federal research expenditures -----	5,882,434
Net benefit above total research expenditures -----	<u>5,742,434</u>

Benefit/cost ratio:	
Federal cost -----	39.6
Total cost -----	13.8

Break-even point for fishermen=2.1 percent increase in catch.

Break-even point for total research cost=5.1 percent increase in catch for Rhode Island.

The potential of the trawl is presently being tested on shrimp in the Gulf of Maine.

Commercial vessels in Point Judith are presently getting ready to try out the trawl on off-shore stocks.

Senator PELL. Now, I had a couple of specific questions, and we do have some more witnesses to hear from, but Dr. Ostenso is the lead witness here.

How do you feel about the authorizations for the national needs program for 1979 and 1980?

What do you think those authorization levels should be?

Dr. OSTENSO. Well, before I answer your question, to finish up on Senator Stevens' inquiry, I should conclude by pointing out that approximately 40 percent of the total sea grant program is devoted to the various aspects of fisheries.

We think that this provides a reasonable balance in our overall program.

The initiatives we are going forward with in the future will strengthen both our aquaculture effort and our fisheries management program. These are two of the principal initiatives we plan for the future.

In answer to your question, with regard to the authorizations for the national projects, Senator Pell, we are still on the learning curve in this area. We feel very strongly that this is a strong management tool provided to the Office of Sea Grant.

Senator PELL. In connection with the international program, it has been suggested that the present law is too restrictive in limiting it just to developing nations.

What would be your view in this regard?

Dr. OSTENSO. I have two areas of concern.

First, I believe very strongly that the rationale for the international program in sea grant is to develop oceanographic capability in less developed countries, coastal nations. Irrespective of what happens with the law of the sea negotiations, it is clear that there will be widespread support for a consent regime for research in coastal waters out to 200 miles. Over 40 nations have thus far established such a regime.

A necessary element for getting permission to do research in these waters will be a willingness to cooperate in research and to give access to the data to the coastal nations in whose waters access for research is sought.

In fact, most of the coastal nations in whose waters we want to work do not have the capability to interpret scientific data adequately,

and institutionally, the sea grant program is uniquely structured to develop this kind of capability.

So I think there is a need, a responsibility, that the Office of Sea Grant can fulfill with its international program.

With regard to the restrictiveness of the language as it now exists, and with specific reference to the trade list, we do have some problems.

First, the criteria that establishes that list of countries on the trade list is not necessarily the same list that we would use in wanting to get scientific research access to coastal waters. The list was not made up with this purpose of scientific research access in mind.

Second, much of the capability development that we can provide to coastal nations can be done through existing international institutional arrangements and cooperative arrangements between countries, some of which involve developed countries as well as less developed countries. It would be difficult, as the law is presently written, to work with two classes of citizenship in such cooperative arrangements. Thus, opportunities to achieve desired capability development might well be lost, due to the current language in the act.

Third, I am concerned about the sea grant international program resembling an aid, give-away-type effort, and this does not argue for the viability of the international program, either within the executive or the legislative branch.

So I think I would prefer the management flexibility, bearing in mind that I fully support what the purpose of the international program should be, that a change in the current language of the act would allow.

Senator PELL. In connection with international sea grant, I would be interested to know if you have had any discussions or any thoughts with regard to the Azores in regard to a program there.

Dr. OSTENSO. The Azores are an interesting place to work from. There is a long heritage of cooperation between the Azores and the University of Rhode Island, as you know.

The regulations that cover international program funding will be in effect this Tuesday, April 11. We had an original screening of preliminary proposals for international program funding that we looked at with the State Department and other Federal agencies involved in foreign affairs, such as AID. We went back with a priority rating on those preliminary proposals, and the final proposals are yet to come in.

At this time, we have not received a proposal to deal directly with the Azores, but I understand one is in the mill.

Senator PELL. I hope you will look at it sympathetically when it comes.

Some directors of sea grant programs at universities have become increasingly concerned with financing the ship operations and paying for ship time.

I realize the original legislation was in great part silent on this subject, and I wonder what your own thoughts are, and I wonder whether we ought to broaden the legislation to increase funds for ship operations.

Dr. OSTENSO. I feel very strongly in the affirmative on that. With extended jurisdiction, especially now with the increased sensitivity to

pollution, I think it is imperative that the sea grant program go to sea.

The 1976 authorization does explicitly permit us to contribute to the support of the ships that we use. I think this is a healthy thing. Unfortunately, this came at a fairly austere budgeting time for us, but our intention is to provide ship support.

Senator PELL. Doesn't that only cover those ships leased but not ships that are owned by the institutions?

Dr. OSTENSO. We contribute to the support of the ship, according to our usage of it, and most universities have a daily rate worked out.

Senator PELL. But is there any difference in your treatment of allotting funds as to whether the vessel is owned by the university or leased by the university?

Dr. OSTENSO. The answer to that, I believe, is no.

It is a bit confusing, because most university ships are leased. They are bailed to the university by either NSF or the Navy. A few of the universities actually hold title to the ships. And I feel that it is the merit of the research, not the ownership of the vessel, that is germane to funding support.

Senator PELL. That is good. So you would agree with us that there should be movement in this direction?

Dr. OSTENSO. Absolutely.

Senator PELL. Good.

We have some more questions that we would like answered for the record, and I'm not sure but what Senator Hollings may have some, too.

Senator PELL. Is there any further statement you would like to make?

Dr. OSTENSO. No. It is a pleasure to be here, and I think the national sea grant program is going to become the centerpiece of the national marine effort. We have the legislation, the people and the will to do it.

Senator PELL. Well, I'm glad we share that view. I know when we designed the Sea Grant College Act I thought that it should be the lead agency for the development and exploitation, in the proper sense of the word, of ocean space. It has not, for one reason or another, grown to the extent we would like it to have grown. I would hope that in the second decade, that in one way or another, we could persuade the Bureau of the Budget that there is no better cost-benefit arm of the Government than the sea grant program.

And I think the more we can emphasize the cost-benefit ratios, the better you will fare in the administration requests and before the bar of public opinion.

You have a wonderful record, better than any other arm of the Government, and a very direct parallel with the Land Grant College Act upon which we modeled this legislation.

Senator STEVENS. Mr. Chairman, I agree with you, but I think that more and more we have been forced to go to the Department of Agriculture to get the support we need for the farmers of the sea, for the fishermen. And I really think, if you are going to have the constituency you need in the next decade, you're going to have to redirect this program somehow so that it has some balance between high-level, international technological research and ecological concerns in the oceans,

and the constituency here at home that is presently starving for assistance to meet the demands of modern technology as applied to the fisheries area.

We are constantly falling behind in the fisheries production efforts of this country, and yet we have a tremendous protein reserve, and we have the capability and the dedication to sustain new production from our ocean fisheries.

I really urge you to consider upgrading the impact of the sea grant program on fisheries, per se, because that is where the constituency really is that will ultimately bring additional people to this table and additional interest to the Congress as a whole in the sea grant program.

I don't belittle your efforts at all. I congratulate you. I think it is a fantastic program, and you have got things going now, I think, even better than they were before. It is a program that politics has never been involved in, to my knowledge, and it is one that those of us who have been interested in have wished we could push it on and expand it further, and I think that that expansion will come about when the constituency that is involved realizes that the sea grant program has a great deal more to offer the farmers of the sea than it has in the past.

Dr. OSTENSO. I agree with you. And as I mentioned earlier, those are initiatives for the future—fisheries management and aquaculture.

In terms of aquaculture, I feel that the relatively small sea grant program does have a principal, and clearly the most visible, program in aquaculture, and I would like to refer you to the editorial of Sea Technology magazine last month in which sea grant was cited for what it has done in aquaculture in such a short period of time.

I feel that sea grant should continue to strive for excellence and should not rest on its past performance.

Senator PELL. I think we are both saying the same thing, and that is, focus on those programs where you get the maximum cost-benefit ratio, and if in the international program—the same thing would apply there. In the Azores, for example, if you could find some way of increasing their return to 40 to 1 or 30 to 1, that is what this small amount of money—to my mind, too small—is designed for. And I think both committees, the authorizing committees of Congress, have that very much in their mind, not only when we authorize, when we created the legislation, but right now, today.

Thank you, Dr. Ostenso.

Dr. OSTENSO. I think we are of a common mind on that, Senator.

Thank you.

[The statement follows:]

STATEMENT OF DR. NED A. OSTENSO, DIRECTOR, NATIONAL SEA GRANT PROGRAM,
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, U.S. DEPARTMENT OF
COMMERCE

Mr. Chairman and Members of the Committee and Subcommittee, I am pleased to be here today and make my first appearance before you since I was named Director of the National Sea Grant Program in January 1977. My presentation today also marks the first time in two years that representatives from Sea Grant have appeared before your committees and the first time a representative of Sea Grant has testified before you since the enactment of the Sea Grant Program Improvement Act of 1976. As you might imagine, a great deal has taken place in that time, and I am glad to have the chance to bring you up to date on our activities.

As you know, Sea Grant was created by Congress in 1966 to bring greater focus upon both the oceans and the potential that they represent for Americans and for all mankind. In its formative years, Sea Grant's priorities were established primarily to avoid duplication and inconsistency. The goal for the program's first 10 years of existence was to establish a national system of institutions that was responsive primarily to local and regional needs and opportunities. At the same time, considerable emphasis was placed on making certain that a fairly balanced national program of research, education and training, and marine advisory services was achieved.

From its meager beginning, Sea Grant has grown, with the aid of both the philosophical and the financial support of Congress, into a program that in the past fiscal year supported nearly 700 projects at more than 125 colleges, universities, and laboratories across the United States. Much of this activity, of course, centers on local and regional problems, which was the original Congressional intent when the 1966 Sea Grant Act was passed. Because of that focus, wide diversity of effort has been a part and parcel of our program, with studies ranging from aquaculture to coastal engineering, with extensive differences from one geographical area to another. While pursuing research, the program also has developed a growing education program designed to teach youngsters from kindergarten through high school, as well as undergraduates and graduate students in college, a greater appreciation of the marine environment. Sea Grant also has a growing marine advisory service program, which is helping greatly in bringing the problems of coastal and other communities to Sea Grants researchers on the campuses and bringing the results of that research to the citizens of the coastal and other communities.

As modified by Congress in 1976, the goals of Sea Grant have been expanded to bring more attention to national projects, international cooperation assistance, and to student fellowships. These new efforts are seen as extensions of the program, however, not as redirection; therefore primary emphasis will continue to be on programs emanating from the hustings.

I mentioned that considerable emphasis necessarily had been placed during Sea Grant's early years on the development of our Sea Grant institutions. We now have 12 Sea Grant Colleges which, as you know, is a status given to an institution in recognition of a well-integrated program of marine research, education and training, and marine advisory services that is sustained over a period of several years. Since Sea Grant representatives last appeared before your committee, we have named four Sea Grant Colleges—the Universities of Delaware and North Carolina, the State University System of Florida, and the Massachusetts Institute of Technology. We look upon this growth as being quite significant. It is a tribute to the individual colleges and universities for in order to achieve the distinction of Sea Grant College status, Sea Grant first must have won acceptance as a part of the institution itself. It is because of the high caliber of our researchers and scientists and the dedicated leadership of our Sea Grant Directors in the field that such great progress has been made toward the achievement of our ultimate goal of 24 or 25 Sea Grant Colleges.

In the development of this university-agency relationship in Sea Grant, we have been able to instill a link between the Federal Government and local institutions that has permitted greater cooperation between the institutions and industry, the institutions and state and other agencies, and, more importantly, between the institutions and the people of the United States. We feel such a Federal-State linkage is critical to a continuing and comprehensive Sea Grant Program and we are pleased to have had such success in developing that relationship.

The Sea Grant Program has developed a significant degree of flexibility by not allowing itself to be encumbered with strict and rigid guidelines and priorities.

Sea Grant has had its share of accomplishments. I have already mentioned the elevation of four of our institutions to Sea Grant College status, subsequently to our last senate authorization hearings. Other Sea Grant institutions have also seen their Sea Grant program status advance. As you know, Sea Grant provides three categories of institutional support. An institution with one project or with loosely-related projects has "project status." When an institution's program becomes more developed and has several projects in two of the three elements of Sea Grant (i.e., research, education and training, and marine advisory services) that represents a coordinated program effort which is designated a "coherent area program." When the institution has a coordinated program effort and

includes in its program all three Sea Grant elements, it is given "institutional program" status. An institutional program must operate effectively and successfully for at least three years to qualify for Sea Grant College designation. Several Sea Grant institutions have advanced their status since our last appearance here, and this indicates how much the Sea Grant Program has been maturing.

These developments and achievements have been accompanied by a number of other accomplishments that we think are highly significant results of Sea Grant research. For example:

Recently, Sea Grant researcher Dr. Martin J. Nemiroff determined that a cold water drowning victim stands a much better chance of survival than a warm water drowning victim. The University of Michigan physician made his findings public in the late fall of 1977 and, already, there is considerable evidence that a great many lives are being saved as a direct result of his research. At least one of the victims treated by Dr. Nemiroff had been submersed for 38 minutes and recovered without brain damage. Another for 15 minutes. Another for at least 10. The Commander of the Second Coast Guard District in St. Louis has reported that, partly as a result of Dr. Nemiroff's work, boating fatalities in that area were reduced last year by 25 percent, which means that 60 lives were saved.

Recent research at a number of Sea Grant institutions has demonstrated that the marine environment is a rich source of unique biochemicals that have been largely unexploited in medicine and agriculture. The antimicrobial, insecticidal, and pharmacological nature of pure substances and extracts from a variety of marine plants and animals shows that the novel chemical structures associated with biological effects have potential in the treatment of heart disease, cancer, microbial diseases and infections, and in the medical manipulation of the central nervous system. Also, these new chemical structures certainly will serve as models for scientists who develop synthetic drugs—in the same fashion that substances from land organisms have been the major source, either naturally or in synthetic modification, of drugs currently used in medicine. The sea will play an increasingly important role in drug development because a major share of chemical inspiration from land organisms has already been exploited and because biochemical knowledge at the molecular level is still too sketchily understood to allow chemical design of drugs from scratch.

Already Sea Grant researchers have screened marine extracts for ability to inhibit growth of malignant cells in test animals and several are being completely evaluated by the National Cancer Institute. Other substances have been shown to increase the strength of heart beat, to have antiviral properties, to inhibit cell division without toxicity, or to prolong greatly the effects of pentobarbital which is an important anesthetic and sedative. Prolonging the effects could allow smaller doses and lessen chance of drug dependence. Antiviral properties are particularly significant because currently there are only five drugs useful in treating viral diseases. Other natural marine substances recently isolated and identified have been demonstrated just as toxic against certain insects as DDT. It appears that the chemistry of these substances can be exploited in developing biodegradable insecticides.

A Sea Grant scientist at the University of South Florida, Dr. David Hessinger, is studying the toxins contained in the venom of the Portuguese Man-of-War, a jellyfish that has an excruciatingly painful sting which under some circumstances, can be fatal. His work holds great hope for lifeguards, divers, fishermen (and others whose occupations might cause them to work in waters where these organisms might be present), tourists, beachgoers, and individuals who might have a high sensitivity to a sting.

In another area, University of South Florida scientist Professor Joe Turbeville has carried out successful experiments with a prototype oilspill recovery boat. The Professor is now in Denmark with the boat working with the Danish government in a cooperative effort to find a way to contain oil spills.

Our scientists are carrying out research to find a suitable means for disposing of shellfish wastes, long a problem in the seafood industry. We know, as a result of our research, that the shells from the shellfish contain chitin (kite-in) a cellulose-like material that studies indicate will be the source of materials to wrap food, heal wounds, strengthen paper and cloth, and bond paper, wood, and leather.

Among other efforts offering great potential are Sea Grant studies to: freeze-dry salmon sperm and oyster seed for use in hatcheries the year round; develop sonar techniques to detect the depth and composition of offshore sand and gravel deposits; develop new diving equipment for the growing scuba diving

population and commercial diving industry; develop solar heat from a pond of brine solution and fresh water which traps heat from sunlight; and develop improved methods of transplanting turtle grass that have wide significance in the rehabilitation of pollution-destroyed waterways.

Sea Grant has been one of the leaders in development of the field of aquaculture. In 1971, the Mardella Corporation was funded by Sea Grant to conduct a survey of industry, government, and academic specialists to determine priorities for the advancement of aquaculture in the United States. This led to the development of a Special Emphasis Document for NOAA aquaculture programs in 1973 and to the NOAA Aquaculture Plan, published in 1977. These efforts to identify the needs in this field were conducted jointly by Sea Grant, the National Marine Fisheries Service, and other NOAA components.

Sea Grant has been responsible for meeting three other aquaculture needs. Many people, particularly those new to the field of aquaculture, have sought a single source of information on a variety of topics. Some have turned to Washington for such assistance. In an effort to partially fill this gap, Sea Grant has funded the development of a National Aquaculture Information System by the Virginia Institute of Marine Sciences, in cooperation with NOAA's Environmental Data Service. This System provides computer assisted access to a range of information about growing aquatic organisms.

Since many individuals seek assistance locally, Sea Grant has begun adding aquaculture advisory service specialists and agents to many of its statewide programs. Some of these are jointly supported by Sea Grant and the U.S. Department of Agriculture, through the Land Grant Universities.

Two years ago, the NOAA Aquaculture Coordinator began work on the plans for development of individual species in culture. To assist him in this effort, Sea Grant funded a project at the University of Washington designed to devise a procedure for allocating priorities among aquaculture research needs that would be flexible and would allow for updating as research results became available. Because a development plan was desired for the freshwater prawn, *Macrobrachium*, and because it is one of the simpler species for which a development plan could be developed, it was the species selected for this planning project.

In addition, Sea Grant has sponsored or co-sponsored many workshops and meetings designed to bring researchers and producers together to discuss current activities and needs for the future. This includes meetings discussing lobsters, marine shrimp, freshwater prawns, salmon and oysters, as well as meetings concerned with priorities for the future. At such meetings, aquaculturists have learned about each other's programs and problems.

In aquaculture research, Sea Grant investigators have conducted studies ranging from initial feasibility analyses of culturing several aquatic organisms to complex systems engineering development, to the identification of legal/regulatory constraints inhibiting the evolution of aquaculture into a mature U.S. industry. This research has advanced the state-of-the-art of aquaculture for many species, including salmon, shrimp, freshwater prawns, lobsters, oysters, clams, mussels and yellow perch, and also, for marine plants. It has resulted in procedures for analyzing the economics of various aquaculture systems to determine their feasibility and to identify the high cost factors that require research and development to make the system more efficient. Sea Grant projects also have been identifying the cause of disease and mortality and developing techniques to eliminate those problems that could be disastrous in a production system. Finally, we have several groups initiating long-term efforts to develop new strains of plants and animals that are ideally suited for aquaculture systems in terms of such factors as rapid growth on low-cost feeds and disease resistance.

Despite these programs, the field of aquaculture, especially for marine species, is still operating with a paucity of information and techniques. Sea Grant researchers, working with specialists from many private companies, the National Marine Fisheries Service, the Fish and Wildlife Service, and several state agencies have scratched only the surface of terms of developing the knowledge required so that producers will be able to operate with an acceptable degree of certainty.

I would like now to discuss marine education, a subject that has been of great interest to these committees. Under Congressional direction in the fiscal year 1977 appropriations, Sea Grant put new emphasis on marine education. As a result of this directive, during fiscal year 1977 Sea Grant increased funding

for marine education by nearly \$900,000 over fiscal year 1976 funding. This funding included a large number of special or "supplemental" grants. These "supplemental" grants included projects to increase public understanding of the oceans and the coastal zone, to develop specific marine curricula attuned to the needs and the geography of particular areas and aimed especially at kindergarten through the twelfth grade teachers, and to develop a national policy on marine education in the United States. I might add that we believe we have greatly improved our marine education effort. The number of education projects funded by Sea Grant increased to 92 compared with 84 from the past year. Financial support jumped from \$2 million to \$2.9 million Sea Grant dollars in the past year, and from \$2.1 million to \$2.7 million matching dollars during the same period. Our funding of projects for kindergarten through 12th grade education increased 300 percent last year.

Closely related to our work in education, of course, is our marine advisory service program. Pressures from marine recreation and the extension of our fisheries jurisdiction to 200 miles, to cite two examples, have created a real challenge for the manpower and expertise of this network. To meet the increased pressures, we have been able to increase the number of marine advisory agents.

I am happy to report, also, that we were able last year to bring Sea Grant to Puerto Rico with the introduction of a marine advisory service program there. It has proven to be quite successful, and we are continuing and expanding it this year.

In the past two years, Sea Grant has increased its efforts to stimulate interest in the marine environment among those individuals, such as women, minorities, and the handicapped, whose previous background or training might not have generated such an interest. The Office of Sea Grant has discussed this subject with the Sea Grant Program Directors and the Marine Advisory Service Leaders at the various universities, with the Sea Grant Review Panel, and with NOAA officials. We hope to receive significantly more fellowship proposals that would stimulate an interest in these groups.

Sea Grant has recently funded inner-city marine science education programs in New York City; in Hampton/Norfolk, Virginia; in Los Angeles; in Milwaukee; and in Detroit. We feel that these programs will introduce inner-city minority groups to the marine environment and to the potentials of a marine career. Too little has been done in the past to interest minority youths in marine-related careers.

Within the Sea Grant Program network of 26 institutions, the number of women and minority individuals occupying positions as Director, Associate Director, or Assistant Director has been increasing. The following is a breakdown of the positions held this year: Two women directors (Maryland and Puerto Rico); five women associate or assistant directors (Delaware, Hawaii, New Hampshire, Mississippi-Alabama, and Wisconsin); in Hawaii, a woman was acting director for a period of time this year; and the director of the University of Georgia program is an Asian-American. We also have a full-time female biologist on our staff at the Sea Grant Office. If leaders of program elements in communications, education, advisory services, and research were tabulated, the numbers of minorities and women would increase dramatically.

We feel that encouraging interest in the marine environment and in marine-related careers among those who would not ordinarily develop such an interest is an important part of what Sea Grant is about, and we will continue our efforts in this area.

As you know, the 1976 Act added three new program areas to the National Sea Grant Program: Fellowships, National Projects, and International Cooperation Assistance. These new areas were first funded in fiscal year 1978. There are three separate sections that authorize appropriations in the existing law. We believe it would be more appropriate to consolidate these three authorizations into a single section to cover all the programs established by the Act. This consolidation would allow for increased management flexibility and would provide for a more simplified budget process for the Sea Grant Program. We are preparing draft legislation and will be submitting it to the Congress shortly.

In accordance with the provisions of the Act, regulations for Sea Grant Program funding, including guidelines for the awarding of Sea Grant Fellowships, have been submitted to the Federal Register as final rules. These regulations and guidelines are being promulgated after extensive consultation with Congressional staff members, with several officials in NOAA, with officials of the Department

of State, with the Sea Grant Review Panel, and with the Sea Grant Program Directors.

The guidelines for Sea Grant Fellowships state that innovation and uniqueness will be significant factors in determining which funding proposals will be funded. We also believe that the Fellowship program affords a unique opportunity to stimulate in women, minorities, and the handicapped an interest in the oceans and coastal zones. We feel that this approach is consistent with the sentiments expressed by the NOAA Administrator at his confirmation hearings.

Proposals for Fellowship funding will be expected to address (a) the nature and focus of the proposal Fellowship program, (b) the utilization of institutional or other appropriate resources in this education and training of Sea Grant Fellows, (c) the methods of advertising availability of the Fellowships, (d) the methods of selection of recipients, and (e) the terms of tenure and method of determining continuity of tenure.

Section 206 of the 1976 Act called for the Secretary of Commerce to identify by regulation national needs and problems with respect to ocean and coastal resources. The section empowered the Secretary to fund projects, through the Office of Sea Grant, that responded to these national needs and problems. A Departmental delegation of authority has given the responsibility for the identification of these national needs and problems to the Administrator of NOAA.

The regulations are careful to delineate between the identification of national needs and problems by the Administrator and the funding by the Office of Sea Grant of projects responsive to these needs and problems. The regulations invite the public to submit suggestions as to what things constitute national needs and problems to the Office of Sea Grant. The regulations also provide for input from the Sea Grant Program Directors. In addition, I have asked NOAA's office of Policy and Planning to assist the Office of Sea Grant and the Administrator in identifying these national needs and problems. Although a more extensive listing will be added shortly as an amendment to the National Projects portion of the regulations, the Administrator has identified in the Federal Register the following item an initial national need: "The development and experimental verification of hydrodynamic laws governing the transport of marine sediments in the flow fields occurring in coastal waters." We determine this to be a national need because erosion affects approximately 28 percent of the Nation's shorelines and because it is universally agreed that engineering solutions are hampered by our lack of understanding of the mechanisms by which waves and currents move coastal sediments.

The regulations note that proposals for national project funding will be expected to address: (1) the relevance of the proposed project to a national need or problem that has been identified by the Administrator; (2) the nature and focus of the proposed project; (3) a demonstrated capacity to carry out the proposed project in a competent and cost-effective manner and (4) the utilization of existing capability and coordination with other relevant projects.

We feel that this National Projects program will strengthen the ties between the Office of Sea Grant and the rest of NOAA. In addition, it adds a welcome dimension of flexibility to the Sea Grant Program.

The regulations make clear that international projects funded under the International Cooperation Assistance program are intended to be genuinely cooperative; i.e., the recipient nation must evidence a commitment to the project. Proposals for funding under this program will be expected to address: (1) the nature and focus of the proposed programs, (2) the utilization of institutional and other appropriate resources in the implementation of an International Cooperation Assistance project, (3) a clear indication of the foreign participant's commitment to the project, (4) the identification of accomplishments expected from a single granting interval, (5) the implicit or explicit commitment of resources, and (6) the impact of the proposed project on the institution receiving funding.

The Office of Sea Grant has been, and will continue to be, in consultation with the Department of State in the shaping and carrying out of this program. Because the United Nations Educational, Scientific, and Cultural Organization (UNESCO) also funds international projects of the type covered by Sea Grant International Cooperation Assistance, and in order to effect coordination in this area between Sea Grant and UNESCO, the Division of Marine Sciences (UNESCO) will be informed of all projects funded.

Although funding for these three new programs has been available only this year, the Office of Sea Grant has received a tremendous number of requests for funding.

I believe that the National Sea Grant Program has shown much improvement in the two years since representatives of the Office of Sea Grant last appeared before you. I feel that the Federal-State cooperative approach to program development is a good one. It is now just over a year since I became Director of the Office of Sea Grant. It has been a good year, and I look to the future with confidence that Sea Grant will continue to make a significant contribution to the Nation as it carries out the objective of its 1976 legislation, "... to increase the understanding, assessment, development, utilization, and conservation of the Nation's ocean and coastal resources by providing assistance to promote a strong educational base, responsive research and training activities, and broad and prompt dissemination of knowledge and techniques."

Thank you.

I will be glad to answer any questions that you might have.

[The following information was subsequently received for the record:]

QUESTIONS OF THE COMMITTEES AND THE ANSWERS THERETO

Question. I think you will agree that it has taken some time to get the national needs and international programs off the ground. I appreciate the need for deliberation and caution in initiating new programs, but would you inform the committees of any particular problems that arose in implementing these programs?

Answer. Neither the National Projects and International Cooperation Assistance Programs, which were added to Sea Grant by the 1976 Reauthorization Act, had legislative histories which clearly and fully delineated their intent and purpose. When we began drawing up guidelines for implementing the two programs, we found little agreement among those with whom we discussed the matter as to exactly what types of projects should be funded, how problems were to be identified, who was to participate and how, etc. Therefore, we extended our discussions to the point where we have developed a consensus for action amongst the Congress, the Sea Grant Review Panel, NOAA administration and the Sea Grant Program Directors and participants. We are now ready to implement the new program in this the midst of the first year in which funding is available.

Question. In regard to the International Program, as you know the legislation requires consultation with the Department of State. Has there been coordination and cooperation with and from the State Department?

Answer. There has been extensive consultation with personnel of the State Department over the past year. They have participated in the formulation of the guidelines for implementing the program and in the review of the first group of preliminary proposals. We anticipate the continued involvement of the State Department in the International program. The Sea Grant International Program is but one of a large number of ongoing interfaces we have with the Department of State.

Question. Again, in regard to the International Program, when do you anticipate that the first grant or grants will be awarded? Have you found, in applications received and in comments and inquiries you have received, a level of interest in the program, and the required quality in the applications to justify the authorizations being considered by this committee?

Answer. We anticipate awarding the first grants for the International program by early summer. The inquiries and preliminary proposals received thus far have indicated a high level of interest in the International program and enough formal proposals of high quality are anticipated that will justify the authorized funding.

Question. Could you cite for the committee now or provide for the record, some specific examples of increased productivity in the marine resource field, or reduced costs, directly as a result of the Sea Grant program?

Answer. We will limit our list of examples of increased productivity or reduced costs which are direct results of the Sea Grant Program to the following representative samples:

(a) Precious Coral. One company in the precious coral business in Hawaii grew from 50 people employed and \$500,000 per year in 1971 to 214 people and \$7,800,000 by 1974 as a result of research conducted by University of Hawaii scientists.

(b) The net pen rearing of salmon in Puget Sound by Domsea Farms Inc. is an outgrowth of a pilot scale test jointly funded by Sea Grant and Ocean Systems, Inc. This operation now produces about 1,000,000 pounds of pan-sized salmon per year.

(c) The ocean ranching program now nearing full operation by the Weyerhaeuser Corporation is largely the result of an experimental program at Oregon State University. The use of heated water for accelerating the growth of the young salmon prior to release to the sea is based upon research done by the University of Washington. The investment thus far in this operation will exceed \$10,000,000 and over 80,000,000 salmon can be released by this operation.

(d) Several Sea Grant programs have worked to develop lower cost systems to protect coastal areas and structures. Some of these, including the tethered float breakwater, the floating tire breakwater, and the marsh grass beach stabilization system have already proved successful on a small scale.

(e) The North Carolina Sea Grant Program developed an alternative septic waste disposal system for coastal areas in the state in which conventional systems were unacceptable. This allowed a contractor to obtain permits to build 50 new homes in an area without endangering nearby shellfish populations.

(f) North Carolina advisory services agents working with fishermen and local boat building companies to get fishing boats insulated to reduce discoloration and spoilage of shrimp and fish have generated a new business and reduced losses of valuable aquatic protein.

(g) Double-cropping with crawfish aquaculture is averting financial disaster amongst the rice farmers in the U.S.

(h) A double-trawl system developed at the University of Georgia is reducing the fuel consumption vs catch ratio by as much as 50 percent.

Question. In regard to the basic Sea Grant College program, would you provide for the record a listing of the Sea Grant Colleges, and of other institutions participating in the program, and the dollar amount of their current programs.

Answer. The following list indicates the level of funding for the multiproject programs as of April 12, 1978.

Sea Grant Colleges:	
Texas A. & M. University	\$1, 832, 700
Oregon State University	2, 213, 700
University of Washington	1, 869, 900
University of Rhode Island	1, 385, 800
University of Hawaii	1, 545, 300
University of Wisconsin	1, 400, 000
University of North Carolina	850, 000
SUS Florida	1, 180, 400
Massachusetts Institute of Technology	1, 379, 700
University of Delaware	809, 500
University of California	2, 400, 700
State University of New York	1, 485, 000
Institutional programs:	
University of Georgia	630, 000
University of Maine/New Hampshire	1, 150, 000
University of Southern California	609, 000
University of Alaska	910, 000
Louisiana State University	840, 000
Coherent area programs:	
University of Michigan	721, 000
University of Maryland	522, 200
University of Guam	53, 700
Mississippi/Alabama Sea Grant Consortium	586, 900
Marine Research Center—South Carolina	419, 500
Virginia Institute of Marine Science	475, 600
University of Miami	291, 200
Woods Hole Oceanographic Institute	425, 000
University of Minnesota	208, 900
New Jersey Marine Science Consortium	299, 200

Question. Would you provide for the record a breakdown of current Sea Grant funding distribution by States.

Answer. The following is a list of funding by State for fiscal year 1977.

Alaska	\$783,200
Arizona	32,900
California	3,472,800
Connecticut	215,700
Colorado	25,000
Delaware	1,316,300
Washington, D.C.	16,000
Florida	1,471,600
Georgia	630,000
Hawaii	1,570,300
Louisiana	840,000
Maine	1,136,400
Maryland	447,400
Massachusetts	1,682,000
Michigan	824,300
Minnesota	107,500
Mississippi	500,000
New Hampshire	46,700
New Jersey	345,700
New York	1,634,200
North Carolina	447,660
Ohio	47,900
Oklahoma	100,000
Oregon	2,054,240
Rhode Island	1,465,700
South Carolina	419,500
Texas	2,225,000
Virginia	678,300
Washington	1,974,000
Wisconsin	1,400,000
Guam	53,700
Puerto Rico	39,900

Question. In regard to the Sea Grant program generally, I noted in the trade press recently, a report on recommendations made by Dr. Frank Press, science advisor to the President, to Secretary Kreps regarding the future direction of the program. If that letter is available to you, would you provide a copy for the committee please.

The trade press report indicates that Dr. Press suggested that Sea Grant change its emphasis from institution-building to an emphasis on the marine and coastal issues that face the nation in the 1980's. He is quoted as wondering whether Sea Grant is initiating "Sufficient long-term and fundamental research" and as suggesting that the program should consider whether it has the proper mix of research, advisory services and education/training programs".

Would you comment on Dr. Press' suggestions please.

Answer. The letter from Dr. Press is attached. With respect to the suggestion that there be a change in emphasis from institution-building to an emphasis on marine and coastal issues that face the nation for the 1980's, we would like to point out that we have done our institution-building to date by funding research, education and advisory services which were aimed at the issues of the 1960's-70's. Further, we will be involved in some "institution-building" in different fields in the various universities as long as there are changing needs and problems in the marine resources field. However, we recognize that the point of the suggestion is a matter of degree and we are now looking more toward putting the system to work rather than developing it. In this regard, each technical staff member in the national office is being assigned responsibility for one or more subject areas which will allow us to place greater emphasis on the issues of the present and future.

We have already reminded our staff and the Directors of our universities of the necessity of an appropriate balance of longer-term, more fundamental research with the shorter-term, more applied studies. Therefore, we agree with this suggestion.

As to the last suggestion you identified, we review the programmatic mix frequently and plan to continue to do so. However, we believe that the proper mix

of the various parts of the national program will be different from time to time, and at the local level will be different from state to state.

Question. There is provision in the authorization for lx withdrawal of Sea Grant college status from an institution that no longer is producing the quality and quantity of work required for the Sea Grant designation. I think this is an important provision to maintain the quality of the Sea Grant program, and to satisfy budgetary critics who fear that Sea Grant designation creates an unending obligation on the federal taxpayer.

Has Sea Grant status ever been withdrawn from an institution?

Answer. No Sea Grant College has lost its designations as of this date. However, two programs have been reduced from Institutional to Coherent Area Program status. Every program is reviewed annually to assure that only projects of quality are supported. We would not hesitate to take proper action should any program fail to produce the quality and quantity of work expected.

EXECUTIVE OFFICE OF THE PRESIDENT,
OFFICE OF SCIENCE AND TECHNOLOGY POLICY,
Washington, D.C., March 2, 1978.

HON. JUANITA KREPS,
Secretary of Commerce,
Washington, D.C.

DEAR JUANITA: I have reviewed the Sea Grant Annual Report to the President and Congress as required by Section 211 of the Sea Grant Program Improvement Act of 1976 (Public Law 94-461). I am pleased to commend you for the Program and for its record of accomplishment.

The Sea Grant Program represents a successful partnership between the Federal Government and the States for addressing important local research needs and interests, as well as scientific and engineering problems of national importance. As recounted in this year's report, Sea Grant supported research, such as research on "near drowning" and on an oil-spill recovery boat, has proven productive and has received justified public attention.

Perhaps in the coming year it is appropriate to take careful stock of the Sea Grant Program and possibly to alter its course slightly. I am mindful in making this suggestion that the program has now been established for a decade. Such an evaluation is particularly timely in light of the Administration's efforts to review ocean-related programs, policies and organizations. Further, it would come at a time when there is new leadership within your Department, the National Oceanic and Atmospheric Administration, and the Program itself. Questions that might be addressed could include the following:

Is there an opportunity to change the Sea Grant Program from its traditional emphasis on institution building to an emphasis on the marine and coastal issues that will face the Nation in the 1980's?

Does the program initiate sufficient long-term and fundamental research to contribute to the solution of the major marine-related issues that lie ahead?

How can the Sea Grant Program research be made a more effective input in the formulation of policy concerning the coastal-zone and the extended resources zone?

How can the quality of Sea Grant institutions be strengthened?

Is there a proper mix of research, advisory services, and education/training programs?

What should be the long-term Federal/state/local funding commitment to Sea Grant institutions?

An evaluation that provides answers to these questions will not be completed immediately, nor are the questions the only ones worthy of attention. Nonetheless, they indicate areas that warrant consideration over the coming year. I will look forward to learning of the results of your review in the months ahead.

With warm regards,
Yours sincerely,

FRANK PRESS, *Director.*

Senator PELL. Our next witness is the Honorable John Negroponte, Deputy Assistant Secretary for Oceans and Fisheries Affairs, Department of State.

And I congratulate him on the speed with which he has taken, to come up to speed in the rather difficult and complicated job, and wish him well.

STATEMENT OF JOHN NEGROPONTE, DEPUTY ASSISTANT SECRETARY FOR OCEANS AND FISHERIES AFFAIRS, DEPARTMENT OF STATE; ACCOMPANIED BY WILLIAM SULLIVAN, OFFICE OF MARINE SCIENCE AND TECHNOLOGY AFFAIRS

Mr. NEGROPONTE. I asked Dr. Ostenso if he would stay with us here, in case there are any questions that he can help us on.

Also, I have, on my left, William Sullivan, who is the head of our Office of Marine Science and Technology Affairs in the Department of State.

I have a prepared statement, which I circulated previously, Mr. Chairman. Would you like me to read it, or should I just introduce it for the record?

Senator PELL. We will introduce it in full in the record, and if you care to summarize it, I would be very appreciative.

Mr. NEGROPONTE. I would just like to add a few words to what I believe has already been rather eloquently stated by Dr. Ostenso, himself, when he talked about the international aspects of the sea grant program. We don't perceive this program as some sort of giveaway or assistance program, per se. This is a program which we perceive as well designed to meet important interests of the United States, given the trend of various coastal States around the world to extend their jurisdiction to such matters as marine science. And if we are to insure the kind of relations and the kind of access to the coasts of other developing countries in the future in this important area of oceanography, it is in our self-interest, we believe, to try to build the seeds of future cooperation, and that is the way we perceive this modest, but important, international sea grant program.

Now, I would just add to those remarks that it is difficult to defend the program in any great detail, because we haven't really even implemented it yet. We are considering preproposals. The regulations for the program are awaiting publication in the Federal Register, and we will shortly have a set of final proposals for consideration.

So, all I would urge, at this point, is that we give the program a chance so that we can see how it operates over the next year or two and then I think we will be in a better position to judge how we wish to proceed from there with respect to international sea grant.

Thank you very much, Mr. Chairman. I would be very happy to entertain any questions.

Senator PELL. Thank you very much, indeed.

I am very glad that you have a good working relationship with the sea grant program, and I look forward to continuing to follow it.

In connection with international sea grant, how do you see its growth? Would you agree that we should not confine ourselves only to developing nations? Do you have any thoughts with regard to the specific proposal on the Azores?

Mr. NEGROPONTE. With respect to your first question, we believe that the emphasis should be with respect to developing nations, principally

because we are talking about such a modest sum of money, something on the order of \$900,000, I believe, Mr. Chairman, and, therefore, it would seem rather easy, to us, to dilute the effort, if one started to get involved in somewhat expensive exchanges with some of the other more developed countries.

We, therefore, would prefer that every effort be made to retain the emphasis on those countries which are less developed.

Second, with regard to the Azores, I think that, if a proposal were forthcoming, I think we would be happy to study it very, very carefully.

Senator PELL. Could you elucidate for us the working relationship between your office and the Commerce Department? And I guess that covers not only this program but a variety of others. Do you have a liaison with Dr. Ostenso, or how do you communicate back and forth?

Mr. NEGROPONTE. With respect to the sea grant program, Mr. Sullivan's office is in constant contact with Dr. Ostenso's office, with respect to the international sea grant, and the way we have worked thus far was that the various proposals for the international program were conveyed to us late last fall. I guess, and we took each of these proposals to the various country desks concerned within the State Department.

We collated some preliminary comments, which we then conveyed back to Mr. Ostenso's office, and we are now awaiting the final proposals.

I would not profess that this has been a very active relationship, at this stage, since, as I said earlier, the program hasn't yet gotten under full steam. But I would imagine these relationships would intensify as we get involved in specific projects.

Senator PELL. Would you be able to comment on the way—on the desirable spending level for the sea grant international program? Do you think the present authorization is adequate?

Mr. NEGROPONTE. I would certainly not be prepared to recommend more or less, until we have had an opportunity to evaluate, over the next year or so, our experience at the existing level. I would think that would be the most reasonable approach.

Senator PELL. Could you give me an example of any specific experience you've had so far with the international program, with the very modest amount of money that you have.

Mr. NEGROPONTE. We have not spent a nickel, Mr. Chairman.

Senator PELL. What would be the reason for that?

Dr. OSTENSO. The final regulations for the sea grant program, including all of the programs that were encompassed in the 1976 authorization act, will be published in the Federal Register Tuesday of this coming week.

This has been a long, slow process, but a process I am fairly pleased with, because it has been a collegial process. There has been a vast participation from the legislatively mandated review panel, from the executives within NOAA, from the staff on the Hill, from the sea grant program directors and others. A great deal of collective wisdom has gone into these guidelines.

So, by law, we could not fund a project until the final guidelines were published. The preliminary ones have been up for a review and have been revised, and there has been input from a number of sources.

Not wanting to wait for this whole process to get started, we did go out to the sea grant community and ask them to submit preliminary proposals so that we could get some feeling of what the capacity of the sea grant program was in this international area.

I am pleased to report that we got—well, I'm not sure if I'm pleased, but we got over \$3 million worth of proposals, just from the sea grant community alone. Most of these proposals were of considerable merit. We've got the capacity to do a lot more than we are funded to do right now, but we are off to a good start.

When we got these preliminary proposals, we reviewed them with the State Department. We kept them abreast as they came in, with Mr. Sullivan's office.

I might add, parenthetically, we have many more interactions than just the sea grant international program.

Now, that the regulations are about to be published, the institutions are coming forward with their formal proposals. As they come in, all decisions for funding will be made, not only jointly with the State Department, but also, we think that other federal agencies should be a part of the process or review, particularly AID. So that we are very anxious to use their resources as effectively as we can.

Senator PELL. Mr. Negroponte, I just want to be sure that I do understand you correctly. With regard to limiting the funds in the international program to the developing nations or not, as I understood you, you would support a change that would remove this limitation; is that correct?

Mr. NEGROPONTE. Mr. Chairman, we would prefer that the legislation not be changed, that the language not remove this restriction, because we believe that, with the sum of money that we are talking about, the risk arises that the funds might be diluted in more expensive programs with the developed countries.

At the same time, we have been told and we have learned that for a variety of reasons there are others who believe that this modification ought to be made because of the kind of flexibility that Mr. Ostenso was referring to earlier, and also in terms of, if you will, the acceptability of the international sea grant program to various members of the House Subcommittee on Oceanography.

So, we don't think it is an issue of overriding concern. I have stated a preference. We are not prepared to fall on our sword to defend the language as it was.

Senator PELL. I appreciate the specificity of your view. This will be a judgment that we will make, taking into account the various viewpoints presented.

We thank you for being with us, and wish you well.

Mr. NEGROPONTE. Thank you very much, Mr. Chairman.

[The statement follows:]

STATEMENT OF JOHN D. NEGROPONTE, DEPUTY ASSISTANT SECRETARY OF STATE FOR OCEANS AND FISHERIES AFFAIRS

Thank you, Mr. Chairman, for your invitation to give my views on the international component of the Sea Grant Improvement Act of 1976.

From my vantage point, I view the existing Sea Grant Program as a valuable part of our overall national program for dealing with marine problems. I think that we have now achieved, through the Sea Grant Program, the kind of success in utilizing education, research, and advisory services, with a primary focus on regional and local problems. By helping to solve problems which are not unique

to the United States, the results can be applied to common problems of all coastal nations.

The decision of Congress in 1976 to create an International Sea Grant component with a focus on developing nations, during its review of the overall Sea Grant Program, suggests that Congress shares this Administration's view on the value of this Program in promoting amity among nations by helping developing countries to advance some of the capability they require to deal with their own problems. The Program allows experienced Sea Grant practitioners in our universities to combine forces with local universities which know about local conditions, problems, and needs. And, since it is designed as a cooperative program, it allows both the U.S. institution and the cooperating foreign institution to pursue their own interests for their own reasons.

I see the International Sea Grant program as a small, university-based pilot effort which could develop a new capacity within existing institutions to work bilaterally in cooperative effort with developing countries on joint research ventures. This is new to marine research, where, in the past, almost all international cooperation has been with scientists from industrialized countries. While this has been very productive, it must change, since most of the world's coastal nations are developing countries with little indigenous capability to manage and develop their own coastal and offshore resources. This program may help alleviate the serious political problems which have surfaced for example in the law of the Sea Conference where the present text would require consent for vessels conducting research within 200 miles off foreign shores. As of a few weeks ago, at least 46 countries had already declared jurisdiction over science in their 200-mile zones and many more are pending. We have experienced that developing countries, suspicious of research off their shores, may deny consent if given the option. The problem will be much greater with universal 200-mile zones, with 31 percent of the ocean being encompassed in such zones off foreign coasts. These regions contain some of the most scientifically important areas. If we have a mechanism by which to encourage mutual efforts with these countries, so they see the relevance of such research, the chances for getting permission to continue to do our research may be somewhat increased.

At the present time, some \$40 million of U.S. Government-funded academic oceanographic research is conducted within 200 miles of foreign countries. I feel we need the good will which could be generated by the International Sea Grant Program. If the Program did not already exist, we would now have to establish one, as the U.S. must increasingly turn its attention to the problems of technical cooperation with the developing world.

In conclusion, I believe the program should be carefully funded and administered so that the reservoir of experience in applying research to marine development, which exists in the Sea Grant Program can be tapped appropriately to increase possibilities for marine cooperation in a meaningful way. We must proceed carefully and we must plan carefully, if it is to work properly. We are very pleased with the cooperative spirit we have seen in the Office of Sea Grant and the Sea Grant community in developing this important program.

Thank you, Mr. Chairman. I would be pleased to answer any questions.

Senator PELL. Our next witness will be Mr. Byron Battle, from the Center for Policy Alternatives, MIT.

STATEMENT OF BYRON F. BATTLE, CENTER FOR POLICY ALTERNATIVES, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Mr. BATTLE. Mr. Chairman, my name is Byron Battle. I represent a research group at the Massachusetts Institute of Technology, called the Center for Policy Alternatives.

I would want to open my statement with a couple of qualifiers, so that the conclusions of our research could be put into proper perspective.

The report which we prepared last year for the sea grant college office was entitled, "Program Development Procedures and Transfer

Mechanisms in the National Sea Grant Program." The key phrase in this title is "transfer mechanisms," which is a bit of heavy professional jargon which we have used, which refers to how to put good research to good use. Our center at MIT is quite interested in this process, and we feel that sea grant is a program that lends itself very favorably toward this type of transfer of research from, so to speak, the laboratory to the ultimate user.

More specifically, however, our focus in this report was on the commercial application in the form of new products and processes which have resulted from sea grant research over the past few years.

So, therefore, I would emphasize that our conclusions, or the focus of our study, is much more limited than the entire sea grant program. We are looking at one aspect which we think is important and certainly is very visible in the sea grant program, but by no means is it the entire program. Therefore, we do not wish to generalize too far in our observations here.

The reason for the commercial focus results from the fact that this report is a sequel to an earlier study we did for sea grant on the potential commercial and foreign trade impacts of the sea grant program.

The interesting aspect of that study was what we learned about the characteristics of successful—commercially successful—sea grant projects. And, as a result of these findings, the Sea Grant Office asked us to take this research one step farther and look at the implication of these conclusions on the program-management process in the national sea grant program. Hence, this report and my presence today.

Mr. Chairman, we have had the privilege of working very closely or observing very closely sea grant over the last 2½ years, and, as a result of our cumulative impressions, we have come to have a certain feeling for how it operates.

Senator PELL. Your statement will put in full in the record, and to oversimplify what you're saying, as I understand it, you have conducted a very definitive study and found that the cost-benefit features of this program are excellent, would that be correct?

Mr. BATTLE. Of the earlier study, yes, the study on the commercial aspects.

Senator PELL. What is the average cost-benefit ratio, in your view, of this program, compared to the average cost-benefit ratio of the overall average Government program?

Mr. BATTLE. I'm afraid, Mr. Chairman, I'm not really qualified to answer that question. I haven't compared it with other programs; and also, I don't think we did a cost-benefit ratio, as such, of the entire sea grant program. We were looking especially at the research characteristics of successful commercial projects in the earlier report, not this one.

Senator PELL. Do you know of any Government program that has a better, a higher cost-benefit ratio than sea grant?

Mr. BATTLE. No, sir, I do not.

Senator PELL. Thank you. You suggest in your statement that some of what sea grant does never gets to commercial users, but I thought this was the job of the advisory service, to make this information available to the consumers, the users, and end-users. Could you be more explicit about what this problem is and how you would remedy it.

Mr. BATTLE. As I said earlier, Mr. Chairman, one of the focuses was how to strengthen these transfer mechanisms. And one of the inherent mechanisms, or the very explicit mechanisms of sea grant is the Sea Grant Marine Advisory Services. We feel that, despite the existence of these services, which are the sine qua non of the sea grant system, that much more could be done in small ways, not by major organizational reforms, at the level of the individual sea grant institution, to improve the transfer, to facilitate this transfer.

Now, one way, as we have suggested, we think that the sea grant colleges should make a more aggressive effort—perhaps that's too strong a word—but a more pointed effort to involve the private sector in all stages of research, because we have found in previous analyses that those institutions which were not reluctant to work with private firms to seek out their advice at the early stage when they were formulating research and later when they were trying to implement in a practical sense the results of that research, that these institutions had the greatest benefit, the best results in terms of commercial product.

We feel, as we have stated in the conclusions of this prepared statement, that the universities should make a greater effort in this university-industry relationship so that they can be alert to the opportunities, and this can be done by not only the marine advisory services, but the sea grant directors and, of course, with some assistance from the national administrators of the program in certain instances where sea grant projects may cross over into more than one region and not be limited to one particular program.

One thing we've noticed in our observations of the local programs is that very frequently—and this is partially because of the limited funding—very frequently the individual programs could benefit from more background analysis of what local market demand is for various types of research they are capable of doing. Also, what are the needs of the various sectors and the various industries in their region.

But there have been very few funds spent in most of these programs to do the sort of background analysis for planning of future research proposals. We think this would be a useful technique and one that is not exorbitantly expensive over a number of years, to have a sort of running background knowledge of what the sectors' needs are.

This is the type of innovation we would like to see in the sea grant program, to make, as you say, to make the benefits more visible and more real.

I might point out that another of the suggestions we have made, which is a little bit difficult to put in concrete terms, but it has been one of the conclusions that we've found, is the feel that more support should be given for imaginative and, in some cases, riskier projects. Very frequently, because of limited funding, again, there is a tendency to remove or eliminate those projects which do not have a very, very precise result and do not promise a precise result and which have a methodology which is a bit uncertain or experimental. Because of the limited funding, there tends to be a more conservative bias in some of the projects throughout the system.

I am generalizing, of course, but we feel that sea grant can gain much more in terms of its own reputation by showing its willingness to support imaginative projects, and very frequently, as we noticed in

the first study, these types of projects have often been the most successful, commercially speaking, because they have led to new ventures, not just to new processes.

Senator PELL. Thank you very much, indeed. I appreciate your being with us, and if there are any further questions to submit to you for the record on the part of Senator Hollings or me, I'm sure you'll be glad to answer them for the record.

[The statement follows:]

STATEMENT OF BYRON F. BATTLE, CENTER FOR POLICY ALTERNATIVES,
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Mr. Chairman, I have been invited to testify before this committee today to report on the conclusions of an analysis of the National Sea Grant College Program which was recently completed at the Massachusetts Institute of Technology. The study, entitled "Program Development Procedures and Transfer Mechanisms in the National Sea Grant Program", was carried out by the Center for Policy Alternatives at MIT with the objective of suggesting means by which the Sea Grant program might facilitate the practical transfer of results of research from the participating universities to their local and state communities. More specifically, this study aimed at identifying steps whereby the Sea Grant program could encourage greater and more effective application of the results of this university-based research to commercial use in the form of new products or processes.

I would emphasize from the outset, therefore, that the scope of this study was limited to those projects within the Sea Grant portfolio which can be considered to have commercial potential. As the range of Sea Grant programming extends far beyond this category of projects, I would hasten to add that the conclusions of the study were not intended to be broad generalizations applying to all Sea Grant activities.

The reason for this particular limited focus on the Sea Grant program stems from an earlier study which the Center conducted for the Sea Grant program entitled "An Analysis of the Potential Commercial and Foreign Trade Impacts of the Sea Grant Program". That study analyzed the extent and conditions under which Sea Grant-supported research could be expected to have positive commercial implications in the future. The study's conclusions were based on close analysis of a sample of 77 Sea Grant projects in 1975 of which a significant number were expected to have positive commercial results in terms of estimated sales by 1980 by firms introducing new products or processes based on Sea Grant-supported research.

Mr. Chairman, I will proceed briefly from several general observations to the more specific conclusions of this report. We have had the opportunity to observe at close hand the functioning of the Sea Grant system for over two years. We have gradually come to have a feeling during this period for its strengths and its weaknesses. The much overused term "unique" is almost always employed by Sea Grant's supporters in describing the program. While we would like to avoid an empty repetition of this description, we nevertheless are forced to the conclusion that the Sea Grant program is indeed one of a kind with no equivalent either in the United States or in any other developed country. Sea Grant's original mandate was a clear one—to establish a functioning network of universities throughout the country engaged in a special working partnership with their local communities, private and public sectors alike. Without hesitation, we would state our judgment that Sea Grant has faithfully and effectively fulfilled the letter and spirit of the legislation establishing the system.

This being said, we believe that any organization such as Sea Grant faced with implementing an entirely new programmatic idea can be expected to face mid-course adjustments after several years of operation. Sea Grant has had its growth problems and appears prepared to face up to them. The fact that we at MIT were requested to analyze one specific aspect of the program and to suggest some useful alternatives available to Sea Grant management attests to this willingness to strengthen the program.

In general, we believe that Sea Grant, after 11 to 12 years in existence, needs to come to grips with two major problems. First, Sea Grant needs to decide

clearly on those substantive areas related to research on the oceans and the nation's coasts and waterways where it wishes to concentrate its efforts and limited resources in the future. Sea Grant is a small program which has dispersed its research across a very large range of activities in its effort to build up university capabilities in sea-related research. Largely because of this diffused focus, Sea Grant today finds itself plagued by lack of public understanding of its purpose and accomplishments, doubts and indifference within the Executive Branch, and as a result seriously inadequate funding for program expansion and new initiatives.

Second, Sea Grant needs to direct more of its attention in program planning to means of aiding and encouraging universities to achieve broader social and commercial application of their research results. We have concluded that many valuable research efforts with potentially useful applications lie fallow following their completion due to a variety of "missing links" between the university researcher and possible users in the field.

Mr. Chairman, I will summarize some of the specific steps recommended in the report as follows:

CONCENTRATION ON STRENGTHENING THE UNIQUE UNIVERSITY-COMMUNITY PARTNERSHIPS THROUGHOUT THE COUNTRY RATHER THAN COMPETING WITH OTHER RESEARCH-SUPPORTING INSTITUTIONS FOR BASIC MARINE RESEARCH

Sea Grant should increase its emphasis on the truly unique features of its program—the partnership which it fosters between its participating universities and local communities, state governments, and private firms and organizations. The 'bottom-up' character of program planning should not be weakened. To this end, Sea Grant's principal asset—the close working links between its marine advisory services and its research projects—should constantly be emphasized. Sea Grant should not attempt to compete with the older, more established research-supporting institutions for traditional basic marine research. Sea Grant is best in a strong catalyst role, linking university and community together through research on relevant and highly current issues related to the sea and its resources.

PRIORITY EMPHASIS ON SUBSTANTIVE RESEARCH AREAS RATHER THAN INSTITUTION BUILDING

Sea Grant management should now begin to turn its attention to defining those substantive areas where it wishes to make a major contribution. During the past ten years the focus has been heavily on institution-building, that is, establishing a network of Sea Grant model universities in each coastal and Great Lake state with the desired internal balance between the three Sea Grant functions—research, advisory services and education. This objective, in our view, has been achieved very successfully and the energies of the program should now shift from the mechanics of building up this system to more specific research areas where Sea Grant can make a contribution.

MORE ACTIVE WORKING RELATIONSHIPS WITH THE PRIVATE SECTOR

Sea Grant universities should seek more working relationships with private firms so as to remain alert to the opportunities inherent in university-industry cooperation. We have found in the course of this investigation that in those universities where contacts with private firms were actively pursued both at the early stage of formulating the ideas for projects as well as in eventual implementation, the chances of both technical and commercial success were greatly improved. The inputs coming from firms having perspective of the real and practical problems associated with both production and marketing proved themselves to be important contributions to the research process. Many successful projects have actually come at the suggestion of such users who have encouraged and assisted the researchers in their tasks. Greater efforts both by researchers and the Sea Grant advisory services to involve potential users at all stages of the research cycle should serve to strengthen these relationships between industry and universities and improve the relevance and practical applicability of Sea Grant research.

MORE ACTIVE ROLE BY NATIONAL BODIES IN SUGGESTING AND SYNTHESIZING
RESEARCH PROJECTS

The decentralized nature of the Sea Grant Program accounts for much of its richness and diversity for which Sea Grant can be justifiably proud. We have come to the conclusion, however, that the national management bodies, such as the National Sea Grant Office and the National Review Panel, could make many important contributions to the planning process without sacrificing the local character of the programs. The national management, with its access to information on all Sea Grant programs and other similar research being undertaken in the U.S. and abroad, is in a unique position to assist the local Sea Grant programs in defining useful and needed research areas. Presently, these groups play an insignificant role in program development. Both the National Office and the National Review Panel could improve the cohesiveness and relevance of Sea Grant programming by a more constructive coordinating role and by helping to synthesize many related and overlapping projects throughout the country.

MORE SUPPORT FOR IMAGINATIVE PROJECTS

Sea Grant programming should provide more latitude for highly imaginative, even risky, projects with important potential. In spite of limited funding, Sea Grant on a national basis should encourage more imaginative, unorthodox approaches to interesting problems. Frequently, such projects are proposed by researchers only to be rejected because of restricted funding and the projects' uncertain results. Ultimately, Sea Grant's reputation will gain far more from its willingness to take risks with exciting problems than from a portfolio of sound, less ambitious projects which produce exactly what they promise.

MORE ATTENTION TO DEFINING MARKET DEMAND AND SECTORAL NEEDS

Sea Grant institutions as a whole should place more emphasis on (a) defining current or potential demand for the products of their research and (b) understanding the problems and opportunities of the sectors where Sea Grant research is relevant. Sea Grant is very well equipped to test public and private sector needs in communities throughout the country. Despite this inherent ability, Sea Grant does not spend an adequate portion of its funds and energies in defining demand for the research it wishes to undertake or the technical requirements of sectors where it wishes to have an impact. This emphasis should come both from the national organization and local administrators.

Mr. Chairman, the foregoing is an overview of the major recommendations we have made with respect to Sea Grant program planning. Details are available in the report which you and the other members of the Committee are being provided with. I would conclude with our observation that the Sea Grant program is one which on the whole functions extremely well due to the many strong factors built into it. In our view, Sea Grant is not in need of any major organizational upheavals. What is required after a decade of operation is a less diffused approach through greater concentration on several specific objectives which are already clearly implied in Sea Grant's mission.

Senator PELL. Thank you very much.

I did have one question I wanted to ask Dr. Ostenso.

What would be your reaction to the idea of a 4-year authorization, instead of a 2-year authorization, if the Senate, in its wisdom, moved in that direction?

Mr. OSTENSO. I have no problem with the 2-year authorization. I think it is good to come back to the well, so to speak, and get our program reviewed. We've got a good story to tell, and we like to tell it as often as we can.

I think I would probably be more comfortable with a 3-year than a 4-year, but I certainly would not object to a 4-year authorization.

Senator PELL. Good. Thank you very much.

Our final witness this morning is Dr. William Wick, director of the sea grant college program at Oregon State University.

Dr. Wick.

STATEMENT OF DR. WILLIAM Q. WICK, DIRECTOR, SEA GRANT COLLEGE PROGRAM, OREGON STATE UNIVERSITY, CORVALLIS, OREG.

Dr. WICK. Thank you, Senator Pell.

Senator PELL. I would add, too, my own personal delight at seeing you here, because I recall you were so kind to give to me the sea grant college award, and it is now on my wall, and I would give you a chance to see it hung up.

Dr. WICK. I am looking forward to that. I wanted to see it hanging on the wall, and I am very pleased about the award.

I am submitting some testimony for the record, and would like to highlight my points if that is all right with you.

Senator PELL. Certainly. Your statement will appear in full in the record.

Dr. WICK. I would like to start out by thanking you for the opportunity to activate a new and pioneering idea which has been a real privilege for those of us who have been active in sea grant since the beginning in 1966.

I think the Sea Grant Act of 1966, as passed, was a bold step. As was mentioned earlier this morning, sea grant is designed somewhat like land grant, and I agree that in some ways sea grant is similar. But I would point out that there are important differences—if not in style, then in functional timing. And these are important to how sea grant is working today and the positive things it is doing.

In my testimony, I have inserted a diagram which indicates what I believe is a very important functional concept of research, education, and advisory services. All elements of sea grant must hang together so that they can work interchangeably with each other and get the best possible results from it.

And this is where sea grant and land grant differ somewhat. Because as you will recall, the land grant program's functional trinity arose in different human generations.

Next I would like to mention that perhaps it was the vision of the Sea Grant Act to start developing what I call "genuine marine universities," and I believe that this is starting to happen.

In our own case, for example, 12 years ago we had an excellent, young, fairly large department of oceanography, some work in fisheries, primarily oriented to stream and estuary and a small effort in sea food technology.

Since then, we have been able to move in a wholistic sense toward development of a total marine university, and not just in the areas of high science and technology, but into rather unusual marine disciplines such as English, anthropology, law, forestry, engineering, and so forth.

Further: to that, we began with a group of what I would call "old pro" type faculty members in classical disciplines, and are in the process—all of us in the sea grant network—of developing what I would tend to call a "new cadre of ocean-oriented faculty" who choose to be where the action is. I believe that this is significant.

Dr. Battle mentioned in his report just a few minutes ago a point that seems important. The plea is to permit individual programs to

evolve in a manner which builds on the characteristics of the individual institutions in the cultural and political arena in which they operate.

Even though the sea grant network across the country can function as a true network, there can and should be differences within the individual programs.

I was asked to mention specifically the "marine advisory function" of the sea grant program nationally, and to comment on how the programs were developing and whether a standard pattern was developing.

I think in some senses a pattern is developing, but once again I would caution and hope that we could separate individual program emphases based on the needs that might exist. One of the questions relating to transferring technology that is an important one—and it is a difficult concept to get across, I believe, but a common denominator, as far as I'm concerned, and sometimes often unspoken—is the goal of helping people to grow into more productive citizens using new marine knowledge not as the end result, but as the medium through which people are developed.

And I believe that this is happening among all the marine programs supported by Congress. I feel that sea grant programs emphasize the "people" element more strongly than any other marine program. People are central to sea grant. They are central in the designing of programs, serving as members of policy councils attached to many of the programs, and help to evaluate the programs. These are all important elements.

The sea grant director at the University of Rhode Island, in his testimony to the House recently, made a statement that I believe bears repeating.

Sea Grant is having an impact on how America chooses to develop, and utilize and conserve marine resources. This impact, I believe, could not have been achieved through the channels available prior to the passage of the Sea Grant Act. There simply was no mechanism that made it possible for people in industry, in the universities, in local, State, and Federal Governments to cooperatively solve marine problems in a national and local emphasis arena.

We believe this is an important sea grant strength.

I was also asked to mention a few points about marine education. This was discussed a couple of years ago as a focus of interest of the committee. We think that the best result we have totally is the students that we are developing. Some of these were being developed in the traditional disciplines that existed before sea grant. Now there are students being trained and employed in responsible positions throughout the United States in industry, government, and academia in disciplines that did not exist and could not exist prior to sea grant.

Consider such areas as "marine resources management," which is being taught at the University of Rhode Island, Oregon State University, and elsewhere; increased sophistication in "ocean engineering," and some of these other specialties. There are emerging programs at a number of schools which attempt to bridge technology and the humanities to give feeling and meaning to the precise rigor of marine sciences and engineering.

I believe this is a major step ahead.

You know that there are approximately 700 research projects involved with the sea grant program. I would like to mention one cost/benefit result that relates to Oregon. It relates to our work in ocean ranching of salmon which began about 10 years ago.

We took a look at whether we could release larger numbers of salmon at low cost and low technology. The results, to date, are promising—not conclusive, but promising enough that one major company is investing \$12 million in capital construction, plus \$8 million in operating capital, in the next 5 years.

This company, last month, opened the largest salmon hatchery in the United States either public or private—perhaps the largest in the world. The annual production is pegged at 80 million salmon smolts released per year within 5 years. And they currently have 12 million salmon ready for release. That is a large investment on the part of one company.

There are several other companies ready to invest in ocean ranching. Sea grant made a very modest investment in research, in training, and in advisory services on the ocean ranching concept. So the cost/benefit analysis on this project could, perhaps, support our entire program for a number of years.

You mentioned international projects a few times this morning. Parts of this sea-grant-developed technology in ocean ranching is being used internationally in several countries: Canada, Japan, Russia, and Chile, specifically. We think this is a useful move.

We also have a number of other active international components that involve sea grant people through support from the United States-Japan cooperative science program and others, in the area of fish diseases.

I have been trying to emphasize the positive, because I feel very positive, about sea grant. That doesn't mean everything is perfect. I think, as we get down toward the central problems of developing America's marine resources, we may tread on some toes, or we may stir up dust that has lain fallow for a number of years.

This has two results. One result is that those who have discovered us want to have more and more help as they go along. There are others who would like to have us go away. We are getting close, maybe, to where things are happening. Sea grant is starting to make a difference in America's marine arena.

As we become accepted, the demands for more research, education, and advisory services currently far outstrip our ability to respond. I am very pleased with the way the people of America, through the Federal Government, the States, the local governments, and through industries have joined in this sea grant partnership. I just hope that we have enough resources to keep it growing at a healthy rate so that we can do those things that sea grant was designed to do.

Thank you very much.

Senator PELL. Thank you very much, indeed, Dr. Wick.

One question that bothers me a little bit is, we have heard reports that some of our scientists prefer to work on ONR, the Office of Naval Research, or the National Science Foundation programs instead of sea grant. Is there any truth to that, in your view? And if there is, what would be the reason?

Dr. WICK. Sea grant is a managed program, in the sense that it has a goal of action. This has nothing to do with how good the science is, in my opinion. There are some faculty members who choose to work with sea grant's action orientation. There are other scientists who are working in a less structured, less high-paced area, and probably would prefer not to be involved in sea grant.

I think the important thing is that we are developing in most of our programs a group of young scientists—young, not necessarily in age, but in attitude—that are interested in being where the action is. They are interested in putting their best knowledge and technology and time on the line for programs that are useful directly for people.

So I'm not concerned about that attitude. I can explain it very easily. I'm very happy that there are sea-grant-type people being developed.

Senator PELL. Speaking of action, do you have any what we might call aquaculture agents? I was very impressed when I was in Japan to see, like the county agents—the agricultural county agents, but they have them as aquaculture county agents—who are not scientists; they are technicians who show these skippers how to put together the best fuel efficiency for their vessels, how to mend their nets just a little better, how to harvest the product of the sea. And I was wondering if you have developed any such technicians?

Dr. WICK. Yes; we have. Our advisory program is structured in two fashions. One, it is structured geographically so that we have the entire major areas of coastal land covered. Second, it is structured by discipline, or areas of interest.

So we have agents who have responsibility for an area, plus the total State's effort, perhaps, in aquaculture, or fisheries engineering, or coastal-zone management questions, or estuary management, or something like that. We try to cover these bases.

Senator PELL. How many would you have in your own institution?

Dr. WICK. How many in our advisory program?

Senator PELL. No. Out of the Oregon State University, how many county agents have you trained and are now working?

Dr. WICK. That is two different questions, because we have trained some of the ones that are working around the country. We are very fortunate that they have chosen to intern in our program.

Senator PELL. That is why I asked two separate questions.

Dr. WICK. We have currently four—marine extension agents we call them—that have geographic responsibility. These are backed up by a team of specialists in a number of disciplines.

Senator PELL. I would like to ask this question to Dr. Ostenso, too, if I could. How many, on a national basis? How many county aquaculture agents—or what do you call them? marine extension agents—would there be presently functioning in the United States?

Dr. OSTENSO. The figures I'm going to give you are full-time equivalents. There are many more bodies involved in both the geographic generalists and the subject-area specialists.

We have grown from 209 to 260 in the last 2 years.

Senator PELL. These are technicians? These are not Ph. D.'s, these are not M.A.'s?

Dr. OSTENSO. They are all levels. There are 260 full-time equivalents, which represents a gene pool of probably three times that number of individuals.

Senator PELL. But these are people willing to get cold, and their feet wet, and go out on the trawlers on the vessels with the fishermen, saying "Why don't you do this instead of that?"

Dr. OSTENSO. Absolutely.

Senator PELL. Do you have any idea how they are divided up on the two coasts?

Dr. OSTENSO. I could submit that for the record.

Senator PELL. I would be very interested if you could, even on a State-by-State basis.

Dr. OSTENSO. I can also split it out by generalists and specialists.

[The following information was subsequently received for the record:]

Full time equivalents (FTE's), as defined in the attached, are presented for two classifications—specialists and agents. The distinction between the two categories is primarily one of employment classification and not function. Specialists and agents are involved in taking voluntary education and service to marine resource users. Specialists usually have state or multi-county responsibility and have indepth expertise in a particular subject area. Agents tend to have multi-county or county responsibility and become involved in a variety of subject areas. The FTE's presented do not include clerical support or the many Sea Grant researchers involved in advisory activities, although the Sea Grant researchers contributions are a noted input to the marine advisory program to the extent that many of them add a percentage of time of their research project specifically to include marine advisory work; that is, workshops, publications, et cetera.

SEA GRANT MARINE ADVISORY/EXTENSION FTE'S AS OF DECEMBER 1977

	FTE's		Total
	Specialist	Agent	
East coast:			
Connecticut.....	2.7		2.7
Delaware.....	6.25	2	8.25
Florida.....	6	8.5	14.5
Georgia.....	8.75	3	11.75
Maine.....	5.3	6.7	12
Maryland.....	2.66	2	4.66
Massachusetts.....	7.1	2	9.1
New Hampshire.....	5.9		5.9
New Jersey.....	2.1		2.1
New York.....	3.33	9	12.33
North Carolina.....	8.45	7	15.45
Rhode Island.....	9.85		9.85
South Carolina.....	3.7	1	4.7
Virginia.....	17.8	1	18.8
Total.....	89.9	42.2	132.1
West coast:			
Alaska.....	6.1	3.75	9.85
California.....	7	8	15
Hawaii.....	7	6	13
Oregon.....	9.5	4	13.5
Washington.....	7.5	3.8	11.3
Total.....	37.1	25.6	62.7
Gulf coast:			
Alabama.....	2.6		2.6
Louisiana.....	6.25	5	11.25
Mississippi.....	4.5		4.5
Puerto Rico.....	.35	3	3.35
Texas.....	15	6	21
Total.....	28.7	14	42.7

See footnote at end of table.

SEA GRANT MARINE ADVISORY/EXTENSION FTE'S AS OF DECEMBER 1977—Continued

	FTE's		
	Specialist	Agent	Total
Great Lakes:			
Michigan.....	2.65	3.75	6.4
Minnesota.....	3.83		3.83
Wisconsin.....	9.3		9.3
Total.....	15.8	3.8	19.5
FTE total.....	171.5	85.5	257

¹ This total FTE represents 315 individuals.

Dr. OSTENSO. We do have a cadre of aquaculture advisers, too, who have established a central aquaculture information service so that interested members of the public will have access to a central repository of aquacultural information.

Senator PELL. I thank you very much, indeed, Dr. Ostenso.

Dr. Wick?

Dr. WICK. Could I add, Senator Pell, that our advisory agents—our marine extension agents—are full-fledged faculty members in the same sense as our research and teaching counterparts at Oregon State University.

This varies somewhat across the country by institution, but they are full-fledged people and they love to get their feet wet.

Senator PELL. Good.

Thank you very much, gentlemen, and on behalf of Senator Hollings and the Commerce Committee.

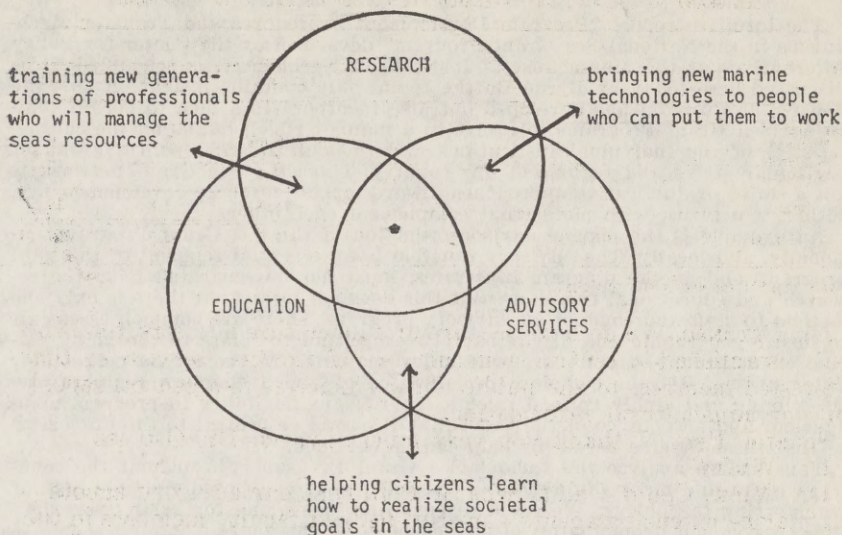
[The statement follows:]

STATEMENT OF WILLIAM Q. WICK, DIRECTOR, SEA GRANT COLLEGE PROGRAM,
OREGON STATE UNIVERSITY

Chairman, Senators, and Members of the Subcommittees, my name is Bill Wick. I speak today as President of The Sea Grant Association, a group of more than forty marine-oriented universities dedicated to the Sea Grant concept of helping to put America's oceans to work through research, education and advisory services. But I'm also here as Director of one of the twelve Sea Grant Colleges—Oregon State University.

It is an exhilarating experience to be a pioneer in activating a great idea. Thank you for that privilege. When the Senate and the House in 1966 passed the original Sea Grant legislation, there were wise heads involved. The Sea Grant Program is a productive and great idea for America.

Sea Grant has been likened to development of the Land Grant system of universities more than a century ago. And in some ways, Sea Grant is similar. But there are important differences, if not in style, then in functional timing. For Sea Grant was born with a mandate to functionally integrate from the start, the research, education and training and advisory service activities. This is a vital concept and helps to explain the Sea Grant contributions toward marine development that have taken place in the few short years of the program's existence. Sea Grant as a functional trinity can be shown as diagrammed on the following page.



*SOCIETAL PROGRESS: Changing people's behavior to ensure economic welfare and environmental health for the world and its human community

Our Sea Grant programs are composed of projects. Projects are categorized as research, education or advisory by function. But each projects contains, to a varying degree, all three functions. By keeping these functions closely coordinated, our clients, the people of America, can utilize results at the earliest possible time.

And this is happening. A network of truly marine-oriented universities is evolving. And these universities are learning to work together in the elusive pursuit of optimal development, use and conservation of marine resources. Sea Grant has provided a catalytic and synergistic effect to mould narrowly focused schools of oceanography or fisheries into genuine and marine universities.

An example is my home base, Oregon State University. Prior to Sea Grant we had a young, large, and excellent Department of Oceanography focused mainly on the classical approach to Oceanography. We had maintained a seafood element in our Department of Food Science and Technology since 1940. Our Department of Fisheries and Wildlife had a historic relationship with oyster and salmon studies but no offshore fisheries capabilities. While purity of discipline has been maintained, Sea Grant activities have provided the catalyst to enlist appropriate segments of eight schools and colleges and about twenty academic departments toward marine resource development activities. We have expanded seaward in a holistic sense with emerging or mature programs in the classical disciplines plus strong efforts in Engineering, Law, Extension, Forestry, English, Anthropology and other areas. These additions are not simply a stray project or course, here or there, but rather a functional program with elements of research, education and advisory services throughout. Beginning with a cadre of "old pros," we and others in the Sea Grant system are developing a new cadre of ocean-oriented faculty who choose to be where the action is.

The intuitive report "Program Development Procedures and Transfer Mechanisms in the National Sea Grant Program" developed by the Center for Policy Alternatives at the Massachusetts Institute of Technology, is scheduled to be discussed here today by Byron Battle. It not only contains insight on how the Sea Grant Program has developed but also incorporates a plea to permit individual Sea Grant Programs to evolve in a manner which builds on the characteristics of the individual institutions and the cultural and political arena of particular states and regions of our country. Thus, the Sea Grant network is not a series of duplicative approaches toward marine resource development but, rather, a network with pieces that complement each other.

An example is the marine advisory function of the Sea Grant Program, nationally, and locally. The advisory function is an essential segment of the total program, and as the diagram illustrates, must not be separated from the research and educational functions. But this does not mean that there is only one method to staff and conduct an advisory program. There are common essentials: to insure geographic and disciplinary coverage and to relate to the many marine client groups—from those who enjoy seascapes to those who make their living at sea. But the complex specialization of high technology requires precise timing and highly trained talents. This means flexibility in program management and acceptance of the Sea Grant Program as central to the university so that these diverse needs for help can be obtained.

Thus, as we analyze the various Sea Grant Programs throughout the country, we can find many differences in approach to the supposedly simple task of transferring technology. We could discuss this idea alone for a long period of time. A common denominator, often unspoken, is the goal of helping people to grow into more productive and informed citizens, using new marine knowledge as the medium through which this growth can occur. And it is happening, in Oregon and throughout the Coastal and Great Lakes states.

In fact, the "people element" stimulated in Sea Grant Programs is an unusual aspect of technology programs in general and completely unique in Sea Grant among marine resource development efforts. People are central to Sea Grant. Our citizens help to design our programs. Citizens advisory and policy councils are attached to many of the programs. The partnership funding from federal, state, and local government and industry involves citizens at many levels—and involves them meaningfully as generators of ideas and needs and users and evaluators of results.

Sea Grant is having an impact on how America chooses to develop, utilize and conserve marine resources. As Niels Rorholm, Sea Grant Director at the University of Rhode Island, recently stated: "This impact, I believe, could not have been achieved through the channels available to us prior to the Act (Sea Grant Act of 1966). There simply was no mechanism that made it possible for people in industry, in the universities, in local, state and federal governments to co-operatively solve marine problems that were perceived locally but solved within a national framework using university science and technology."

Is the Sea Grant Program a good investment for America? This can be answered in many ways and the question itself might seem to be self serving. To me, the answer has to be a resounding yes. Many of the results do not lend themselves to a fast cost-benefit analysis. Perhaps the most important results are the several thousand well-trained students who are now at work in America's marine industries, governments, and universities as a result of Sea Grant supported training. Although some of these young people perhaps would have finished their undergraduate and graduate studies in traditional fields whether Sea Grant had existed or not, there are many others who are products of fields that didn't formally exist prior to Sea Grant. Consider the marine resources management curricula at several universities, the maritime law programs, the increased sophistication of ocean engineering, and the marine advisory education programs, among other specialties. Consider also the emerging programs at a number of schools attempting to bridge technology and the humanities—to give feeling and meaning to the precise rigor of marine sciences and engineering.

The National Sea Grant Program provides support for several hundred research projects each year. These projects are tied into systematic programs to help in solving marine problems. Some provide immediate payoffs while the results of others form a building block for other questions. A few in each program may provide results which more than pay for the entire effort. Let me recount for you one that provides an example. In 1968, the first active year of Sea Grant at Oregon State University, we began a series of research projects on the new idea of

ocean ranching of salmon. We hypothesized that large numbers of salmon smolts could be incubated adjacent to an estuary stream, imprinted with brackish water, and released without feeding. We anticipated about a 1 percent return at maturity. Results to date are promising, though not conclusive, but promising enough that a major company is expending twelve million dollars in capital construction and will invest eight million dollars in operating capital in the next five years. This company last month opened the largest salmon hatchery in the United States (perhaps the largest in the world). The annual production is pegged at eighty million salmon smolts released per year, within five years. They currently have more than twelve million fish ready for release.

Oregon has become the center of the ocean ranching industry. Several other companies are preparing to make substantial investments. The Director of our State Fish and Wildlife agency, speaking to a legislative interim committee last week, predicted that an additional four and one-half million salmon—above the three million of today (about forty-five million pounds with a raw product value of at least fifty million dollars) would be added to the Oregon harvest annually by 1985—and this would largely come from private ocean ranching efforts.

Now, I recognize with you that these are a lot of paper fish that we are talking about. This is high risk, leading edge effort. But it is exciting. And the research investment through Sea Grant was a minor, but essential, series of steps in the process. The research embodied hatchery technology, disease and nutrition work, economics and marketing, legal studies leading to state laws, and continuous marine advisory efforts. Parts of this Sea Grant developed technology are being utilized internationally in Canada, Japan, Russia and Chile.

Another Sea Grant aquaculture example also has an active international component. John Fryer, Chairman of the Department of Microbiology at Oregon State University, although mild mannered and humble, is one of the leading fish virologists in the world. He, his staff and students, are among the leading developers of vaccines to control fish diseases. A portion of the work is under the auspices of the U.S.-Japan Cooperative Science Program. Next week John will leave for visits in Japan, Taiwan, Hong Kong and Bangkok to exchange information. I applaud the opportunities for mutually useful international exchanges of technical information which can lead to better use of marine resources and am pleased that the Sea Grant Program offers the chance to do these.

I've been accentuating the positive. That's normal. I feel positive about Sea Grant. But that doesn't mean that everything is perfect. Not everyone loves us. As we move closer to the center of problems in marine resource development and begin to make a difference, we tend to shake up some dust that has lain fallow. Change can be threatening. With a broad program like Sea Grant, there are those who plead with us to spend more time and effort on their particular interest. There are others who wish we would go away. As we become accepted, the demands for more research, education and advisory programs are far greater than our resources will permit.

Yes, we need more money from the federal side to take advantage of the great opportunities that are opening to Sea Grant Programs throughout the country.

Thank you for the opportunity to speak with you today and for your vision in the Sea Grant Act some twelve years ago.

Senator PELL. I would adjourn the meeting at this time, and I thank everybody for being here.

[Whereupon, at 11:20 a.m., the hearing was adjourned, subject to the call of the Chair.]

[The following information was subsequently received for the record:]

U.S. SENATE,
Washington, D.C., March 13, 1978.

HON. HOWARD W. CANNON,
Chairman, Senate Committee on Commerce, Science, and Transportation, Russell Senate Office Building, Washington, D.C.

DEAR HOWARD: Enclosed herein is a copy of a letter which I have received from Dr. Rita Colwell, Director, University of Maryland Sea Grant Program. The Sea Grant Program at the University of Maryland is very well administered and has undertaken many fine research activities to assist the vital

seafood industry in Maryland. As you know, the Chesapeake Bay and its estuarine system is one of America's great natural resources and through its Horn Point oyster hatchery, the University Sea Grant Program has undertaken research to increase the oyster production in the Bay. Recently Dr. Colwell, a highly regarded microbiologist, has been named as Director of the Program.

As Dr. Colwell indicates in her letter, the increased authorization for the Sea Grant Program is important to the University of Maryland's effort. I therefore thought that a copy of her letter would be of interest to the members of the Committee when it undertakes the hearings in April.

Your attention in this matter is appreciated.

With best regards,

Sincerely,

PAUL S. SARBANES,
U.S. Senator.

Enclosure.

UNIVERSITY OF MARYLAND,
College Park, February 7, 1978.

HON. PAUL S. SARBANES,

U.S. Senator,

Dirksen Senate Office Building, Washington, D.C.

DEAR SENATOR SARBANES: It is my understanding that the Sea Grant authorization hearings will be held in Washington, D.C. on February 9, 1978. I hope that you will support strongly the Sea Grant authorization. That authorization increase to \$55 million for each of the fiscal years 1979 and 1980 is clearly justifiable, in my view, in regard to the excellent contributions made by Sea Grant Colleges in the area of marine research, education and advisory service. The University of Maryland Sea Grant Program will benefit considerably from increased authorization, since we are somewhat late in our membership in the Sea Grant institutional program activity and, therefore, have suffered from the fact that the ongoing institutions have continued to receive funding and little new funds were available for new programs, such as that at the University of Maryland. Therefore, I would urge you to support the Sea Grant Program which comes before the Subcommittee on Oceanography.

Thank you for your interest in our work here at the University of Maryland.

Yours sincerely,

R. R. COLWELL,
Director, University of Maryland Sea Grant Program.

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The first part of the report deals with the general situation of the country and the progress of the work during the year. It is followed by a detailed account of the various projects and the results achieved. The report concludes with a summary of the work done and the prospects for the future.

REPORT ON THE WORK OF THE COMMITTEE

The Committee has the honor to acknowledge the assistance rendered by the various departments and the progress made during the year.

The Committee has also the pleasure to announce that the work of the year has been completed and that the results are satisfactory.

The Committee has the honor to recommend that the work of the year be approved and that the results be published.

Very respectfully,
The Chairman of the Committee

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