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OCEANOGRAPHY MISCELLANEOUS—PART 1

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DOCUMENTS

HEARINGS

BEFORE THE

JUL 7 1980

SUBCOMMITTEE ON OCEANOGRAPHY

FARELL LIBRARY
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OF THE

COMMITTEE ON

MERCHANT MARINE AND FISHERIES

HOUSE OF REPRESENTATIVES

NINETY-SIXTH CONGRESS

ON

DRILLING MUD RESEARCH OVERSIGHT

MARCH 3, 1980

SEA GRANT REAUTHORIZATION AND OVERSIGHT

FEBRUARY 21, 1980

CHESAPEAKE BAY RESEARCH COORDINATION—H.R. 4417

(JOINT HEARING WITH SUBCOMMITTEE ON NATURAL RESOURCES AND ENVIRONMENT OF THE COMMITTEE ON SCIENCE AND TECHNOLOGY)

SEPTEMBER 6, 1979

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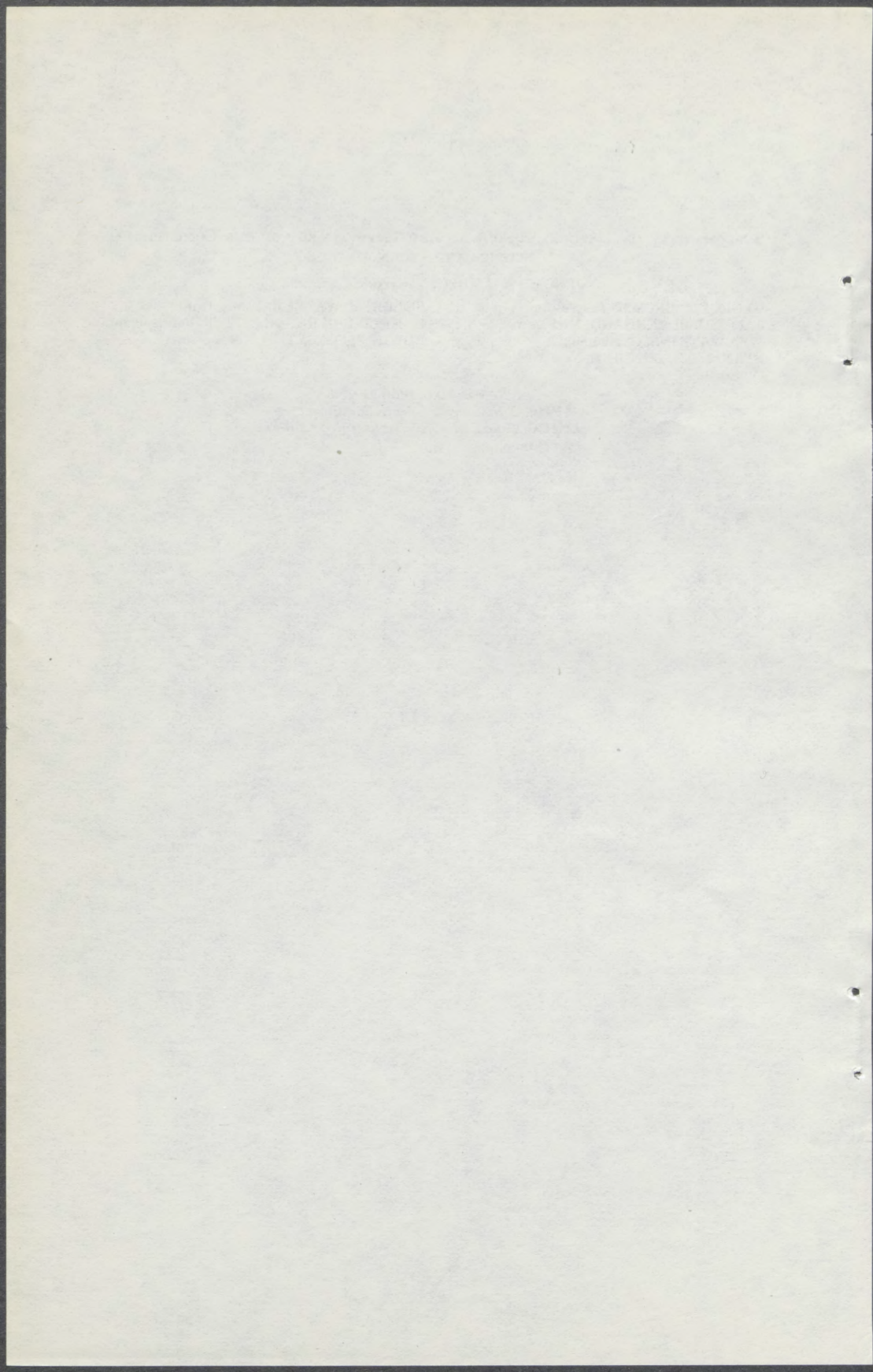
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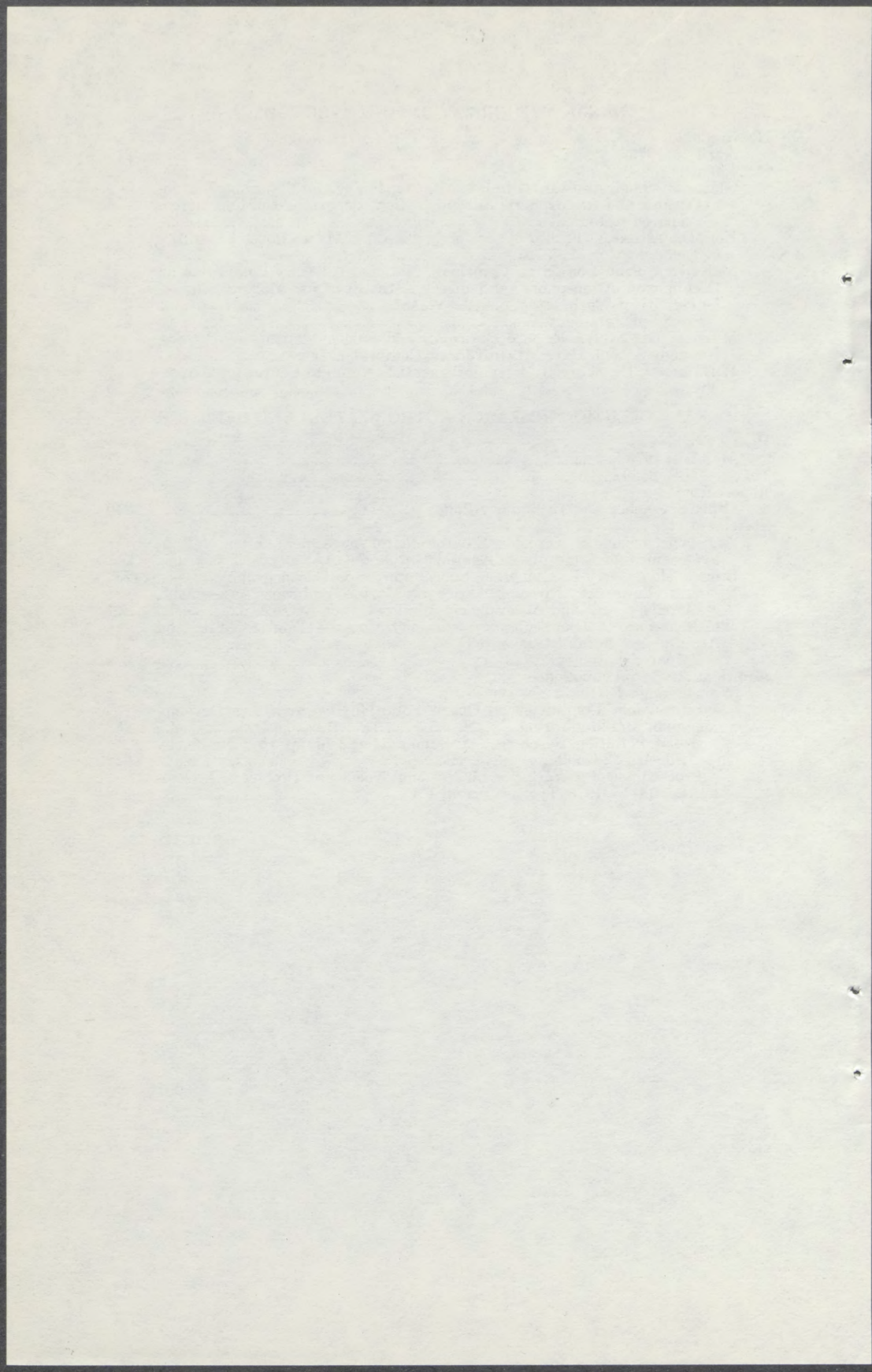
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DRILLING MUD RESEARCH—OVERSIGHT

MONDAY, MARCH 3, 1980

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON OCEANOGRAPHY,
COMMITTEE ON MERCHANT MARINE AND FISHERIES,
Washington, D.C.

The subcommittee met at 1 p.m., in room 1302, Longworth House Office Building, Hon. Gerry E. Studds (chairman) presiding.

Present: Representatives Studds, Forsythe, and Emery.

Staff present: Richard Norling, Diane Hull, and Curt Marshall.

Mr. STUDDS. The meeting will come to order. I have just arrived on an airplane and I am leaving again on an airplane at 3:30. This subcommittee will proceed, votes or no votes. I will not leave this chair. There are no votes of consequence on the floor today. Whatever members come and go, the chairman will go straight through, as long as it takes, until 3 o'clock. I wish to apologize to the witnesses for what happened the last time.

The Subcommittee on Oceanography meets today to receive scientific and technical testimony concerning available research on the nature and composition of drill muds, drill cuttings, and formation waters, and their short- and long-term effects on the environment. These are materials either used in, or incidental to, offshore oil and gas drilling.

Drilling muds are mixtures of clays, diverse chemicals, and water which are used as a lubricant during oil and gas operations. These muds, which vary greatly in composition depending upon the specific requirements of an individual well, are also pumped into the oil wells to reinforce the walls of the drilled hole, to weight the drilling column which helps prevent blow-outs, and to transport cuttings to the surface.

Drill cuttings are those pieces of the seabed and subsurface rock which are displaced or impacted by the drilling process.

Formation waters are the waters found in off-shore oil and gas reservoirs which contain petroleum, dissolved mineral salts, and traces of heavy metals. These waters are generally separated from the oil and gas at the surface and simply returned to the water column from the oil rig.

All of these materials contain potentially hazardous substances which could adversely affect biological populations.

The extent of that hazard is the subject of considerable debate within the scientific community which includes government, industry, and private researchers.

In order to make intelligent assessments of the effects of certain activities on the OCS, the Congress and relevant agencies must have access to conclusive scientific research upon which to base

those assessments. It is for this reason that the subcommittee has requested witnesses from the Department of the Interior, the National Oceanic and Atmospheric Administration, and the Environmental Protection Agency to appear before it to offer an assessment of current scientific knowledge.

Representatives of the Department of the Interior have stated in past testimony that they possess a "shelf full" of studies on these materials, none of which indicates any adverse long- or short-term environmental effects.

However, in July of last year NOAA stated that the evidence on these materials was "contradictory and controversial" and, in fact, recommended barging of these materials off Georges Bank to avoid unreasonable risk to the fisheries.

This member has seen studies which indicate "no effect" and others which indicate "significant effects." At least one industry publication would indicate that we do not know the composition of these materials, let alone their effects.

Thus, in an effort to eliminate our confusion—to resolve some of these incongruities—today's hearing has been called.

Without objection, I will ask that the statement of Henry L. Longest II, Deputy Assistant Administrator for Water Program Operations, Environmental Protection Agency, be made a part of the record.

[The following was received for the record:]

STATEMENT OF HENRY L. LONGEST II, DEPUTY ASSISTANT ADMINISTRATION FOR
WATER PROGRAM OPERATIONS, ENVIRONMENTAL PROTECTION AGENCY

Good afternoon, Mr. Chairman and members of the subcommittee. I am pleased to be here again to discuss the responsibilities of the Environmental Protection Agency to regulate discharges into ocean waters resulting from offshore oil and gas development, a subject we briefly touched upon during the Ocean Dumping Act reauthorization hearings last week.

It is my understanding that the primary focus of the hearing today is to address the specific research directed to understanding the nature and the potential impacts of such discharges. For that purpose, I have with me today Dr. Norman Richards, who is an Associate Director of our Florida Gulf Breeze Laboratory, and Dr. Suzanne Bolton, a marine biologist with our Ocean Programs Branch.

Before dealing with scientific and technical details, however, I would like to give the Subcommittee a brief review of EPA's authorities in relation to ocean activities, specifically Outer Continental Shelf drilling and production operations. These authorities are intended to minimize the adverse impacts of industrial activities on the environment through setting consistent standards covering the full range of waste disposal problems.

Under EPA's existing regulatory programs, municipal and industrial discharges into ocean waters are regulated under section 402 of the Clean Water Act through issuance of a National Pollutant Discharge Elimination System (NPDES) permit. Disposal of waste materials through dumping into ocean waters is regulated under the Marine Protection, Research and Sanctuaries Act (MPRSA) by the issuance of Ocean Dumping Permits. These two statutes are intended to operate as a comprehensive, integrated consistent regulatory framework for the control of ocean pollution.

EPA has established Effluent Guidelines which are technology based standards that form the basis for discharge limitations contained in NPDES permits for a number of classes of industrial activities. The oil and gas extraction industry is one "class" of industry for which discharge limitations have been established. In most instances, these standards may be adequate to handle the discharge concerns. However, where OCS development and production takes place near sensitive areas, the Effluent Guidelines may not necessarily provide adequate protection, and site specific decisions may be needed for developing more restrictive permit conditions. Such decisions must be researched through analysis of specific information that is

tailored to identify the special concerns relating to the effect of a particular discharge on a particular area of the ocean.

The requirement for individual analyses of discharges into marine waters is contained in section 403(c) of the Clean Water Act, as amended. The Agency has recently proposed a set of "Ocean Discharge Criteria" which will be used in the future as the basis for issuing NPDES permits under Section 402 of the Clean Water Act.

Under section 403, NPDES permit requirements for discharges into marine waters must reflect the effect of such discharges on the local ecosystem. EPA has instituted drilling related research and monitoring programs designed to fill these regulatory needs. Environmental concerns being addressed include the effects of chemicals discharged during oil and gas drilling activities that originate from: (a) "drilling fluids" or "drilling muds"—chemicals added to the well-bore which are later discharged; and (b) "cuttings"—formation solids that become suspended in the drilling fluid. These effluents are discharged into the aquatic environment during exploratory and developmental drilling.

The development of additional data on what, if any, adverse environmental effects occur through normal oil and gas drilling and production will further assist in providing appropriate environmental controls on these activities, particularly in ecologically sensitive areas. At the same time, it may eliminate unjustified concern about certain chemicals used in drilling fluids and also prevent over-regulation of oil and gas development and production.

Thank you for giving me the opportunity to provide the Subcommittee an overview of EPA's regulatory authorities in this area.

Mr. STUDDS. Let me briefly set the stage. We are focusing on drill muds and I would like to focus on three broad questions with regard to drill muds, drill cuttings and formation waters.

First of all, what is in them? What are they? What is their chemical composition?

Second, what degree of toxicity is there for those components for the marine environment, for marine organization?

Finally, what are their lethal and chronic effects? What is their nature? What happens to them when they are discharged over the waters over physical dispersal and over time, and what do we know about them over significantly long periods of time in a marine environment?

In a broad general way, those are the questions that concern the subcommittee. We would like to focus on scientific and factual questions. We have no policymakers here, no assistant secretaries and even no deputy assistant secretaries. We have people here who know something. That is an important distinction. That is our intention and our effort. That is already a distinctly improved atmosphere over what we usually face. I will steer away from questions which are essentially policy questions. It is our firm intention and desire to get at, as far as our knowledge will permit us to do so, questions of scientific fact. We want to know how much we know in this area and what kind of reliability we can ascribe to that knowledge.

I have before me a list of who I am facing here. For the benefit of everyone present, I will ask you to identify yourselves.

STATEMENTS OF DEAN PARSONS, OCS COORDINATOR, NATIONAL MARINE FISHERIES SERVICE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, AND TOM BURKE, OCEANOGRAPHER, BUREAU OF LAND MANAGEMENT, DEPARTMENT OF INTERIOR, ACCOMPANIED BY TERRY HIGHT, CHEMICAL ENGINEER, U.S. GEOLOGICAL SURVEY, GULF OF MEXICO OFFICE, AND NORMAN RICHARDS, ASSOCIATE DIRECTOR FOR EXTRAMURAL ACTIVITIES, GULF BREEZE ENVIRONMENTAL RESEARCH LABORATORY, U.S. ENVIRONMENTAL PROTECTION AGENCY, GULF BREEZE, FLA., ACCOMPANIED BY SUZANNE BOLTON, MARINE BIOLOGIST, OCEAN PROGRAM BRANCH

Mr. HIGHT. Terry Hight, I am with the U.S. Geological Survey, Conservation Division, Gulf of Mexico Office. I am a chemical engineer.

Mr. BURKE. I am Thomas Burke, Biological Oceanographer, Bureau of Land Management, Department of Interior, Washington, D.C.

Dr. RICHARDS. I am Norman Richards, Environmental Protection Agency, Environmental Research Laboratory, Gulf Breeze, Fla., and I am a biologist.

Dr. BOLTON. I am Suzanne Bolton. I am with the Environmental Protection Agency in Washington. I am a biologist.

Dr. PARSONS. I am Dean Parsons of the National Marine Fisheries Service in Washington in the Office of Habitat Protection. I am an estuarine ecologist.

Mr. STUDDS. I will spare myself the embarrassment of introducing myself in a similar fashion. I know absolutely nothing at all. I will sit in awe of you.

Does anyone have a prepared statement?

Dr. PARSONS. I have an oral statement that refers to the kind of research that NOAA has completed and is doing now, although I notice it is not necessarily in line with the three questions you posed.

Would you care for me to run briefly through it.

Mr. STUDDS. I would appreciate it if you would focus on those three broad questions.

Dr. PARSONS. Since they refer to the kind of research going on, and not to your questions posed, I will not make a statement.

Mr. STUDDS. Feel free, if you think it is important, to insist that it is important. We will leave that to your discretion. If you have anything in writing, that will appear as you wish at any time.

Does anyone else have a statement?

Mr. BURKE. Mr. Chairman, I have a statement which, in several ways, addresses the questions you are interested in. I can read it or do as you wish.

Mr. STUDDS. It is four pages long. Would you like to read it and/or summarize it for us just to start things going?

Mr. BURKE. I think I would prefer to read it to catch all the points.

Mr. STUDDS. OK.

Mr. BURKE. Mr. Chairman, thank you for the opportunity to discuss the state of scientific knowledge about the composition of

drill muds and cuttings and formation waters, and their effects on marine biological populations.

The Bureau of Land Management is responsible for leasing of lands on the Outer Continental Shelf for oil and gas development. The National Environmental Policy Act (NEPA) and the OCS Lands Act Amendments of 1978 dictate that we conduct environmental assessments of the impacts of oil and gas development before, during, and after such development occurs in different geographic regions. Specifically, assessments are performed and published as environmental impact statements prior to offshore lease sales; drilling operations in the vicinity of important biological features are monitored; and the effectiveness of lease stipulations and other regulatory measures is evaluated after operations have commenced.

BLM has established an environmental studies program with responsibility for gathering pertinent environmental and socio-economic data to support the OCS leasing and development decisions. The program began in 1974 with a major objective of determining the long-term impacts of offshore oil and gas development on the physical, biological, and human environments. Our strategy then, and for nearly 3 years thereafter, was to collect extensive oceanographic data to establish "baseline" or benchmark environmental conditions which could be monitored in later years for any substantial alterations in natural conditions that might be induced by oil and gas development. In 1978, we redirected our program emphasis to address specific issues that would affect key decisions in a more immediate and timely fashion. This approach, which was started in fiscal year 1979, has been effective. Information needs are developed at the regional level with participation of Federal, State, and public entities. A national program of studies is forged from the various regional needs; studies are conducted in the field or laboratory; and derived information is transferred to different decision-making levels and agencies.

Studies on drilling muds have been a part of the BLM research program since its inception. It was recognized at that time that muds could contain noxious substances such as heavy metals, biocides, and even oil, that can be introduced to the marine environment via operational and bulk discharges. Little was known about these components, however, and our initial efforts concentrated on the physical dispersion of the muds in the water column and onto the bottom. Metal and mineralogic analyses were used to track the behavior of the plume from drilling rigs. In a special case, the Flower Gardens coral reef in the Gulf of Mexico, we have been monitoring the habitat itself for indications of damage, as well as the drilling operations and shunted discharge of drill fluids.

We have attached a list of the studies that we have conducted through fiscal year 1979 related to the effects of drill muds. It should be noted that these studies are field efforts on physical transport and habitat monitoring. We have not conducted toxicity tests on muds or their components. The last study on the list, Formation Water Dispersion Model, is directed at impacts of formation water. I can give you more details on these studies now or can provide it for the record.

As a result of the recent interest in drilling fluids impacts, including a symposium on the fates and effects of drilling fluids held in Orlando in January of this year, BLM has begun a review of its current research, with a goal of organizing its various research needs into a program element. The symposium was jointly sponsored by government and industry, and was attended by over 350 interested parties and researchers from the United States, Canada, and several other foreign countries. Many interesting and often conflicting results were presented, but several points stand out as directives for any future research, including:

- The need for more information on the composition of muds;
- More standardized bioassay methods;
- Appropriate test organisms, test materials and concentrations;
- Study design based on the apparent localized nature of effects of muds;

- Emphasis on the physical impacts of muds in the field versus the toxicological impacts; and

- A need to synthesize existing information.

With these ideas in mind, our efforts this year on drill muds research are directed along several lines. First, an intensive literature survey and synthesis on drilling muds characteristics, components, transport and effects, will be conducted under contract. Second, BLM, as part of an Interagency Committee for Flower Gardens Research, is helping to develop a research program for those coral reefs in the Gulf of Mexico that will include components for drill mud transport, effects at the laboratory and field level, and an examination of different methods of discharge, including shunting and limited rates. The Mid-Atlantic Biological Task Force on OCS Operations is also beginning to design some research for that area.

In addition, as a result of a recent lease sale in the Georges Bank, a Biological Task Force for the North Atlantic has been established to give advice on matters associated with environmental protection. Questions regarding disposal of drilling fluids will be addressed by the task force. Information which is available and is being collected and analyzed will be of use to the task force. In addition, the task force will be involved in assessing needs for information and methods of data collection.

While it is clear that drilling fluids research will command a larger portion of our program's efforts and funds, the analysis has not yet been made as to how and where to dedicate the effort to best meet our information needs in OCS decisionmaking.

We welcome the assistance of technical experts in Federal agencies and private institutions in developing our information base.

That concludes my statement.

I would also like to offer for the record the chart that appears at the end of my statement.

Mr. STUPPS. That will be made a part of the record.

[The following was received for the record:]

DRILLING FLUIDS RESEARCH THROUGH FISCAL YEAR 1979

Title ¹	Contractor	Contract number
MAFLA Rig Monitoring Study (B).....	State University System, Institute of Oceanography.	CT5-30
Biological and Geological Reconnaissance of Selected Topographical Features on the Texas Continental Shelf (B).	Texas A. & M. University.....	CT5-4
Central Gulf of Mexico Ecological Investigations of Petroleum Production Platforms (B).	Southwest Research Institute.....	CT8-17
Northern Gulf of Mexico Topographic Features Study (B).	Texas A. & M. University.....	CT6-18
Do.....	do.....	CT7-15
Do.....	do.....	CT8-35
South Texas OCS Baseline Study Rig Monitoring (B).....	University of Texas.....	CT6-17
Formation Water Dispersion Model (B).....	University of Southern California.....	YN-020, CT9-002

¹ Study types: (A) literature surveys, (B) monitoring and plume dispersal, (C) laboratory/field toxicity.

Note.—The first 7 studies were designed to monitor the results of drilling activities. Additionally, toxicity and plume dispersal studies have been carried out by several consultant organizations as a result of various BLM requirements. Examples include the "Tanner Bank Mud and Cuttings Study" conducted for Shell Oil Company by Ecomar, Inc., and the "Drilling Fluid Dispersion and Biological Effects Study for the Lower Cook Inlet Cost Well" conducted for the Atlantic Richfield Company by Dames and Moore.

Mr. STUDDS. Thank you very much.

Is there anyone else who wishes to make an opening statement?

Do I address you all as doctors?

Mr. HIGHT. No.

Mr. STUDDS. You do not wish to be called Dr. Hight?

Mr. HIGHT. No.

Mr. BURKE. No.

Mr. STUDDS. The two on my left will not be addressed as doctors.

Let me start by asking each of you, and I will begin with the Interior Department what we know, I guess what your agencies know because I already have an impression there may be a difference in degree of research, about the chemical composition of drilling muds.

Interior?

Mr. HIGHT. In "World Oil" each year they publish a listing of the chemical names and trade names of components used in drilling muds and we also have a list from Dresser Industries, Magcobar, listing in general terms the chemical composition of their trade-name products, and other products that they sell.

Mr. STUDDS. What do you mean in general terms?

Mr. HIGHT. I mean generally if they were going to say a certain hydrocarbon, they might say a paraffinic hydrocarbon.

Mr. STUDDS. Is that explicitly sufficient?

Mr. HIGHT. For gross toxicity information, it is for me.

Mr. STUDDS. Let me just ask the same questions to the other agencies.

What do we know about the composition of these animals?

Dr. RICHARDS. The problem is not so much what we know, but what we do not know. Drilling fluid is a complex mixture of mixtures. The ingredients include a wide variety of chemicals. The problem is some of them appear to be proprietary. The American Petroleum Institute's component listing states that fact. Another problem is that these mixtures appear to undergo transformations downhole. We know some of the things that go into the drilling fluids, but we don't know them all. Drilling fluid components con-

tain contaminants—they are not pure chemicals—they are complex mixtures of industrial grade chemicals. Only the trade names of most chemicals are known. The problem is: in order to do predictive toxicology and predict what effect, these things would have on organisms, we really need more information on the chemical analysis.

Mr. STUDDS. Dr. Bolton, do you want to add to that?

Dr. BOLTON. I don't think I really have too much more to add right now.

Mr. STUDDS. Dr. Parsons, NOAA?

Dr. PARSONS. Just one or two comments.

I agree with Dr. Richards' statement also. In my review of permit applications, there is often mention of additives used in the drilling mud, but usually very little indication of what they are or what their concentration may be. I have before me a list of 15 categories of drilling fluid additives commonly used: lubricants, flocculants, bactericides, et cetera. I have no idea of what chemicals are found in these additives nor what their toxicities are. This information is not provided in drilling permits.

We do have a good understanding of the basic components that form 90 percent of the drill muds, but very little about the remaining 10 percent.

Mr. STUDDS. Let me go back to the Department of Interior. You have heard two agencies assert that we do not know some of the components. What is your response to that?

Mr. HIGHT. Dr. Parsons mentioned bactericides which are the most toxic of the mud components. He should know what the composition is because bactericides are registered by the Environmental Protection Agency and it is mandatory that the composition be attached to each of the products sold, so that the composition should be known.

Mr. STUDDS. What about the assertion by the other two agencies that there are components which are proprietary in nature and whose composition is not known?

Mr. HIGHT. There are some that we do not know the composition. I have 67 products that show, in general terms, what Magcobar has listed and what their composition is. Basically what it gets down to, there are probably about 500 different tradename products that are used and they represent probably about 25 different products and probably about a dozen of those are used in the drilling of a well.

Mr. STUDDS. At any one time?

Mr. HIGHT. At one time.

Mr. STUDDS. Do you know which it does not list?

Mr. HIGHT. No, it would not be the same for each well. I could tell you the three or four most common ones and then after that, it would depend upon the situation that would arise in drilling, as to what they would be using.

Mr. STUDDS. Am I correct in my understanding that even if we did know, and I gather you are telling us we do not precisely know what goes in the muds and fluids, changes occur during operation due to temperature, pressure and due to the reaction of the additives during the course of the drilling; is that true?

Mr. HIGHT. I am sure changes occur. But if you didn't know what you were putting in, how could you determine that you had a

change coming out? That was EPA's assertion that you didn't know what the composition was, but something was changing.

Mr. STUDDS. Do I detect agreement or disagreement between you and the other two agencies?

Mr. HIGHT. More disagreement than agreement. I think there are some changes, and I think generally one product from one company is similar to another and just because it has a different name on it does not mean we do not know what is in it in general terms.

Mr. BURKE. Several lines of research have tried to overcome this problem. These chemicals, if proprietary or patented, can be purchased and tested.

Mr. STUDDS. Do you do that?

Mr. BURKE. No, I do not, and we have not done any contracting for that.

Mr. STUDDS. Do any agencies of the Federal Government?

Mr. BURKE. I know the Environmental Protection Agency does some. How extensive, I do not know.

Mr. HIGHT. Bactericides are the only products registered by EPA.

Mr. STUDDS. If it is not your agency, Interior, that does the research and the spokesmen for the EPA are the ones who say they don't know, on what do you base your statement that you know?

Mr. HIGHT. It is available. All you have to do is ask the companies for it.

Mr. STUDDS. I have seen literature that says it is proprietary.

Mr. HIGHT. It is.

Mr. STUDDS. What good does it do to ask them for it?

Mr. HIGHT. They won't tell you exactly, but in general terms describe the product.

Mr. STUDDS. Sort of give you a hint?

Mr. HIGHT. Right.

Mr. STUDDS. I am not a scientist, but I understood science to be a little more precise than to operate on hints.

Mr. HIGHT. That is true. I went down and looked over the list as to what compounds were listed. I compared it to the Environmental Protection Agency's Hazardous Substances listing that came out in the Federal Register (February 16, 1979). I saw no hazardous substances based on EPA's definition.

Mr. STUDDS. It is your testimony in the Department of Interior that I quote that we have not conducted toxicity tests on muds or components. You refer to the need for information on the composition of muds in your testimony, yet you assure us we know about them.

Mr. HIGHT. I am sure there are cases in which we don't know the composition.

Mr. BURKE. I was speaking for the Bureau of Land Management's studies program.

Mr. STUDDS. Does the Bureau of Land Management and your group disagree?

Mr. HIGHT. I don't think so. Trade names of products that are used can be purchased and tested for toxicity and chemical composition. If you cannot determine the actual molecular structure, the material is still available for testing.

Mr. STUDDS. Does your agency do the testing?

Mr. BURKE. No.

Mr. STUDDS. Yet you are confident of the results?

Mr. HIGHT. I have the test results for 30 products that Magcobar performed toxicity tests on.

Mr. STUDDS. We are relying on their data and their assurances as to whether or not the product is toxic?

Mr. HIGHT. Yes; I assume their data is correct.

Mr. BURKE. They are publishing in somewhat open forums, subject to discussion and peer review.

Mr. STUDDS. Dr. Richards, I think I hear two agencies of the Department of Interior challenging the assertions made by you and Dr. Parsons that our knowledge of the composition of drill muds is incomplete or inadequate..

Dr. RICHARDS. My colleague, Mr. Hight, just mentioned that biocides are used. Why? The reason is that some of the components of the drilling fluids are fermentable. This means bacteria grow down-hole and in the mud pits and undefined chemical changes occur. That would be one example of a biological activity taking place that would alter mud composition, leading to an undefined chemical mixture.

Mr. STUDDS. Anybody else want to comment on this general topic? It is fascinating.

Dr. PARSONS. I have a comment here. Going back to the review of the permit, which again is often the only information a biologist has to work with, generally the approach has been to list a series of potential additives to drilling muds, and this might be as much as 30 and 40. There is an indication that some of these may be used. This would depend upon the kind of stratigraphic layers encountered while drilling so the combination of additives would change. I don't know of any kind of bioassay information which would test all of these together or in various combinations. I guess a 30 factorial would have quite a number of combinations, so there is very little information on the effects. There is some information in the literature on the effects of single additives and they are strikingly toxic in comparison to drilling mud. I can't give you specific concentrations but I think down to the range in parts per billion.

Mr. STUDDS. Which of the agencies is responsible for research in this government on the question of the composition of drill fluids?

U.S. Geological Survey, do you carry out such research?

Mr. HIGHT. No.

Mr. STUDDS. Bureau of Land Management?

Mr. BURKE. No.

Mr. STUDDS. Environmental Protection Agency?

Dr. BOLTON. Yes, we are carrying out some research in that area.

Mr. STUDDS. NOAA?

Dr. PARSONS. No.

Mr. STUDDS. So the only research agency represented at the table is Environmental Protection Agency and it is the Environmental Protection Agency that is telling us we do not know all we ought to know about the composition if I understand you correctly.

Before we move on, does anyone want to add or subtract?

Dr. Bolton.

Dr. BOLTON. I have a couple of additions. There are changes that take place in the muds.

"Many of the chemicals react with other mud components and thus do not remain in the drilling fluid in their original form."

So even if we know the chemical composition of additives, the material may change.

The second thing is that the Environmental Protection Agency does not have an approved list of additives that may be used in drilling muds.

Those two pieces of information may be of use.

Mr. STUDDS. I take it what tests and studies we have are done on muds not used, what you call off-the-shelf or fresh muds?

Mr. BURKE. No; there are many studies that used mud as the agent for assay testing.

Mr. STUDDS. That use what?

Mr. BURKE. Muds after they come out of the hole. That doesn't say that the character doesn't change further after cooling and depressing.

Mr. STUDDS. Depending upon temperature and pressures?

Mr. BURKE. But it is going to be essentially the material that will be discharged into the environment.

Mr. STUDDS. Let us get to what we know about the toxicity at least of the components whose existence we know about.

Let us start with the U.S. Geological Survey.

Let me know if I ask an inappropriate question to an agency.

To what degree are these components toxic to marine life, Mr. Hight?

Mr. HIGHT. I believe we were talking about the mud that was discharged, not the components, right? You wanted to know about some type of change. You are saying now that you want to know by component the toxicity?

Mr. STUDDS. In general, how would you characterize our state of knowledge regarding the toxicity of these drilling muds to marine life?

Mr. HIGHT. It is not a very toxic substance. We don't see any adverse effect when drilling mud is discharged because of the high dilution rates that occur on discharge.

Mr. STUDDS. OK, Mr. Burke, Bureau of Land Management.

Mr. BURKE. Many of the studies that we have seen that have used whole muds, either fresh or used, have shown some small amount of acute toxicity. The doses that have been used in the bioassay procedure, however, I think are much higher than you find at an operation at a rig within just a few meters of a discharge pipe. So, as I said in my comments, my statement, the actual kinds of concentrations you are going to find in the field are the things that really need to be pursued in the laboratory.

Mr. STUDDS. What is the general nature of your response to the question? Just summarize, Mr. Burke.

Mr. BURKE. Based on acute toxicity tests, there have been some toxicities shown for both used and fresh drilling fluids.

Mr. STUDDS. OK.

Dr. Richards?

Dr. RICHARDS. I would like to preface my response by saying that the scientific community, of course, has certain rules by which

information is determined acceptable and that usually includes peer review of research. The reasons for that, as you well know, is that the analytical methods, the biological testing methods, the sampling methods, and the statistical design that goes into experimentation requires a lot of sophisticated science. The minimum acceptable bit of information is a peer-reviewed published scientific article.

There is very little drilling fluid research information that has been peer reviewed. Therefore, I would hesitate to put much confidence in studies that were done with very little distribution or review.

Let me summarize one of the most recent articles in the peer-review scientific literature that discusses toxicity. I am referring to the study made by Dr. John Sprague of the University of Guelph in Canada. In that paper, the author concludes that the drilling fluids tested by acute toxicity testing are 10 times as toxic as raw refinery wastes or untreated pulp mill effluent.

Dr. RICHARDS. I could provide you with a copy of the entire publication if you would like it.

Mr. STUDDS. It was the Study on Rainbow Trout?

Dr. RICHARDS. Yes, sir.

Mr. STUDDS. We have that.

Dr. Bolton?

Dr. BOLTON. I would like to answer somewhat in response to a statement made by Mr. Burke that concentrations used in many of these tests were not valid with respect to the concentrations that are found in the field. To try to test concentrations such as those measured in the field using our existing toxicity testing modes would mean you would have to use a sample size that was totally prohibitive to demonstrate statistically significant small changes. So you have to test on a larger scale and then you essentially dilute your answer down from there.

For instance, if you find that there is a 5-percent change or increase in sensitivity over a 3-month period in a toxicity test of a material, that is essentially the same thing as 20 percent in a year, taking 3 months and multiplying it by four, so you are having 20 percent change rather than just a 5-percent change over the course of a year. This is based on a dose response curve which is assumed to be linear by our Food and Drug Administration.

What I am saying is that you cannot say that because the levels being tested are high, the results cannot be extrapolated into the field; that these are not valid tests.

Mr. STUDDS. Dr. Richards?

Dr. RICHARDS. I would like to amend my statement. Maybe it would be worthwhile to discuss the basic philosophy of toxicity testing. A short term toxicity test is done over a period of just a few days with adult organisms. The question is: "What does that mean, and how do you extrapolate that to the field?" As a biologist, I think it is very important to look at it from the perspective of the niche that that organism occupies.

For example, shrimp feeding on the bottom—their normal habitat—might encounter a thin layer of drilling fluid on the bottom. That would mean their exposure would be extremely high. Some

people might even say that would be a 100-percent exposure. That would be an exaggeration.

A recent study has shown that drilling fluids, discharged from the surface, penetrate through the water column and some components will stay on the pycnocline because of temperature and salinity differences. Therefore, large concentrations of material will accumulate at that interface. It just so happens that there is a lot of biological activity at that same interface. Again, the concentration seen there is extremely high and it would not be the same as you would measure in an average sample of the entire water column.

Also we have to look at what we do when we run a toxicity test. We are trying to predict something about the potential environmental effects of the toxicant in a reasonably expeditious way and with a minimum expenditure of funds. Two very different questions are: (1) Will any concentration of this material harm that organism? and, (2) What about the effects of field concentrations of that material?

Many of the studies that have been done are totally inappropriate. For example, people quote unpublished studies which were done on a sailfin molly which is a live-bearing fish and is not at all typical of offshore environments. In fact, it is a freshwater and low salinity fish. Philosophically, we have to realize there would be life stages of the organisms that would be more sensitive than the adults being tested. We have to use the standard aquatic "application factor" and determine the "Maximum Allowable Toxicant Concentration." This means, let us allow a standard method to determine a safety factor and not look at what percent of animals is killed in a few days, which is the normal way of reporting these tests.

Mr. STUDDS. You are characterizing a method of toxicity testing which I gather is the predominant one in these studies?

Dr. RICHARDS. No, most studies incorrectly report the LC50 rather than go use safety factors.

Mr. STUDDS. LC50 is the inadequate feature we have been prescribing; is that correct?

Dr. RICHARDS. That is correct. It is most commonly used and it has a place. It is a good, quick screen to get into a ballpark, but, for example, that particular testing would not pick up teratogenicity, carcinogenicity, mutagenicity, histopathology, and reproductive effects.

Mr. STUDDS. Am I correct that that method only measures substantial—lethality—over a short period of time?

Dr. RICHARDS. Yes.

Mr. STUDDS. Can anyone extrapolate on long-term effects from those kinds of studies?

Dr. RICHARDS. They have definite limitations. I would be reluctant to extrapolate on the basis of that information, particularly if it is unpublished.

Mr. STUDDS. Do those studies only propose to demonstrate lethal as opposed to sublethal and chronic effects?

Dr. RICHARDS. That is correct.

Mr. STUDDS. What do we know which might not over time result in mortality, but might have an impact on marine life?

Dr. RICHARDS. I can provide two examples. One would be the feeding response of coral where preliminary data indicate that the coral feeding is inhibited by the presence of the particular drilling fluids that we tested.

Another example is the preliminary information that the American lobster may be inhibited from its normal feeding behavior by the presence of the drilling fluids that were tested.

Mr. STUDDS. And that kind of a behavior change presumably could have dramatic effects over time possibly, but nothing that could be measured one way or another by the kind of short term testing you are describing?

Dr. RICHARDS. That is correct but, of course, behavioral tests do not have the history of verification behind them that some of the other tests do.

Mr. STUDDS. When you get an indication of toxicity in these studies, how do you know what the likely toxicant is?

Dr. RICHARDS. That is one of the most frustrating things that aquatic toxicologists are experiencing. When you try to analyze what it is in the drilling fluid that is responsible for your toxicity, you have to have some kind of clue of what to look for chemically in the complex mixtures of mixtures. You can take a guess of what you know and try to correlate that with the effects you observe, so it is a definite impediment to not know the chemical analysis when you try to get at the culprit. Hopefully, if we were able to have better information on the chemical composition of additives, possibly some less toxic additives could be substituted for more toxic ones.

Mr. STUDDS. Dr. Bolton, do you want to say anything?

Dr. BOLTON. As far as EPA laboratory testing of drilling muds is concerned, I have very little to add because Dr. Richards is in charge of our field testing and laboratories and is far more informed. As for outside literature, I have been able to find no peer-reviewed papers related to drilling muds except perhaps the Sprague paper.

Mr. STUDDS. No papers related to drilling muds in what respect?

Dr. BOLTON. Few if any type of papers on drilling fluids using marine biota and showing long-term or sublethal effects. There were some papers that were given down in Orlando, but they are not in publication yet as far as I know.

Mr. STUDDS. Do I understand you to be saying that you are simply unaware of studies of possible long-term or sublethal effects?

Dr. BOLTON. On whole drilling muds. There are a couple of papers I believe that came out of probably Texas A. & M. by Neff. I am not sure whether they are published yet. I have seen the papers in a draft form. I have not seen the actual published papers.

Mr. STUDDS. Dr. Parsons, do you want to add something at this point?

Dr. PARSONS. Yes, I will see if I can pick up what is left over from what has been discussed.

Mr. STUDDS. Sorry you are on the right. Sometime we will start with you.

Dr. PARSONS. This is comfortable. I have a few comments about LC50's in support of what Dr. Richards has said. That is a term

used to denote the kind of concentration that kills 50 percent of the population.

Mr. STUDDS. You are describing the fairly conventional method of bioassay tests?

Dr. PARSONS. Yes, which is used constantly in terms of permit procedures. This is an arbitrary level and there is nothing magical in terms of what percent of a population can be lost without sustaining some kind of a long-term damage. It may be in actuality a 75-percent loss or perhaps, the population may not be able to take a 5-percent loss.

I recall looking at some LC50 curves for drilling muds 2 years ago in which the LC50 for drilling mud was about 10,000 parts per million (ppm). However, one still observes a kill of 40 percent of the population with 1,000 ppm, and 25 percent of the population at 100 ppm.

This is only a 25-percent difference in terms of the total population killed, but it is essentially a two factor decrease in concentration. One has to be cautious when using LC50's if they are the only information provided to you.

There are some ED—effective dose—50's which do supposedly measure behavioral responses of organisms to mud. We don't know what it means when a diatom ceases to move about. These are arbitrary standards. This is something we can observe and count as scientists and thus it is a convenient tool.

I wanted to go a little more into some of the generic effects of discharging drilling fluids in the field. At this point it appears as if they are essentially a near-field phenomenon. I say that because the studies to date have been lacking in some respects. I am not sure that all of the parameters have been included in these studies, but let us accept, for the moment, what has been done by researchers, primarily oil companies, since they have dominated the research because of regulatory requirements. It appears as if we have a near-field phenomenon, however only for a single well. The question that has been dwelt upon is what happens when we have a number of wells drilled? How many wells does it take altogether in order to detect something that is occurring in a long-term sense?

We are more confident with the near-field. What about the far-field effects? These are certainly the kinds of concerns that can cause you to lose sleep.

Let me talk about some other kinds of effects we have noted from release of drilling fluids.

Mr. STUDDS. Go back again and repeat, if you will, what causes you to lose sleep.

Dr. PARSONS. I think an excessive amount of research has been poured into demonstrating near-field effects, those that can be observed from the discharge of a single rig while, at the same time, I don't think we have paid the proper attention to the cumulative effect of drilling entire fields. There has been some work of that nature in the Gulf of Mexico, although considering the long history of the drilling in the Gulf of Mexico, I question the validity of control areas that have not been previously influenced by drilling.

I attended the drilling symposium, as did quite a few of the other panelists, and I think 90 percent of the studies relate to single rig

discharges from a single well. As of yet, we have not come to grip with how to project long-term effects.

Going back to effects that could be observed from a single rig, it has been observed that a reduction in photosynthesis occurs, caused by a reduction in light transmittance. There have been smothering effects primarily from the discharge of the cuttings which in some cases may form a mound of material 1 or 2 feet high and which may extend out 100 yards. Many observations have been made in the Gulf of Mexico which doesn't have the hydrographic conditions that the east coast does. I don't think we have made very good observations on chronic or long-term effects on biota in the field. Post-drilling surveys undertaken as part of a monitoring program are usually completed within a space of weeks after the drilling has been stopped. I don't know—I may stand to be corrected—of any studies offhand that have gone back to the site of a survey long after completion of drilling and observed changes in faunal composition. There have been post-drilling surveys completed on fields drilled years ago, but there has never been a pre-drilling phase which has been completed, prior to the actual drilling.

In referring to studies of a field in operation for 15 years, let me mention the Buccaneer study being done off Galveston, Tex. This is a field where active drilling hasn't been undertaken for about 5 years; studies are focused on long-term persistence of heavy chemicals around the platforms there. No information is available for the predrilling phase.

Mr. STUDDS. Are there any results?

Dr. PARSONS. There are some mixed results. The study is going into the fourth year of a 5-year program. It is not an actual study of drilling discharges but what has happened as a consequence, and it focuses on sediment changes and not biological changes.

I would like to mention one area which may turn out to be a real sleeper and that is the concern for changes in sediment characteristics as a result of drilling activities over a long period. This has never seemed to be an apparent problem in the Gulf of Mexico. However, they don't have the kind of bottom shellfish that we have on the east coast. As an oyster ecologist, if you alter the sediment type, you may make it unacceptable for young oysters as they settle down out of the plankton. This is not something that would be detected by use of an LC50 in terms of toxic properties, but it is something you could note over a period of time, a decrease in settling rate.

Mr. STUDDS. You are frightening me.

Is there anything else someone would like to add at this point?

Dr. Richards?

Dr. RICHARDS. I would like to add a concept to what was discussed about near-field effects. We have not done research in this area, but it is a concern that I have. A drilling platform is really a unique environment. It is a structure in the marine environment and, as we know from the oil company advertisements, it attracts fish. So, at that structure, we have a congregation of a large number of organisms.

At this particular environment, we are dumping large quantities of concentrated chemicals. As we have seen, there are some near-

field effects in terms of lethality, but what concerns me is the potential for biota to accumulate the discharged chemicals. This is no ordinary environment. We are dumping concentrated chemicals from a point source. We are attracting fish to that point source. Man can see the structure and knows that fish congregate there. We have not done work related to that phenomenon, but it is a concern that I have.

Mr. STUDDS. Of all the toxins and potential toxins in the drill fluids, which are the ones that are of greatest concern?

Dr. RICHARDS. The concern I have is that we have done limited chemical analysis on drilling fluids during the life of a rig and we have found certain spikes of toxicity, and we cannot account for those spikes in toxicity on the basis of heavy metal analysis, so the concern I have is that we don't know where the potential toxicity residuals are.

Mr. STUDDS. We do not know from which component the danger may come?

Dr. RICHARDS. That is right. There is a history of other components that, in the past, were apparently widely used, for example, pentachlorophenols. One concern that I had a few years ago when pentachlorophenol was being used is that it is associated with dioxins. Under certain conditions of temperature, dioxins can be formed from pentachlorophenol. We had a conference on the effects of pentachlorophenol. Subsequent to that conference, the U.S. Geological Survey took action to minimize the use of pentachlorophenates. They were banned in Canada years before in drilling operations.

Mr. HIGHT. Let me correct that. On our ban of halogenated phenols, I wrote to Environment Canada, and even though they said halogenated phenols were restricted in Canada, it was only in the northern tier (north of 60° latitude). It wasn't a complete prohibition.

Mr. STUDDS. Does anybody else want to respond to the general question which I started? Of the components which are toxic or potentially toxic, which are of the greatest concern?

Mr. BURKE. I thought we had turned to the question of long-term effects and I was going to mention a study in the Gulf of Mexico. The Bureau of Land Management has a study similar to the Buccaneer study where we look at 24 production platforms in the Gulf of Mexico, having from 1 to 16 years of production history. We are looking for long-term accumulation of metals and hydrocarbons in sediments as well as biota of those activities. There is a study component for resident population dynamics, I believe.

Mr. STUDDS. How long have those studies been underway?

Mr. BURKE. About 2½ years. I believe this is our final year.

Mr. STUDDS. Do you consider 3 years a long term?

Mr. BURKE. No. The study is 3 years, but we are looking at rigs that have been operating for up to 16 years.

Mr. STUDDS. Do we have original baseline data going back that far?

Mr. BURKE. No, it is not a baseline study.

Mr. STUDDS. How can we measure long-term effects?

Mr. BURKE. We are in an after-the-fact kind of regime. We are doing the best we can, since we don't have the predevelopment baseline.

Mr. STUDDS. I am not trying to be difficult. What conceivable credibility could such a study have against which to compare the effects?

Mr. BURKE. Because long-term accumulation of heavy metals could be of concern.

Mr. STUDDS. Granted, but if we are only studying long term, what do we know?

Mr. BURKE. We are trying to look at an accumulation of over 16 years and the problems it might present if resuspended.

Mr. STUDDS. We grant that you are trying to get at an important question. If we do not know what it was 16 years ago, how can we compare it with what it was we know not when?

Mr. BURKE. We can't.

Mr. STUDDS. Or show what validity it does have?

Mr. BURKE. It is trying to get at what can be the long-term result of the persistence of material.

Mr. STUDDS. You are saying we got a late start?

Mr. BURKE. Yes.

Mr. STUDDS. Dr. Richards?

Dr. RICHARDS. I would like to comment in general about some of the other limitations of field studies for assessing toxicity. Fortunately, I witnessed several of these studies and I was able to appreciate the difficulties which are involved. The difficulties in running field studies, particularly far offshore, are just staggering and I really do sympathize with the people who are attempting to do that; but there are limitations in addition to the ones that you mentioned that concern me.

One is that the coordination with the operator of that rig can lead to several very serious problems. For example, in one case the biological studies were completed before the drilling was completed. Another problem is that I understand in one case the rig was floated off and a discharge was made subsequent to being on location.

Another problem that I have personally experienced is the concept of the "tight hole". That is where drilling has progressed to the point where useful information about the hydrocarbon formation is forthcoming, there is tight security on the rig and justifiably so. At that time, they don't want people taking samples from the drilling fluid on the rig or the cuttings. This is a serious problem for an experimentalist. If you want to study the life of a well or study a drilling operation at a particular time and, for security reasons you just can't get a sample there, it is really difficult.

There is another problem which is one of danger. There are times when hydrogen sulfide is in the sediment. At those times, they don't want personnel aboard the rig other than those necessary. They certainly don't want strangers who are not part of the operation. So to send a scientist out to collect a sample at that point is usually discouraged.

Another example is trying to do studies far offshore. The expense of getting out there and being 100 miles offshore is staggering and

there is a limitation of what you can really do out there on a cruise.

Another problem is it is very difficult to do materials balance to know what is actually used and goes overboard. For example, the desilters and desanders are not set up so you can meter how much material goes overboard and get good quantitative measurements. In one rig study there was a serious attempt to do that.

Production platforms are difficult to study because they are not very accessible. Most of the studies have been done with exploratory rigs. Yet with production platforms, you may multiply the quantity of chemicals discharged because you have multiple wells, 20 for example, from one single structure.

Another problem is when someone is doing a study, there is a possibility that they might be tempted to substitute procedures or drilling fluid components to run a clean operation, and represent it as a routine operation. These are just some of the problems in offshore studies.

Others that concern me are the inability of chemistry, up until recently, to be able to accurately assess which of the known chemicals are actually being deposited in the sediments. Those are just some of the concerns I have about the studies.

Mr. STUDDS. Are there heavy metals discussed in those studies?

Mr. BURKE. Yes.

Mr. STUDDS. Do they bioaccumulate?

Mr. HIGHT. In some studies I have seen, chromium could bioaccumulate to a small degree. But usually the concentration has gone down after the drilling phase is over and the chromium goes back to a background concentration.

Mr. STUDDS. Is there any possibility of it entering the human food chain, the heavy metals?

Mr. HIGHT. There is a possibility. If you caught a fish from near the rig, the maximum concentrations you are talking about are 20 to 30 parts per million of chromium.

Mr. STUDDS. That is not a matter of concern?

Mr. HIGHT. Not in one fish.

Mr. STUDDS. I am talking about the whole food chain.

Mr. HIGHT. How many can you eat?

Mr. STUDDS. Does anybody else want to comment on that question?

Dr. RICHARDS. I want to mention a paper in the peer review literature on the subject of bioaccumulation. It was looking into the question of whether or not barium could bioaccumulate in marine organisms. The reason the study was started was, first of all, it was assumed it was not possible because barium is so sparingly soluble in seawater. So looking at that worst case—the potential for barium accumulation—the investigator found that barium was, in fact, accumulating in shrimp: In the shell of the organism as well as in the tissue of the organism. It also pointed out the importance of running that kind of test during the molting cycle of the organism. Apparently molting is a critical period to look at the bioaccumulation. So I have, again, some concerns about the generalizations that are being made about nonpeer reviewed literature that has not met the minimum test of publication in a scientific journal.

Mr. STUDDS. Let me ask each of you whether or not your agency is actually conducting or responsible for research on the general questions we have been discussing as to the toxic effects of these components.

Mr. Hight, is the U.S. Geological Survey doing research?

Mr. HIGHT. Our agency has done general research at Fisher Island where they have taken samples of used drilling muds and applied them in known concentrations to coral.

Mr. STUDDS. Did it show any effects?

Mr. HIGHT. It did. Within 10 meters of the discharge at a 40-barrel per hour discharge rate, there would be no toxic effects.

Mr. STUDDS. What about sublethal?

Mr. HIGHT. You can always ask those kinds of questions, but you have to draw the line someplace. The Environmental Protection Agency in its hazardous substance list uses LC50. They don't use sublethal effects. I realize your concern but there is only so much time you could spend on something.

Mr. STUDDS. Do I not recall your mentioning some effects on coral earlier, Dr. Richards?

Dr. RICHARDS. Yes; when you finish I can comment on other studies.

Mr. HIGHT. The Bureau of Land Management has looked at the effects of drilling. Yearly they go back and the same investigators look to see if there has been any effect due to drilling. To this date, there has been no effect.

Mr. STUDDS. Whether something has died?

Mr. HIGHT. Visually.

Mr. STUDDS. Visually?

Mr. HIGHT. He took photographs; reoccupied the same site and made an opinion as to whether or not there has been any change.

Mr. STUDDS. Who did that study?

Mr. HIGHT. Dr. Thomas Bright.

Mr. STUDDS. For whom?

Mr. HIGHT. The Bureau of Land Management.

Mr. STUDDS. Funded by the Bureau of Land Management?

Mr. HIGHT. Yes.

Mr. STUDDS. Bureau of Land Management, do you want to add anything to that?

Mr. BURKE. Those subjective and semiquantitative measurements are made three times a year. There is a persistent presence of investigators looking for damages.

Mr. STUDDS. Are the specific studies to which you referred the sum total of what you do or just exemplary?

Mr. BURKE. The total for drill fluids research is on the list. The sublethal studies are the most difficult. That is where there is such a paucity of literature. One of our approaches has been that you need to know what kind of things the organisms are being presented with in the field, and what kinds of concentrations the organisms are being presented with in the field. If a number of studies show you material such as heavy metals or barite or some other material which is known as a component of drilling of fluids is reaching high concentrations, then it allows you to fine tune your bioassay procedure to some degree. We are looking to answer some of those bioavailability questions.

Mr. STUDDS. Dr. Richards?

Dr. RICHARDS. I don't know where to start. I seem to disagree with everything that was said. Let us start with the concept of background concentration. I don't understand how when you don't know the chemical composition of the material you are working with, how you can determine when it is at background.

Second, I would like to review the studies that were done at Fisher Island. Basically they consisted of testing corals for the relative toxicity of several drilling fluids. Those corals were found to be sensitive to those drilling fluids, but again the concept of field concentration comes in. The point is, many of these studies are done for an entirely different purpose. As I pointed out earlier, the reason for testing acute toxicity can be twofold: First, to determine if there is any effect at all, and, second, to determine if in field concentrations it would be a toxic effect.

For example in a coral test, it was determined that corals are unable to remove drilling fluids if it covers them. Ordinarily they have cleaning mechanisms. When calcium carbonate and other inert metals are added, corals are able to remove the smothering effect. There was a reduced ability to remove the drilling fluid, though.

Mr. STUDDS. Dr. Bolton?

Excuse me, were you finished?

Did I interrupt you in your thought?

Dr. RICHARDS. No.

Dr. BOLTON. Back to the trace metals and their quick dissimilation. In the Bureau of Land Management final environmental statement on the Outer Continental Shelf Sale 48, in the gulf, the Bureau of Land Management found that there were elevated levels of barium and cadmium and zinc found in the sediments in the vicinity of the drilling site, and their only response to the degradation 3 months later was that they were somewhat lower. Also in many of the studies in which background measurements were made, one must consider the measurement techniques that were used. If you are using a technique whose sensitivity is not as fine as the standard background level of the particular contaminant with which you are concerned, for instance, if chromium existed in 0.5 part per billion—ppb—in water and you are only capable of measuring 1 part per million—ppm—then everything will be at background, even what may be elevated above background. That seems to be a problem in studies financed by the oil industry and perhaps by the Bureau of Land Management although I won't swear to the last part.

As far as animals' ability to biocumulate, I can give you some examples. Those three are:

(1) Brannon, A. C. and K. P. Rao, 1979. Barium, strontium and calcium levels in the exoskeleton, hepatopancreas and abdominal muscle of the grass shrimp, *Palaemonetes pugio*: relation to molting and exposure to barite. Comp. Bio. Chem. Physiol. 63A: 261-274.

(2) Eisler, R., M. M. Barry, R. L. Lapan, Jr., G. Telek, E. W. Davey, and A. E. Soper, 1978, Metal survey of the marine clam *Pitar morrhuana* collected near a Rhode Island (USA) electroplating plant. Mar. Biol. 45: 311-317.

(3) Mears, H. C. and R. Eisler, 1977. Trace metals in liver from bluefish, tautog, and tilefish in relation to body length. *Chesap. Sci.* 18(3): 315-318.

They all refer to the ability of organisms to bioaccumulate.

Animals may pass through a contaminated area, accumulate trace metals, and contribute to the trace metal content of other organisms of the food chain.

Mr. STUDDS. Does that raise possible questions of human health at the end of the chain?

Dr. BOLTON. Yes, and in comment to the statement you hear about fish and crabs around drilling rigs, there were a lot of viable animals caught in Minamata Bay, Japan, and a lot of people subsequently were affected by mercury poisoning by eating those fish. Just because a food fish or shellfish does not show any outward signs of pathogenicity doesn't mean that the materials which have been accumulated will not affect the human beings who consume the fish product.

Dr. PARSONS. I think it might have been in one of the same papers on barite where the investigator was showing some significant and deteriorating changes in the gut epithelium from the actual ingestion of barite. The changes in the gut may be simply the result of moving large amounts of barite through the gut. Thus, one must be careful about jumping to conclusions that barite exerts no effects.

I have one other comment about the general effect of discharging drilling fluids. I don't think anybody has mentioned information on any of the zooplankton, ichthyoplankton, or meroplankton that could be affected through entrainment in the plume. While there may be such studies, I believe most of the studies have been of the benthic populations and not of the organisms drifting through the plume. I don't think these measurements have been made. We don't know how significant these losses could be in contributing to shellfish egg mortality, et cetera.

Mr. STUDDS. Let me ask you some questions and then I will turn this over to my colleagues.

In summary, if each of you were asked the general question, given the state of our knowledge at this time, as you understand it, of the effects both short term and long term on the marine environment of drill fluids, can you as scientists tell me the effects are such to cause serious concern—or do our studies indicate while there may be some effects, they are not of sufficient magnitude to give us pause as we proceed?

Mr. HIGHT. At this time, we don't have the information that shows really that they are that harmful.

Mr. STUDDS. We do not have the information that shows that they are harmful?

Mr. HIGHT. Yes.

Mr. STUDDS. Do we have the information that shows that they are not harmful?

Mr. HIGHT. We do, I think.

Mr. STUDDS. Mr. Burke?

Mr. BURKE. From what we know now, just right now, there are effects of discharge of drilling fluids. They are short term. They are localized. I do not know whether it is a cause for concern. I do not

know whether the long-term implications of these materials being introduced into the environment are a matter for concern.

Mr. STUDDS. In other words, is it a fair statement that you make that statement because of the inadequacy of research to date?

Mr. BURKE. That is correct.

Mr. STUDDS. Dr. Richards?

Dr. RICHARDS. We have inadequate information for making a hazard assessment. The inadequacy lies in the lack of understanding of the exposure of animals, particularly in these specific niches that I mentioned like the benthic communities—the bottom communities—and also in the pycnocline area.

I also feel that in the case of corals that we need to definitely be concerned about drilling in areas close to coral reefs, particularly if we don't know the chemical composition of the drilling fluids to be used there.

I have another concern. For some reason most of the forums on the effects of drilling fluid concentrate on offshore platforms in very deep water and usually exploratory rigs. I think shallow water exposures may have a higher probability of adverse effects: from production platforms, an even higher probability of effect.

Mr. STUDDS. Dr. Bolton?

Dr. BOLTON. I would be very hesitant with the current state of knowledge to make any endorsement of general discharge of drilling muds, particularly in sensitive areas of the Outer Continental Shelf.

Mr. STUDDS. Dr. Parsons?

Dr. PARSONS. I guess if I were to consider placing a single well, if I were to speak of a relative scale of confidence in predicting the effects of that single well, I would give it a rating of 50 out of a 100. If you were to ask me to predict or project the effects of long-term repetitive drilling in any given situation based on what I know, I would probably rate it at a five, so I am only half confident on the short term and practically not at all on the long term.

Mr. STUDDS. This could be an interesting biological task force on Georges Bank.

I have gone over my time.

Mr. Forsythe?

Mr. FORSYTHE. I am sorry this whole hearing has fallen victim to some of the whims of the floor. I have one basic question. After 25 years of offshore drilling in the gulf during which time nearly 20,000 wells have been drilled, what evidence do we have to show that there has been significant harm to the marine environment and, most particularly, to the bluegill? Is there any evidence that in marine life that is consumed, the shrimp have shown any toxics that are of any concern to human life in the use of these foods?

Mr. HIGHT. I am not aware of any significant harm in the last 40 years.

Mr. FORSYTHE. That is a long time for something to develop that is of a significant nature. I think Dr. Richards pointed out that the shallow water situation is where it all started. In more recent years, it has gone to deeper water.

Mr. BURKE. At the gross levels of impact you have asked, I do not think anything has been shown, but I think the sensitivity of the

research lacks something, so I couldn't answer that question very well.

Mr. FORSYTHE. I would be more concerned about the toxics we have buried in this country, in my State in particular.

Dr. Richards?

Dr. RICHARDS. Yes, I agree with Mr. Burke that the sensitivity of the kinds of studies that have been made is certainly inadequate to have detected the retrospective effects that you are describing.

Mr. FORSYTHE. Particularly in the food chain as it affects the human animal.

Dr. RICHARDS. Yes, again since we don't know what to look for chemically, it is difficult to design a study to look for it.

Mr. FORSYTHE. Dr. Bolton?

Dr. BOLTON. I think that possibly in the Gulf of Mexico you can show that there has been some effect perhaps of oil and who knows what other contributing influences. Oyster catches have gone down.

Mr. FORSYTHE. And now back up.

Dr. BOLTON. The fish catches, according to some figures in the National Academy of Science study are approximately the same catch size made 10 years ago, but now made by 10 times the number of commercial boats. It is the same fish catch, but with an increased amount of effort. With shrimp, it is the same type of situation. You have an increased effort for the same amount of catch. You can show there has been an effect on the gulf. Also, if you care to take a study that was financed by the American Petroleum Institute called the GURC—Gulf Universities Research Consortium—study, it has been rather well-critiqued in a draft paper I have read which should be out in referred publication relatively soon by one of the WHOI scientists. The biggest point he noted from the primary papers contributing to that final report is that essentially the area of the northern gulf, the area of Timbalier Bay, is uniformly polluted and the areas that were used in that study as control sites were as polluted as experimental sites. Very little of what the final report concludes can be validated in terms of an objective scientific approach.

Mr. FORSYTHE. Dr. Parsons.

Dr. PARSONS. I can only add my support to what was said. The lack or possible lack of control area in the Gulf of Mexico is one complication. In terms of the shrimp catch, oil and gas activity has often been cited as having no effect. It is almost a moot question as to what might have been the catches in 30 years without the Outer Continental Shelf development. One wouldn't know; one would not be able to predict that. There is a tremendous variability in any system as large as the Gulf of Mexico. Since there were no measurements prior to the oil and gas development, it is difficult to compare after drilling has occurred. These questions should certainly be looked at in the future to determine whether there actually have been changes in shrimp catches attributed to some extent to oil and gas activities, but they are tough questions.

Mr. FORSYTHE. We really don't know and we don't have evidence that would indicate, so far as human life is concerned, that there is an impact.

We have considered that there might be larger fish catches, larger shrimp catches that are not directly tied into oil activity, and we are talking about the basic drill muds.

Do any of you, and I think you can say yes or no, think that the impact has been such in the gulf that it could be called a real problem in terms of our environment, even over the 40 years that this has been going on? Certainly it is not a desert. Yes, there are places in the inshore areas where there is pollution that comes from a whole lot of sources, many of them having to do with the oil industry. That is not the oil industry today. When you get off to the gulf, the offshore—and that is what we are talking about—I do not hear things that alarm me.

Unless somebody wants to pick that up, I want to thank the Chairman.

Mr. STUDDS. Mr. Emery?

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

I am sorry I was not able to be here during the first part of the session. I am interested in some of the chemical compounds that are used in drilling muds. Consequently, I asked my staff to contact the Department of Interior to try to determine what the mixture of drilling muds is or what the nature of some of the materials is, how they interact, and what we can expect when they mix into the marine environment.

I am not so worried about barium because I guess I am a barium survivor, or having had some medical treatment involving barium X-rays, which consumes great amounts, it does not seem to me to be a problem inasmuch as it is used for medical purposes.

At any rate, there are some materials that I am quite concerned about, and I would like to have each of you comment on the nature of these materials and shed a little light on what they are used for and what their impact might well be in the marine environment.

First of all, who can tell me what bentonite is?

Mr. HIGHT. Sodium montmorillonite.

Mr. EMERY. What is it used for?

Mr. HIGHT. It is used as a viscosifier.

Mr. EMERY. Explain what you mean by that.

Mr. HIGHT. When a certain stress or force is applied to a fluid, it will flow. You want the cuttings to be held in suspension.

Mr. EMERY. What is the nature of bentonite which makes it useful? What are some of its chemical characteristics?

Mr. HIGHT. It has a——

Mr. EMERY. Hold the microphone closer.

Mr. HIGHT. Why it is a good substance to use is that the particles repel one another and it can hold things in suspension and you can use deflocculants if you do have a contaminant, but that is the principal use of it, as a viscosifier and the components are in suspension, Mr. Emery.

Mr. EMERY. Is it a reactive material?

Mr. HIGHT. No.

Mr. EMERY. What is its pH?

Mr. HIGHT. Near 7.

Mr. EMERY. Nearly neutral?

Mr. HIGHT. Yes.

Mr. EMERY. What is the pH of seawater?

Mr. HIGHT. About 8.

Mr. EMERY. Is the mixture of materials of lower or higher pH in seawater in any concentration, any danger to marine organisms?

Mr. HIGHT. The pH was measured and it really didn't change on discharge of drill mud and cuttings.

Mr. EMERY. How much of a variation in pH is detected in the vicinity of disposal and dischargeable aeration?

Mr. HIGHT. I am not aware of any study that shows there was any appreciable pH change.

Mr. EMERY. There must have been a gradient some distance away from the spoilage area, a small distance. There must be some effect.

Mr. HIGHT. You have enough carbonate ion that acts as buffer to resist a change in pH. If you work out the dilution calculations, you are working against a system that has a lot more water that you are diluting into than what you are adding. So you have the buffering effect and dilution effect.

Mr. EMERY. What is attapulgate or however that is pronounced?

Mr. HIGHT. Attapulgate is Fuller's Earth. It is another type of clay and it is used with saltwater muds. It is kind of a needle-like structure rather than the plate-like structure of bentonite.

Mr. EMERY. What is its chemical composition?

Mr. HIGHT. I think it is a magnesium aluminum silicate.

Mr. EMERY. That has fairly neutral chemical characteristics as well?

Mr. HIGHT. Yes.

Mr. EMERY. I notice that asbestos fibers are used as a viscosifier?

Mr. HIGHT. At times.

Mr. EMERY. You cannot tell me that does not have any problems?

Mr. HIGHT. No, asbestos is used most often in west Texas where you are using a brine-type drilling fluid, a low-weight fluid. It is not used to any great extent offshore.

Mr. EMERY. What do you consider great extent?

Mr. HIGHT. Twenty or thirty pounds in a typical well.

Mr. EMERY. That is quite a large volume of asbestos if it is mixed in the marine environment. We have had some studies of shipyards in my district which indicate that small quantities in the atmosphere are a potential cancer risk.

What are the bioaccumulation characteristics of asbestos?

Mr. HIGHT. The Environmental Protection Agency on its list of 299 hazardous substances which contains a list of things harmful if discharged into water does not list asbestos.

Mr. EMERY. That does not convince me.

Mr. HIGHT. The use of asbestos is on the decline offshore. I have talked with people associated with leading companies and they no longer use it offshore.

Mr. EMERY. Do you have any control or any ability to control use of asbestos in the drilling mud?

Mr. HIGHT. Outer Continental Shelf Order No. 7 requires that the lessee submit the Chemical component to be used with applications for a permit to drill. The supervisor has authority to recommend certain substances not be used.

Mr. EMERY. Has he recommended that asbestos not be used?

Mr. HIGHT. I don't know. I am not in the district office.

Mr. EMERY. I would appreciate it if you would provide this committee with any regulation about the use of asbestos.

What is causticized Quebracho?

Mr. HIGHT. Well, am I going to do all the answering?

Mr. EMERY. I would be happy to have anyone respond to the questioning. Maybe we ought to have all of you respond.

You are the chemical engineer, are you not?

Mr. HIGHT. Yes, sir. That is a natural substance. It is a plant material and it is used as a deflocculant.

Mr. EMERY. You said a plant material?

Mr. HIGHT. Yes.

Mr. EMERY. How is it causticized?

Mr. HIGHT. I would just assume it was just sodium hydroxide reacting with the material.

Mr. EMERY. That is a very strong, basic solution having a pH somewhere in the vicinity of 11?

Mr. HIGHT. No. It depends upon what the normality is. It can go up to 14.

Mr. EMERY. So it is even a strong-based material. What are the characteristics of sodium hydroxide mixed with seawater?

Mr. HIGHT. It would be basic. It would be elevated from eight.

Mr. EMERY. What are the effects of marine organisms coming into contact with concentrations of very high pH material such as sodium hydroxide?

Mr. HIGHT. There would be a repulsion. The studies on Tanner Bank didn't show there was an appreciable pH change. Sodium hydroxide is not used as a drilling fluid.

Mr. EMERY. But in muds to cut the growth of bacteriological organisms?

Mr. HIGHT. That is a minor reason. The major reason was deflocculants work better at higher pH. Usually unless it is a lime mud, the pH is from 9 to 10.

Mr. EMERY. From the information I have from the Department of Interior, the sodium hydroxide and potassium hydroxide are used for pH stability and control of growth of bacteriological organisms?

Mr. HIGHT. It is used for that. The most direct use is use of bactericides rather than with pH. You have to get up high in pH ranges for sodium or potassium hydroxide to be effective as a bactericide.

Mr. EMERY. pH in the range of 13 to 14 is high.

Mr. HIGHT. You cannot have that unless you have a lime mud.

Mr. EMERY. That is a fairly high pH in the South.

Mr. HIGHT. Right.

Mr. EMERY. What is the use of paraformaldehyde?

Mr. HIGHT. It is a bactericide used in drilling.

Mr. EMERY. What concentration?

Mr. HIGHT. Five-tenths per pound, a barrel.

Mr. EMERY. Is that used offshore?

Mr. HIGHT. Yes.

Mr. EMERY. Have any studies been done to your knowledge on the effects of concentrations of paraformaldehyde compounds or drilling compounds offshore?

Mr. HIGHT. Basically what happens, it should be readily oxidized and it shouldn't bioaccumulate. I am not aware of any studies. It is not as highly toxic as some of the other bactericides.

Mr. EMERY. What are the characteristics of sodium pentachlorophenate?

Mr. HIGHT. That is a substance that the USGS has prohibited use of. As Dr. Richards indicated, it had some problems along with being toxic that were harmful.

Mr. EMERY. Various lignosulfonates, calcium lignosulfonate, modified lignosulfonate and blended lignosulfonate; what is their use?

Mr. HIGHT. Deflocculant as is chromelignosulfonate.

Mr. EMERY. There apparently has been some increased concern for the concentration of those substances; can you give me an idea of what those concerns are?

Mr. HIGHT. The concerns that I have heard of, and I think it is from the Environmental Protection Agency and maybe they should address that, is due to the chromium concentration. Since it is a heavy metal, there is a potential for bioaccumulation or toxicity or whatever.

Mr. EMERY. I have a very long list of substances here which I will not continue to read because we will probably be here for the rest of the afternoon if I do, but I have listed a few that I have questions about and I would appreciate any comments from members of the panel as to their characteristics, whether they are desirable or replaceable in drilling mud.

It seems asbestos, in some of these other materials, is clearly dangerous and probably ought not to be used in any contact with the environment if at all possible, and I wonder if you will be able to tell us if there are replacements or other substitutions that we might examine.

Mr. HIGHT. There are replacements for it. Asbestos is a fluid loss reducer. There are other compounds like shredded cellophane and other candidates.

Mr. EMERY. May I have some comments from some of the other members of the panel about the compositions of muds and fluids?

Dr. PARSONS. I don't think I would be able to add anything on the chemical content. I would encourage the further use of walnut shells. That seems to be pretty safe. In terms of the chemistry of the other compounds, it is just out of my area.

Dr. BOLTON. I was looking for the specific facts of the amount of chromium lignosulfonate in particular that was discharged from one of the wells that was mentioned in a paper called the Shinn report. I cannot find it right now. It was a considerable amount of chromium discharged.

The other thing that has to be considered is the use of other chromium containing compounds which also increases the amount of chromium content that is going to be discharged.

Mr. HIGHT. One thing about the chromium, when it is tied up with chromium lignosulfonate it is tied up with other components, the chrome is not in a soluble phase, but more of an insoluble phase. The chromium concentration might be 200 parts per million, if you measured total chromium. You might get three or four parts per million as soluble chrome.

Mr. BURKE. The difficulty with chromium has been how difficult it is to ionize if, in fact, it becomes available; if it becomes an ion, that seems to be a material of concern, but it can be chelated in an unavailable form or not very toxic to marine organisms; it is one of the research areas.

Mr. EMERY. When you refer to ion availability of chromium, chromium ions exist in an oxidation state of either plus two or plus four. Which one of those is the most——

Mr. HIGHT. Three or six. Six is the most toxic.

Mr. EMERY. Which one of those ions is the most dangerous? The six?

Mr. HIGHT. Yes.

Mr. EMERY. And the plus three ion is not as critical?

Mr. HIGHT. Not as toxic.

Dr. BOLTON. We are making a mistake when we look just at the soluble portion. The materials have a tendency to adsorb to the actual muds and those muds have been shown to be consumed by benthic fauna as in the work sponsored by the EPA Gulf Breeze Lab. Once the material has been ingested by an organism, there are going to be changes that take place in the chemical structures and there is nothing to say that that material will not or cannot be bioaccumulated as suggested in the papers I cited earlier. We cannot fall back on the soluble chrome and whether one form or another is the form in which it is found in muds. We are repeatedly told that the plus three ion is the form in which chromium is found in the drilling muds. Fine, that doesn't mean that the plus three ion is the form in which it stays. Nor does the chrome discussion necessarily represent what is happening with heavy metals other than chromium in which there may be other special concern and which also may be found in drilling mud.

Mr. EMERY. What is the nature of cadmium?

Dr. BOLTON. Cadmium, unlike chromium, is not used by living organisms. It is toxic and dosage dependent.

Mr. EMERY. So cadmium would be in the same category as mercury or lead in terms of being highly toxic?

Dr. BOLTON. Right. That is where the issue of barite that you were unconcerned about may be more of a concern than any of us realize.

Mr. EMERY. My point in bringing that up is simply that there has been a body of experience of using barium for medical purposes.

Dr. BOLTON. A very high grade of barium is used for medical purposes.

Mr. EMERY. I hope so.

Dr. BOLTON. The problem is that what is used in the field may not be that high a grade. Barium is rated by weight, not chemical content. You could use a grade of barite that is going to be highly contaminated with heavy metals. I believe that has been demonstrated at the Orlando meeting.

Mr. EMERY. You are talking about a mixture?

Dr. BOLTON. When you mine a pure load of barite, whatever form it is found in, the bedload is the purest form. When your vein starts petering out, you will start picking up more and more contaminants. Unfortunately, I was told by a representative of the oil

industry that our barite is running out, so we are getting more and more of the contaminated barite.

Mr. EMERY. Do you have any particular comments on sodium polyacrylate or sodium carboxymethyl cellulose or polyanionic celulosic polymer?

Dr. BOLTON. I would direct comment on that to someone who is more knowledgeable of these polymers.

Mr. HIGHT. Not particularly toxic.

Mr. EMERY. Tell me more about the materials.

Mr. HIGHT. I thought you said toxicity. You want to know something about carboxymethyl cellulose (CMC)?

Mr. EMERY. Yes.

Mr. HIGHT. CMC is used as a fluid loss reducer.

Mr. EMERY. How does it perform this task? What are the characteristics?

Mr. HIGHT. I think it forms a gel-like structure.

Mr. EMERY. So it is sort of a colloid as such?

Mr. HIGHT. Yes.

Mr. EMERY. I am thinking that various marine colloids made of seaweeds could perform the same task.

Mr. HIGHT. You have to remember the temperature goes up when drilling deeper and with the associated oxidation, as with carboxymethyl cellulose, you have to get something that is resistant to bacterial growth.

Mr. EMERY. I thank you very much for responding to these rather complicated questions. I will not pursue this anymore at the present time except to suggest that there are quite a few compounds that I am concerned with and interested in and any further information you can provide us as to characteristics will be very useful in our further understanding of any biological impacts that this might have on the marine environment.

Dr. PARSONS. On the question of solubility, this can be an extremely important consideration. Let me cite an example of the exposure of adult oysters to petroleum hydrocarbons. It has long been accepted that adult oysters are fairly insensitive to oil when added in soluble form. Concentrations of LC-50's are 100 parts per million or greater. However, there were some recent studies done 2 or 3 years ago in which the oil was attached to clay particles so that the oyster would ingest them. Under these test conditions, mortality dropped to one part per million after an exposure of 15 days. This kind of experimental approach has not been looked at in any great detail.

Mr. EMERY. Thank you.

Thank you, Mr. Chairman.

Mr. STUDDS. You have done your usual job of shattering the stereotype of the Members of Congress.

Mr. EMERY. It could be good or bad.

Mr. STUDDS. It could not be bad.

With respect to drill muds and the operation of drilling, would you say that by shunting the fluids no adverse impact would be created by the on-site disposal of materials?

Mr. HIGHT. On shunting, I think it has a place. It is used in the Gulf of Mexico to protect certain areas such as reefs by shunting below or into the nephroid zone where it limits a potential for the

contact with the coral that you are trying to protect. For an area with a flat bottom, it doesn't have a place. It can be used some places; not others.

Mr. STUDDS. How about Georges Bank?

Mr. HIGHT. I don't know.

Mr. STUDDS. Bureau of Land Management?

Mr. BURKE. I don't know the answer to your last question. The use of shunting is something related to given hydrographic regimes. Where you have measurements and knowledge of the area, select those places where it can work for you. I think we have room for shunting in Flower Garden Bank.

Mr. STUDDS. Dr. Richards?

Dr. RICHARDS. I have been unable to find a study that justifies its use. I feel the assumption that you do, in fact, shunt into the "nephloid" (turbid) layer near the ocean floor and the assumption that the material will stay there have not been proven. I have various serious reservations about the process of shunting for that reason.

Mr. STUDDS. How about shunting to midlevels or other than to the bottom?

Dr. RICHARDS. The problem with shunting is that the theory is you are going to sacrifice the organisms in one environment in order to preserve the organisms in another environment. There are several niches in picnoclines in the ocean floor, in the water column. If you impact one, you may ultimately impact the others, because of the interrelatedness of niches within ecosystems.

Mr. STUDDS. Dr. Bolton?

Dr. BOLTON. I would agree for the most part with Dr. Richards. I think probably the greatest thing that shunting achieves is getting rid of unsightly waste. You don't see it, so people are not concerned.

Mr. STUDDS. Dr. Parsons, do you have anything to add?

I am going to ask you to be as brief as you can.

Dr. PARSONS. I don't see much advantage to shunting especially at a place like Georges Bank because of the dynamic environment. Some years ago I thought so, but I have since seen some study results which seem to indicate the plume is somewhat buoyant and I would have to question the efficacy of shunting to direct the plume to the sea floor.

Mr. STUDDS. You have seen studies about that?

Dr. PARSONS. Yes, if you were to shunt 20 to 30 feet below the surface, there is no guarantee that it would remain there.

Mr. STUDDS. You say there are some studies?

Dr. PARSONS. Yes.

Mr. STUDDS. Would you provide those?

Dr. PARSONS. Yes.

[The name of the studies follow:]

Ecomar, Inc. 1978. Tanner Bank Muds of Cuttings Study. Shell Oil Company Volumes I and II. Executive Summary available.

Mr. STUDDS. How many attended the recent symposium in Florida? Everybody but Mr. Hight.

Is it a fair statement, an accurate statement, that there was considerable disagreement and controversy presented there?

Mr. BURKE. It is quite fair.

Mr. STUDDS. It was generally true that the focus was on the kinds of questions we have been discussing here; is that correct?

I see you are in agreement.

As we move into a frontier area such as the Gulf of Alaska and Georges Bank in New England, how adequate are our baseline studies against which we can make comparisons of changes over time?

Dr. Parsons?

Dr. PARSONS. At the moment, forget it. There is no way you can characterize Georges Bank in its entire variability and measure that against the effects of drilling, especially in the initial stages. My concern is that if drilling is to commence on Georges Bank, in order to detect long-term changes, one would need to develop a monitoring system which would record changes in population or sediment characteristics which could serve as an early warning of further problems. I am not sure we could develop a monitoring system that would achieve that. I do not want to go past the point of no return such as the PCB problem we have in the Great Lakes. I question any monitoring system and the success of it.

Mr. STUDDS. Dr. Bolton.

Dr. BOLTON. I think we found at the meeting of the Biological Task Force on Georges Bank that most of the agencies were not all that familiar with the totality of work done, so we don't know what baseline material should be available. That should be compiled some time later this month.

Mr. STUDDS. Dr. Richards.

Dr. RICHARDS. I agree with what has been said, but I have an additional concern. We do not understand what it is about Georges Bank that makes it as productive as it is. We do not understand the coincidence of events responsible for its exceptional biological productivity and we do not understand that area as an ecosystem. My concern is that we have a dearth of knowledge there.

Mr. STUDDS. Mr. Burke?

Mr. BURKE. The baseline studies which were basically my program for several years do leave an awful lot to be desired primarily because the longest running one was south Texas; that got a full 3 years of data, but in other areas, including the North Atlantic, there was much less time spent, about a year and a half only, which is an inadequate time to establish a baseline, if such a task were possible.

Mr. STUDDS. Mr. Hight?

Mr. HIGHT. I have no comment. The Bureau of Land Management does the baseline studies, not the Geological Survey.

Mr. STUDDS. I have to leave in 2 minutes for Hyannis. Do you have any good news?

Mr. Emery, do you have anything very quickly?

Mr. EMERY. No.

Mr. STUDDS. You do not know any short words, so never mind the short questions.

It is unfair to ask you to respond briefly, but at least you can think about it.

First of all, I want to thank you all for being so patient. I apologize for the confusion that we had last week.

Let me ask you to think about what I am going to ask you. If you were asked face to face by someone who made their living from the sea in the Gulf of Alaska or Georges Bank or any of the frontier areas we are moving into whether, in your scientific judgment the risks, not from catastrophic events, but risks incurred from routine operations of Outer Continental Shelf exploration development and production—if you were asked are those risks such that it is a reasonable thing for a prudent person to proceed with Outer Continental Shelf operations in an area such as Georges Bank, given its richness as a fisheries resource, is it fair to ask you to answer yes or not? It probably is not.

Does anyone care to answer that in 30 seconds or less?

[No response.]

Mr. STUDDS. That will teach me to ask questions. Let us let that stand as something we all need to think about, given the diversity of responses we have gotten here.

If I heard one thing from all of you, if I have derived anything of substance from the diversity of your responses, it stems from precisely that diversity. I am struck by what we do not know and the conflicting interpretations among experts about what we do know which, to a layman, is another way of saying what we do not know.

Mr. Emery, I understand you have a quick question.

Mr. EMERY. Yes, Mr. Chairman.

I wonder if the panelists might amplify on a comment made earlier relative to the effect of barging. It really would not make much difference where the material was barged away from the site or disposed onsite as far as this biological impact was concerned.

One of the suggestions made relative to operations on the Georges Bank is, is it possible that these materials could be barged and dumped 35 miles away over the Continental Shelf?

Do you feel that would minimize any biological risk to the Georges Bank area as far as fishing is concerned?

Is there any benefit to barging as opposed to dumping?

Mr. STUDDS. Thirty seconds.

Dr. PARSONS. I said shunting in any given site would not guarantee any further safety margin at that site, but very obviously barging would.

Mr. EMERY. What is the difference between shunting and barging?

Dr. PARSONS. Shunting is an operational consideration. Operators have certain physical limitations in terms of locating down-shunting pipes and they cannot move drill cuttings and muds physically far enough away. With barging, one could do that.

Mr. STUDDS. Gentlemen, I will ask you to respond to that question in writing.

Thank you for your patience and for contributing to what has been a very meaningful hearing.

[The following was received for the record:]

QUESTION BY MR. EMERY

I am interested in the advantages of barging drill muds to a dumping site off the continental shelf.

Would this eliminate the environmental problems that we have discussed today?

In your answer could you reflect upon the possibility of a large concentrated dumping of muds and cuttings from a barging mishap and compare the damage from this to regular shunting.

DEPARTMENT OF COMMERCE,
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION,
NATIONAL MARINE FISHERIES SERVICE,
Washington, D.C., April 1, 1980.

HON. GERRY E. STUDDS,
House of Representatives,
Washington, D.C.

DEAR MR. STUDDS: The following information is in response to Congressman Emery's question concerning the barging of drill muds, as presented in your letter of March 10, 1980, to Dr. Dean Parsons. Dr. Parsons has provided the following information.

Prior to addressing the question, we would like to elaborate on drilling procedures. The discharge of drill cuttings is a continuous process and occurs as long as drilling is underway. However, drilling muds are not released continually, except for the small volume not removed from the cuttings by washing before being discharged. Instead they are normally discharged several times during the drilling process. This is done so that the composition of mud can be changed, depending upon the stratigraphic layer or other drilling condition that is encountered. To achieve a change in composition, some portion of the mud is discharged so that new mud and other chemicals may be added. After all drilling is completed and before the drilling rig is moved to a new location, the remaining "batch" of mud is discharged during a single "slug" dump. In general, when barging of muds is advocated, what is referred to is this last batch of mud, forming perhaps 30 percent of all of the mud used during the entire drilling process.

The environmental studies performed to date of the effects on the biota of discharging drill muds have been focused on release of large quantities of muds, such as that occurring after completion of drilling. Unquestionably, to barge a volume of mud this large, rather than discharging it, would provide a margin of safety that could be especially important to sensitive biological populations such as coral and lobster. It is more difficult to determine what would be the environmental effect of the intermittent, smaller discharges of mud which occur throughout drilling should they not be barged. These discharges may have a lesser effect on the biota at the time of discharge, but they would still add significantly to the total amount of mud discharged during the extended drilling incumbent with the development of an oil or gas field.

In response to your question, it is Dr. Parson's opinion that the possibility of a large concentrated dumping of mud because of a barging mishap is not an unlikely event, especially if the transfer is attempted during inclement weather. The underlying reason why rig operators dump all muds before moving the rig is to reduce instability of the rig, as it is towed to the next drilling location. The damage sustained by dumping a barge with its contents of drilling mud, compared to that occurring through routine shunting practices, would vary depending upon the depth and location to which the drilling muds were being shunted. Should drill muds be shunted 15 or 20 feet below the surface or less, the amount of environmental damage which might occur would be similar no matter in what manner the release of the muds occurred. In both instances, a large bulk of mud would be released in a relatively short period of time.

If, however, the muds were shunted through a long downpipe to an area near the bottom, presumably to avoid contaminating a sensitive bottom community, then a barging mishap would be the more serious in terms of environmental consequences. The sudden release of a large volume of drilling muds, directly above a coral community could cause mortality, which depending upon the extent of coverage, depth of water and other hydrographic conditions, could be quite extensive.

Sincerely yours,

TERRY L. LEITZELL,
Assistant Administrator for Fisheries.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

APR 17 1980

OFFICE OF THE
ADMINISTRATOR

Honorable Gerry E. Studds
Chairman, Subcommittee on
Oceanography
Committee on Merchant Marine
and Fisheries
Room 1334, Longworth House
Office Building
Washington, D.C. 20515

Dear Mr. Chairman:

In accordance with your request of March 10, we are forwarding Dr. Bolton's response to Mr. Emery's question concerning barging of drill muds to an ocean dumping site.

If you have any further questions, or if we can be of additional assistance, please let us know.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "Hugh M. Miller".

Hugh M. Miller
Assistant Director
for Legislation

Enclosure

Response to Dr. Suzanne Bolton, Marine Biologist,
EPA Ocean Programs Branch to Questions
submitted by Congressman Emery:

- Q.1. I am interested in the advantages of barging drill muds to a dumping site off the continental shelf. Would this eliminate the environmental problems that we have discussed today?
- A.1. I am pleased to submit my response to the request for my opinion on the concept of barging discharges from oil and gas development wells away from the banks and dumping these materials beyond the Outer Continental Shelf off the slope.

Some basic information upon which my opinion should be based are either outside my area of expertise or unavailable at this time. Data on the currents and general water movement through the submarine canyons on the eastern front of the Banks will be collected beginning this summer. Data currently available was presented at the March 18-19, 1980, meeting to the Monitoring Subcommittee of the Biological Task Force on Georges Bank. I am attaching a copy of the minutes of that meeting for your information. The economic aspects of barging similarly are elements of the discussion for which studies are not yet available. Since any barge and dump plan specifying a dump site beyond the Continental Edge would necessitate an understanding of these aspects, any answer I propose now would be hastily concluded and stretching the realm of my expertise.

I am, however, not trying to ignore your interest in barging as a possible approach to the issue of protecting the Banks. Perhaps a slightly different approach might also be considered. In answer to a question concerning discharging of drill fluids on Georges Bank, my response was a hesitancy to endorse a general approval of discharges on the Banks. My concern centered chiefly upon the trace metal components of drilling fluids, their persistence once discharged into the environment, and the ability of marine organisms to accumulate them. With respect to the issue of the open discharge of drill fluids and the position that endorses barging of all fluids and cuttings, I suggest the notion of using a barite material such as bed-mined barite with a low trace-metal contamination. The barite comprises a large volume to the discharges from oil and gas drilling operations and the "cleaner" material could possibly be discharged with reduced concern for long-term impact on the Banks. Any muds containing chrome lignosulfonates or chrome compounds would, however, pose a threat that could be entirely eliminated by either using biologically compatible substitutes or barging them away.

Q.2. In your answer could you reflect upon the possibility of a large concentrated dumping of muds and cuttings from a barging mishap and compare the damage from this to regular shunting.

A.2. In response to your request for reflection upon the comparative damage from a large concentrated dumping of muds and cuttings from a barging mishap or regular shunting, several variables would have to be defined. Shunting represents a chronic discharge of material at some level in the water column over the Bank. That level in the water column will affect the ultimate fate of muds and cuttings. In the instance of muds containing heavy metals, the sequential discharges could contribute metals that accumulate over an extended period of time. Once more I would have to defer to those with greater knowledge of sediment transport to assess the ultimate fate of these contaminants. Materials could in part remain in the Bank sediment or possibly be suspended or resuspended and deposited eventually in the canyon heads, in the "mud patch" southwest of the gyre or redistributed around the Bank. Regardless, with shunting, all discharges not otherwise regulated will be deposited on a bottom at some point.

If there were a "barge" mishap, of course, the location of the mishap would be a critical variable. On the Bank top, the material would probably be washed back and forth over the top surface by strong tidal currents. On the slope of the Bank, materials light enough to remain in suspension would probably be swept either off the Bank or around the gyre before settling in the substrate. A concentrated dump into the canyon heads, however, could constitute a real concern if deposited in a large enough quantity to alter the bottom type thus affecting benthic species.

In conclusion, then, shunting of muds and cuttings is long-term: persistent quantities of toxics may accumulate. The quantity of such toxics could therefore be determined for multiple operations. Barging, on the other hand, is a probability situation. If a barge sinks and if the mishap location is critical, then a statement of damage can be made. Not all barges will sink so not all persistent materials will enter the immediate ecosystem. I am not aware of the mishap percentages for barging in order to make such a calculation. I would suggest that rather than consider barging, as such, the alternative use of mud boats be investigated since these latter have a compartmentalized feature and are more stable than towed barges.

MINUTES OF THE MONITORING SUBCOMMITTEE OF THE BIOLOGICAL TASK FORCE

The first day of the two day monitoring Subcommittee meeting commenced at 10:05 a.m., in the conference room of the Fisheries Center, Woods Hole, Massachusetts on Tuesday, March 18, 1980. Introductory remarks were delivered by the Subcommittee chairman, Suzanne Bolton. She highlighted the elements of the Biological Task Force (BTF) charter which forms the basis of the BTF main body and reviewed the circumstances under which the monitoring Subcommittee composed of Ralph Andrews (FWS) and the chairman (EPA) was formed by the BTF. The charge of the Subcommittee was threefold:

1. To make suggestions of biologically sensitive areas in the lease tracts in reference to Bud Dunenberger's (USGS) request of the BTF.
2. To design a short-term monitoring program
3. To design a long-term monitoring program

She explained that the session's participants were composed of the BTF appointed members, representatives sent by voting and non-voting BTF members, and members of the non-governmental scientific community who were either experienced on Georges Bank or who could lend experimental expertise to the committee and who were interested in the Subcommittee efforts.

Overviews of work done on Georges Bank over the past several years and on-going projects were presented by four researchers to ensure that all participants in the monitoring design effort had a common understanding of existing studies.

Dr. Allan Michael (Benchmark Studies)

Dr. Allan Michael (Taxon) presented the contents and status of the Benchmark Studies, funded in 1976 by BLM to ERCO, the main contractor. The study was designed to be a multi-year survey program intended to provide a statistically, scientifically sound characterization of key environmental aspects including physical, biological, geological, and chemical. The study consisted of 42 sampling sites, however only one year, four seasons, of samples were collected. The physical, chemical and geological samplings were processed and a draft report exists of the data, however, no final report was compiled. While benthic biota sampling was collected for four seasons, only two seasons had been sorted when the effort was terminated by BLM. The remaining two seasons of collections are preserved and are available for further workup. The data from the two seasons processed were put on computer tapes but the statistics used were not those tests requested by the subcontractor, and upon review of the tapes, too many transcription errors were found to make the tapes of much value.

Two handouts (attachments I and II), distributed by Dr. Michael, provided locations of the Benchmark sites, components of the sampling activity, sediment properties, environmental variables, a sampling summary, and some of the benthic data. The latter was used to demonstrate the patchiness of some of the commercially important shellfish and the variability found in replicates of a sampling sites.

Dr. Brad Butman (Currents and Sediment Transport)

Dr. Brad Butman (USGS) presented a survey of currents and sediment transport associated with Georges Bank. The data forming the basis of his review was compiled from environmental studies made by USGS in

cooperation with BLM. He reviewed several historical studies which contributed to the present understanding of the physical, geological and chemical processes of the Bank and described current meter arrays and two tripod systems which have contributed a large amount of the data base available on the Bank. The tripods and meter arrays locations and times of placement are as follows:

<u>tripod</u>	<u>location</u>	<u>dates</u>
A	40° 51'N, 67° 24'W	1975-1979
K	41° 2.2'N, 67° 33.5'W	1977-Present (Terminate 10-80)

The tripods measure surface waves, bottom current speed, eight transmission and temperature and are equipped with a photographic unit for recording sediment surface conditions. Three types of current flow were defined: (1) mean - average flow over many days, parallel to isobathes; (2) tidal - a reversing flow with no net flow, generally strongest at the top of the bank, weaker on the north/south flanks, perpendicular to bathymetry; (3) low frequency - a flow associated with storms, generally parallel to isobaths. He summarized by means of an example in which he suggested a possible transit time off the bank for material in suspension in the water column. By this example, material would take about a month if transported along the shelf to the southwest as to the "mud patch" (a 90% mud depositional area south of the gyre) to three month if caught in the gyre and circulated the circumference.

Hydrographic effects on material transport were discussed. It was emphasized that temperature and salinity are major effectors, so that seasonal effects, haloclines, thermoclines and pycnoclines should be

considered in any monitoring program. While water is constantly stirred by tidal flow on the top of the Bank, off the Bank, there exists a shelf slope-water front which is generally marked by a 10°C isotherm at about 100 m. This front acts as a boundary inhibiting mixing of shelf waters and slope waters.

Concerning sediment resuspension, Dr. Butman noted that on the top of the Bank, material is constantly resuspended and subject to movement back and forth such that in shallow areas to 60m, bottom sediment is constantly reworked, but, between 60-90m, resuspension is seasonal under the influence of strong storms. The submarine canyons can trap some of the along shore flow but might possibly attract materials moving along the bed rather than suspended materials.

Winter storm effects are probably less important below 100m and at depth other factors such as internal waves may scour and resuspend bottom sediments at the front and should be considered in a monitoring study. Dr. Butman emphasized that the degree of erodability of the bottom was rather dependent upon the bottom community. For example at Station A he made reference to a algal-detrital mat which during warmer months (5-6°C or warmer), is not subject to erosion but which, from December through March, is cleaned off and the sediment reworked. In reference to information available near the heads of and within submarine canyons, he summarized that these are gray areas but that negotiations were underway to continue the USGS studies in these geophysical areas.

Dr. Charles Mencie (EG&G) BLM On-going Study

The field study presented, represented data from the efforts of Ratheon and EG&G, from the fall, 1977, to fall, 1979. The program was

process oriented, that is, it was flexible to change with input of data.

It consisted of the components listed:

1. surface currents
2. subsurface currents
3. hydrography —
4. nutrients
5. plankton

Drog studies confirmed that Georges Bank is a complex and very dynamic system. The use of aerially tracked drogs was found to be unsatisfactory for the study of long term surface movement so a switch to satellite tracking was made. Studies indicate that the circulation pattern is predominantly a northeasterly flow along the northern region of the bank and southwesterly in the southern region of the bank. There is evidence for a generally southerly flow across the bank proper. In the vicinity of the Great South Channel, there is also some indication of a northerly flow. The drogs also indicate an area of little movement just east of the Great South Channel. The data suggests that a major portion of the flow exits the Bank to the southwest.

Hydrographic data (temperature, salinity, and oxygen content) were collected on 8 cruises and were used to define regions on and around the Bank characterized by similar mixing processes. Phytoplankton, chlorophyll concentration and primary productivity measurements were made on 4 seasonal cruises. Nutrients and biological data were collected in support of the physical data to better define the mixing processes.

Measurements of primary productivity, chlorophyll concentration and phytoplankton standing crop tended to be higher along the northern region of the bank and in the Great South Channel than elsewhere in the system. The data would preliminarily suggest that the higher

productivity along the northern region of Georges Bank may be due to a weak upwelling of nutrient rich Gulf of Maine intermediate waters into this region as a result of the complex physical properties of this area (e.g., North Flank current jet).

To date two analysis reports have been prepared dealing with the topics: (1) interaction of a Gulf Stream Eddy (Eddy Q, 1977), (2) description of general circulation patterns on Georges Bank. In reference to the eddy data, it was noted that yearly, five to ten eddies pass along the edge of the banks and should be a factor considered in a monitoring plan.

Dr. Richard Cooper - Submersible Studies

Dr. Cooper outlined the submersible studies done by NOAA on the outer shelf, upper slope, in submarine canyons, and on the southern crest of Georges Bank. His research team is proposing to begin, this summer, a baseline study of five sites in the Georges Bank area (two in canyon heads - Lydonia, Oceanographer, three in drill areas).

With an impressive slide show, he demonstrated four distinct habitats in the benthic boundary layer (that region from 1-2m below the substratum and 3-4m above the sediment-water interface) of the OCS and slope. These habitat were as follows:

1. mud-silt substratum: flat featureless, common on the outer shelf and slope of the Continental Shelf.
2. Cerianthus borealis forest: 300-400m; a source of shelter
3. boulder field: sand and crushed shell to clay substratum; at the head of Oceanographer Canyon (200-250m), for instance, white hake populations are extremely concentrated (an article on the geobiology of this canyon will be available soon in Marine Geology); at 1000m, boulder fields and anemones, the sediments are quite variable and two observations were made.

- a. to use otter trawls or a Smith McIntyre for sampling would be naive in the canyons - it is important to see where and how sample is taken
 - b. sedimentation accumulating in these canyon heads could affect juvenile settling
4. Pueblo village habitat: pleistocene clays; 175-250m; cleaner shrimps predominate but the major shapers of the bottom are the tile fish, a unique species (form extensive grottos); tile fishes are a major component of the predator/prey relationship; the upper canyon slope and head, down to 350-400m, are the breeding grounds for the American lobster.

Dr. Cooper solicited comments and suggestions for incorporation in his proposed study of the five G. B. sites.

Dr. Woolcott Smith - Logic of Survey design

Dr. Smith began his discussion by proposing two problems inherent in the design of an environmental monitoring scheme as follows:

- (1) the questions to be answered by the design
- (2) the constraints (financial, duration, sampling techniques)

He emphasized that the more information available prior to modelling a program, the better the design and that, the more detailed the model design, the better the things that can be done statistically. Two major variables for consideration in a sampling design are the number of samples taken over the time period of a study and the number of replicates taken per sample. Such analysis requires that the designers determine a statistically satisfactory compromise between many replicates made a limited number of times a year and no replicates made if sampling is very frequent. Such an analysis must heavily consider practical constraints.

Dr. Smith suggested an oversampling regime, done in a grid pattern, sampling variables and then subsampling within samples. In accordance with this design, any easily recordable sampling should be collected at more frequent intervals to provide additional input to the data base.

The design of a survey dealing with the critical decision involving the level of effort to expend in surveys at a single point in time and the number of times a survey is to be repeated over time is best represented in a paper distributed by the author (Attachment III).

Dr. Howard Sanders (Monitoring Design)

Because of a schedule conflict, Dr. Sanders was unable to participate in the two day session but requested an opportunity to present his inclinations on monitoring of Georges Bank. He preceded his remarks on monitoring by a brief comment on the experiences of Woods Hole scientists with government sponsored workshops or forums. In past endeavors, the independent scientists have been asked to meet and assess programs or make recommendations on agency research priorities. After submitting these consensus conclusions or recommendations, these scientists later saw reports released using their names but not their conclusions or recommendations. Dr. Sanders expressed the opinion that some of the reluctance of Woods Hole Oceanographic Institute (WHOI) scientists to participate in the present Subcommittee's activities was due to these experiences. Dr. Sander's comments were echoed by several of the scientists present. The chairman assured all the participants that the Subcommittee's activities would be reported for the record as completely and accurately as possible.

Dr. Sanders presented his concerns about Georges Bank monitoring by reference to existing studies of oil and gas operations. Most

emphasized was the opinion that the ecosystem of Georges Bank must be defined prior to oil and gas exploration. He cited the Gulf of Mexico as an example to heed in planning activities on the Bank. In particular, he referred to the G.U.R.C. study, and its lack of control sites due to a general contamination of the northwestern and central Gulf as a result of long term oil and gas activity.

The study design proposed as a model is based on the work of Addy, and a monitoring program in the Ekofisk Oil Field in the North Atlantic (Attachment IV). The Addy design is essentially a radial sampling program which requires sampling periodically before, during, and successive years after industrial operation.

Supplementing such a long term monitoring program, Dr. Sanders advised that the subcommittee incorporate an oversampling regime repeated four times a year using high calibre technicians. He suggested that replicates of each sampling site be obtained and distributed, one set each to government, industry and a conservation organization. It was also proposed that a set be put aside and properly stored to serve as a baseline sample in the event that adverse affects on the biota occur on Georges Bank. In this manner, any analysis made of samples could be cross checked by the interested parties and thus serve a quality control function.

General Discussion

Dr. John Farrington (WHOI) suggested that a double blind test was necessary and that any sampling be modified to include data collected from the USGS studies. He advised the participants that there are strategies of gas chromatography/mass spectrography for monitoring around rigs and noted that laser fluorescence is less costly. His concern was

primarily that of oil contamination and the ability to assess the source of such contamination. He proposed cruder measurements on more frequent sampling.

There was interest expressed in the Benchmark data and whether money is available to complete the study and make the data accessible. Several individuals proposed the use of Benchmark sites as core or baseline sites in areas of high probability oil and gas operations.

The discussion that followed compared the pros and cons of monitoring designs with the expected give and take concerning particularly those suggestions made by Dr. Sanders, Smith, and Farrington. Dr. Mencies added to this discourse with some highlights of the Mid-Atlantic monitoring design. Since the direction of the meeting was rambling, it was suggested that we return to the immediate needs at hand i.e., the first two charges outlined in the introductory remarks.

On the topic of specific recommendations to the BTF in compliance with Danenberger's request to enumerate biological sensitive areas, the participants unanimously agreed that without the material being prepared by Pat Hughes and Allan Peterson, the subcommittee was in little better position to make such recommendations at this time than the BTF. Dr. Ingram (NMFS) suggested that the initial reluctance on the part of some agencies to make recommendations might have been due to the attitude that to cite one area as biologically sensitive might preclude that areas of the bank not specifically cited were not biologically sensitive.

Similarly, it was determined that the design of a short term monitoring program was the task at hand and that a long-term more comprehensive program for the Bank might better be deferred to a future meeting specified to that purpose. The definition of "short-term" monitoring program was subsequently agreed upon as follows:

definition: a monitoring program which is designed in both space and time by the site(s) of operation of a rig(s) and the short-term fate of discharges.

By this definition a short-term monitoring program would begin immediately prior to the actual rig emplacement, be designed with the rig site as the focus of the study, continue through the life of the rig and terminate during the year following the removal of drilling operations. It was emphasized that despite the use of the term "site specific" in discussions, this monitoring program would include sampling of sediment sinks such as canyon heads and the mud patch as discussed earlier by Dr. Butman. The emphasis was on a program which could be incorporated into the proposed more comprehensive long-term study.

It was suggested that interested parties prepare plans for a short term program for presentation the following morning to provide a firm starting point for derivation of consensus design. Dr. Allan Michael (Taxon) and Hawley Thomas (BLM) volunteered to submit designs.

Wednesday, March 19, 1980

The meeting began at approximately 9:15 a.m. Carolyn Griswold (NMFS) suggested that the Subcommittee might be interested in a quick review of National Marine Fisheries Programs which are sampling either all or in part in the Georges Bank area. She enumerated them as follows:

1. Ichthyoplankton/zooplankton surveys over all of Georges Bank:
 - a. the larval herring surveys and trawl surveys over the banks - a six transects study of set sites done up to 10 times a year
 - b. ground fish survey - a randomly stratified sampling regime repeated 3 times a year
2. benthic dynamics study - ongoing

3. Gulf-Atlantic survey: selected samples, fish; hydrocarbon content
4. Ocean Pulse Program: some stations on Georges Bank - enzyme analyses, abundance, respiration

Design Suggestions

Proposal #1

Diagram #1 was presented by Hawley Thomas (BLM) as a possible starting point of our short-term monitoring design. He went on to elaborate the sampling pattern which consists of sampling transects located on the spokes of a radial design with sampling sites at specified intervals such that these intervals form concentric circles successively distant from the focal point (the drill operation).

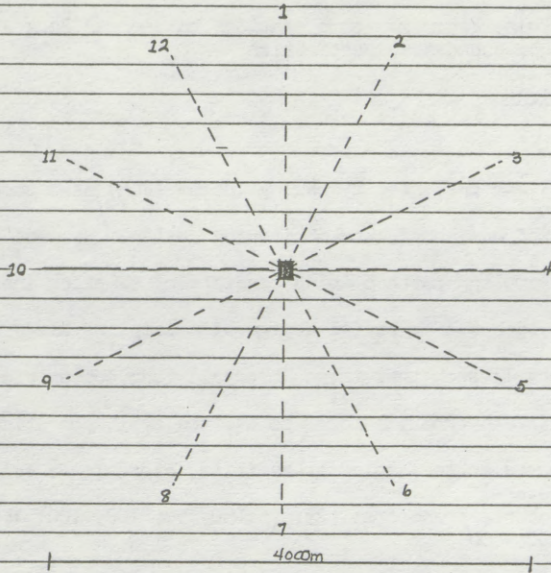
Transects are to be sampled at additive intervals as follows:
(distance in meters)

1. odd numbered transects: 25, 25, 50, 50, 100, 100, 150, 250, 250, 500, 500
2. Even numbered transects: 250m intervals to 2000m from the focus (it was suggested that these even numbered transects be incorporated as a part of the long term program and sampled two times a year)

Mr. Thomas outlined the components of the sampling regime as follows:

1. Time: begin immediately
2. Frequency: (a) presurvey
(b) exploratory rig - following rig site completion (1 week after)
(c) 6 weeks to 6 months after completion
3. Positioning: transponder navigation
4. Sampling: (a) commercially important invertebrates (ocean quahog)
(b) commercially important vertebrates (flounders yellowtail, hake)

diagram # 1



- (c) sediment (predominantly sand)
- (d) benthic scan - underwater t.v. or photography
- (e) geological structure - including chemistry
- (f) dynamics - water flow
- (g) benthos and finfish - state of health
- (h) replicate sampling distributed for analysis as suggested by Dr. Sanders
- (i) water column - including chemistry

In the discussion that followed, initial comments centered on the suggested locator system. Dr. Cooper suggested that the success of this system in such a heavily fished area is questionable. Evidently even buoy markings and public notices to mariners are only marginally successful in protecting these costly electronics. Dr. Butman proposed that Loran C is repeatable to 200 feet and thus satisfactory for the monitoring plan.

It was suggested that grabs samples would be a satisfactory technique on the bank. The use of t.v. cameras requiring constant lighting was criticized and a pogo stick mechanism with strobe or t.v. trawl suggested as alternatives.

To a proposal that selected pollutants be sampled, Mr. Thomas referred to the sampling components of his plan and concluded that if predrilling sampling indicated a healthy system, fine; if not the baseline would be considered elevated.

Pat Hughes expressed concern about seasonal variations and the value of measuring at one point in time. Hawley Thomas felt that the Benchmark data provides the information necessary to assess what is there, while the monitoring plan will provide site and time specific collections. This interchange produced questions about the workup of

the Benchmark data. Hawley Thomas responded that if the money can be found, the samples will be processed.

Woollicott Smith suggested that the diagram be scaled to the tidal cycle so that the last sampling site is outside the range of that cycle. He similarly would prefer more sampling be done. To this latter emphasis on increased sampling, it was pointed out that rigs are only in place up to 200 days for a 16,000 ft. well and information of rig location is available only shortly before siting. Dr. Ingram (NMFS) was concerned that the limited sampling before, during and after, with a year later follow-up, might be skewed by events. He also questioned 25m intervals as within the experimental error of ships navigation. 50m intervals were sampled in the Mid Atlantic study, however.

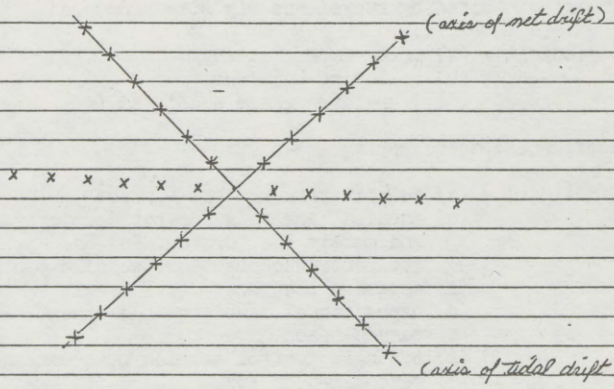
A control site up current was strongly supported despite arguments that the pre-drilling sampling amounted to a control. The pre-drill site it was countered, however, does not provide input of on-going natural occurrences.

Butman supported the feasibility of a control by noting the fairly homogenous sediment conditions on the same isobaths, except on the edge of the shelf, and the ability to calculate distances beyond tidal ellipses and storm incursions.

Proposal #2

Diagram #2 was a rig specific design presented by Dr. Michael based on the EG-G Baltimore Canyon study. The proposal is meant to monitor the site specific drilling operation and to be incorporated into a system oriented long term monitoring plan to address broader issues. The design axis transects are oriented in the direction of

Diagram # 2



(distances calculated from existing knowledge)

tidal drift and in that of net drift. The components of the plan are as follows:

1. Location: sited by buoys once rig site announced
2. Periodicity: (a) prior to rig siting
(b) following bulk dump
(c) 1 yr later, same season as (a)
3. Replicates: oversampling - 3-5
4. Sampling: (a) quantitative benthos - grabs
(b) chemical analysis for petrogenic hydrocarbons and metals (Cd, Cr, Cu, Fe, Ba, Ni, Pb, Zn) in sediment, macrobenthos, sessile benthos
(c) assess epibenthos - t.v. trawls
(d) depositional sampling in sediment sinks and canyon heads
(e) a single control station upstream and well beyond net drift
5. Sampling distances: calculated from existing physical oceanographic knowledge

In the discussion which ensued, the lack of water column measurements was noted. Russ Wilder discussed the difficulty in sampling the water column for drill fluid because of dilution and the limitation of detection capability. A measurement of any surface slick from discharges was proposed. Carolyn Griswold felt we would be remiss not to include plume studies and effects on eggs and larvae. Judy Spiller reported on-going work by Tom Gilbert, New England Aquarium, looking at drill fluid effects on some eggs and larvae. The prime spawning period is apparently April and the following three months.

There was some question about the exponential decrease in sampling sites at the fringes of the sampling design. Dr. Marchesseault, concerned about possibility of heavy metals travelling with fine sediments, suggested that a uniform sampling grid may be necessary.

Concensus Program

Locations were proposed for both experimental and control sampling sites based on the utilization of existing information (Benchmark sites, location of USGS tripods of current meters, lease blocks of high cost/high productiity potential, lease operators requesting USGS permits to drill) - See map (Attachment V - available at April 8 meeting).

Three distinct regions were selected based on sediment and hydrographic characterization as follows:

1. top of bank as typlified by the region around lease blocks 974, 975, 931, and 7
2. slope of the bank as in the region around lease blocks 269, 270, 271
3. near 200m isobath or in the region of canyon heads as around lease blocks 365, 366, 367, 409, 410

The experimental rig specific sites will be determined as explorational plans of the leases requesting permits become available. By selecting one operation/region, monitoring efforts may be maximized and drill effects or dispersion patterns generalized for leases in the three regions in lease sale 42. Once experimental sites are localized, the control sites may be sited up current beyond calculable net excursions but within a comparable sediment and current regime as that of the experimental sites.

By locating experimental and control stations in this manner, seasonal data from applicable Benchmark stations and other available studies may be used to characterize the area of monitoring.

1. Program design

- (a) radial axes/current oriented with uniform sampling approach
- (b) axes extending beyond calculated tidal excursions
- (c) control sites for site specific locations

2. Time frame of short-term monitoring program

- (a) before: determined by siting of operation location by industry;
before structure in place
- (b) during: during actual industry operation preferably during a
significant discharge with the following considerations:
 - i. presence of eggs in the water column
 - ii. toward end of operation so muds represent those of
greatest well depth
- (c) immediately after: within a short period of operation
completion
- (d) contingency: in case of any special event (see component #h to
follow)
- (e) one year post study: same season as (a) one year later

3. Components

- (a) analysis of metals (BLM-9) and petrogenic hydrocarbons in:

- i. sediment

- ii. selected biota (sessile organisms and commercially
important)

- at stations
 - with grabs

- filter feeders (deep sea scallop)
 - deposit feeder

- trawls
 - or
 - traps
 - gulf stream flounder (C. artifrons)
 - or selected endemic species
 - crustaceans (Cancer borealis,
Homarus americanus)

- (b) quantitative macrobenthos (grabs)
0.5mm screen; 0.1m² Smith-McIntyre; 5 replicates
- (c) quantitative megabenthos - photographic

- (d) egg mutagenicity
- (e) ichthyoplankton health (Longwell advice) experimental studies
- (f) water column chemistry
(scaled to density, temperature parameters)
 - i. BLM 9 metals and petrogenic hydrocarbons
 - ii. temperature
 - iii. salinity
 - iv. suspended sediments
- (g) weather conditions/currents
(may be available from rigs by USGS permit conditions) possibly use satellite monitoring
- (h) contingency for special events
 - i. winter storm resuspension
 - ii. Gulf Stream eddies
 - iii. spills (boat or rig)/blowouts
- (i) Continued sampling of selected Benchmark sites and workup of existing data from those sites as in:
 - i. mud patch
 - ii. Great South Channel
 - iii. canyon heads
 - iv. stations 28, 29 or other control sites

The Subcommittee expressed the belief that the short-term monitoring program, as designed, could be incorporated into a more system-comprehensive long-term program on the bank. The implementation of a Sanders-type quality control sample analysis system described earlier was preferred by the participants.

The next meeting was scheduled for May 8-9, 1980, to consider reviews of this program and design the long-term program for implementation prior to drilling operations.

It might be noted that the Subcommittee designed the short-term program prior to the long term program under the assumption, suggested

by several agencies' spokesmen, that no drilling would occur before March of 1981.

Recommendations to BTF by the Monitoring Subcommittee

1. Gather descriptions of on-going or planned projects (duration, locations, application)
2. Workup the Benchmark data, and the data collected by Wigley and Theroux. Attempt to synthesis other NMFS data to usable form
3. Send out the Concensus program for review

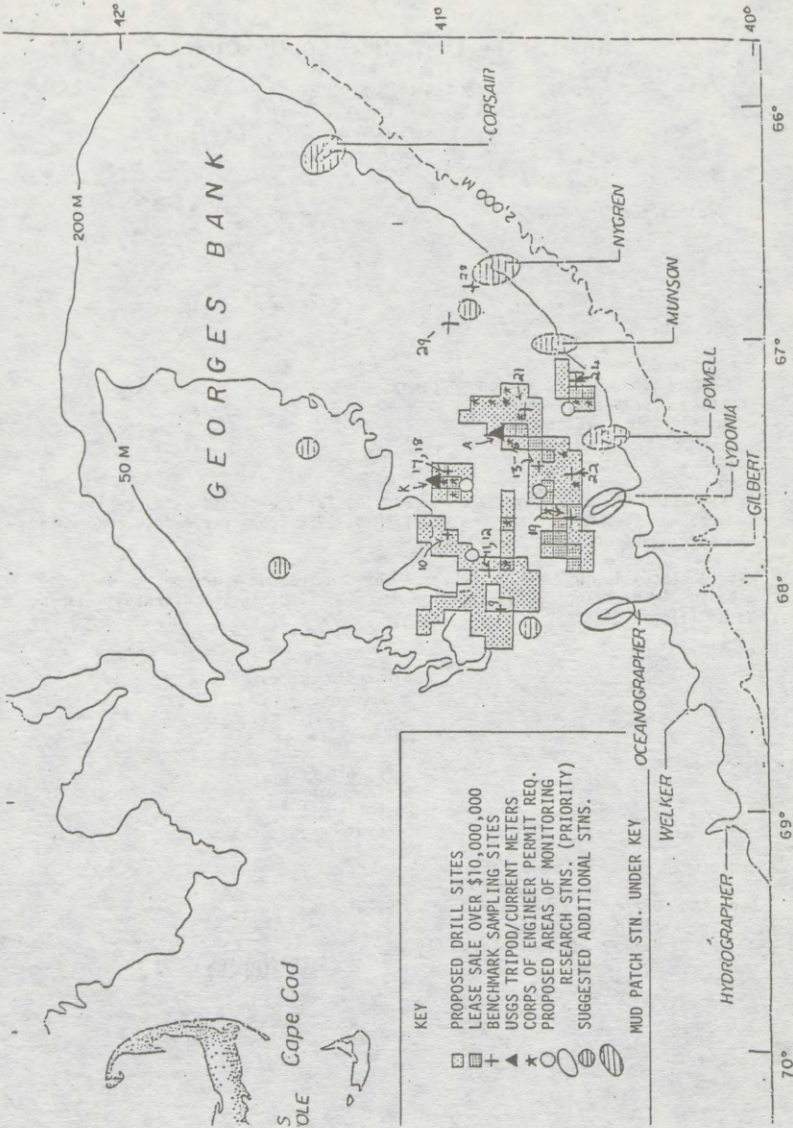


Figure 1. Distribution of underwater research-monitoring stations on Georges Bank and related submarine canyons in relation to proposed drill sites.



United States Department of the Interior

GEOLOGICAL SURVEY

IMPERIAL OFFICE BLDG., 3301 N. CAUSEWAY BLVD

P. O. BOX 7944

METAIRIE, LOUISIANA 70010

TEL: (504) 837-4720

In Reply Refer To: OS-7-1

APR 23 1980

Honorable Gerry E. Studds
Chairman, Subcommittee on Oceanography
House of Representatives
Washington, D.C. 20515

Dear Mr. Studds:

As requested by letters of March 10 and 14, 1980, enclosed is my reply to Congressman Emery's question dated March 3, 1980 (copy enclosed), concerning the barging of drilling muds.

Also enclosed is information requested by Congressman Emery on the use of asbestos in drilling fluids asked on March 3, 1980, in the Oversight Hearing on Drilling Mud Research.

Sincerely yours,

Terry Hight

Terry Hight
Staff Engineer
Operations Support
Gulf of Mexico Area

Enclosures

Copy to: Office of Congressman Gerry E. Studds
146 Main Street
Hyannis, Massachusetts 02601

APR 28 1980

RESPONSE TO MR. EMERY'S QUESTIONS

Subject: Congressman Emery's Request for Information on Barging (Dated March 3, 1980): "I am interested in the advantages of barging drill muds to a dumping site off the continental shelf. Would this eliminate the environmental problems that we have discussed today? In your answer could you reflect upon the possibility of a large concentrated dumping of muds and cuttings from barging mishap and compare the damage from this to regular shunting?"

Response: Your request implies, in part, that there are advantages in barging drill muds and cuttings. I believe the evidence does not support this position. Although barging option can be required by the Department of the Interior to protect biologically sensitive areas, it has not been required because of a number of protective measures which have proven adequate. Rather, barging represents a "simplistic solution" which disregards the fact that no damage has occurred when drilling mud has been properly discharged and also shows a lack of understanding of the inherent problems associated with the operational requirements. Concerning the environmental side of the issue, the drilling mud composition and quantity would be the same if the mud and cuttings were barged or not barged. This would mean that the same number of "unknown chemical compounds" (EPA's and NOAA's concern) would be discharged. The difference being where it was discharged, at what rate, and what the resulting concentration would be as a function of time. With barging, the rate and resulting concentration would be several orders of magnitude greater than the typical 40 barrels per hour discharge rate. An operational consideration, when transferring drilling muds and cuttings by barging from exploratory wells, would occur in the securing of a barge or barges alongside such a mobil drilling rig. This is a safety hazard and increases the risk of losing large amounts of drilling fluid in a short period of time. The barge(s) could conceivably slam against the drilling rig causing loss of the barge, drilling rig, well, and human life. Although barging of drilling fluids in inland waters has been done, it has not been accomplished on the high seas. Barging the drill muds to shore for disposal would contain similar risks as an off-site dumping. In stormy weather if barges could not be dumped when full, operations would come to a halt resulting in downtime and operation problems such as stuck drill pipe with a loss in time, materials, and possible loss of life.

It is illogical to depart on an untested idea which has more potential hazards than present practices which are successful. The question should be, "What can be done to minimize the potential for damage?" Shown below are some of the options that are available:

1. Restrict chemical compounds that are known to be harmful and substitute less harmful substitutes.
2. Require no drilling zones near biologically sensitive areas.
3. Use physical methods such as shunting, or bulk discharging only when the currents would carry the material away from the area(s) of interest.
4. Require dilution prior to discharging.
5. Regulate the discharge rate.
6. Restrict bulk dumping.

In conclusion, I believe the facts indicate that barging is not a solution but rather represents unnecessary risks.

Subject: Congressman Emery's Request for Information on the Use of Asbestos in Drilling Fluids

Response: Preliminary information indicates the following:

1. Principal suppliers of asbestos in the Gulf of Mexico OCS are Montello, Incorporated and Drilling Specialties Company.

2. Asbestos is used in drilling the upper sections of the hole.

3. Asbestos is used primarily as a viscosifier. Asbestos has been used as a lost circulation material; the amount used depends on the severity of the problem.

4. When asbestos is used in a drilling fluid, one to three pounds are used per barrel, depending on the viscosity desired. Two to five pounds per barrel are used in a workover fluid.

5. Bentonite is an available substitute viscosifier and is most often used in place of asbestos.

6. Hunsinger (1980) reports the presence of asbestos in Eastern Canadian waters is very prevalent with values ranging from 10^5 to 10^7 fibers per liter, and asbestos fibers have been found in the drinking water of several major cities in Eastern Canada. This information suggests little potential for environmental damage when discharged into OCS waters.

7. Environmental Science and Technology (1979) reports that further restrictions on the use of asbestos are being considered by EPA and by the Consumer Product Safety Commission. The new regulations could affect the manufacture of household appliances, automobile brake linings, and building materials. EPA is considering a limitation on the annual production and importation of asbestos. Current regulations prohibit using sprayed asbestos materials in buildings and sets limits on workplace exposure. The restrictions on the use of asbestos are directed at air inhalation hazards not water contamination.

Information on the use of asbestos in the Gulf of Mexico OCS Region is being obtained and will be reviewed to determine if health problems are associated in handling asbestos and the subsequent inhalation hazards.

References

- Hunsinger, R. B., Roberts, K. L., and Lawrence, J. 1980.
"Chrysotile Asbestos Fiber Removal During Water Treatment - Pilot Plant
Studies." Environmental Science and Technology, Vol. 14, No. 3: 333-339.
- ES & T Currents, 1979. "Further Restriction on the Use of Asbestos."
Environmental Science and Technology, Vol. 13, No. 12: 1337.

NOTES

Chrysotile Asbestos Fiber Removal during Potable Water Treatment. Pilot Plant Studies

Ronald B. Hunsinger* and Kenneth J. Roberts

Ontario Ministry of the Environment, 135 St. Clair Avenue West, Toronto, Ontario, Canada M4V 1P5

John Lawrence

Water Chemistry Section, National Water Research Institute, Canada Centre for Inland Waters, Burlington, Ontario, Canada L7R 4A6

■ Pilot plant studies incorporating conventional potable water pretreatment (coagulation, flocculation, sedimentation) and filtration to assess chrysotile asbestiform fiber reduction are reported. Some problems were encountered in consistent fortification of the pilot plant feed water with sufficient asbestos to make removal measurement possible. A subjective analysis of the pilot plant runs indicated that optimized conventional water treatment is effective in reducing asbestiform fiber concentrations. Difficulties experienced in analytical precision led to the recommendation that further pilot work be curtailed until analytical methods can measure significant reductions in asbestos across treatment processes at ambient levels. No direct relationship could be found between asbestos concentration and turbidity.

Canada has traditionally been blessed with an abundance of high quality water from which to draw its municipal supplies. However, in 1971 Cunningham and Pontefract (1) identified chrysotile asbestos fibers in the drinking water of several major cities in Eastern Canada and these occurrences have since been confirmed at other locations (2,3). In fact, the presence of chrysotile asbestos in Canadian waters now appears ubiquitous with values ranging from about 10^5 – 10^7 fibers L^{-1} [higher values of up to 10^9 fibers L^{-1} have been reported in the vicinity of asbestos mining communities (4)]. Chrysotile is the most common asbestos species found in Canadian natural waters and in most cases is the only identified fiber present in numbers above the detection limit. The health significance of continuous, low level ingestion of chrysotile asbestos has not been determined, but in the absence of established risk information it would seem reasonable that water treatment engineers aim to achieve as low a level as is possible in potable water.

Lawrence et al. (4,5) have reported results of bench scale studies for the removal of chrysotile fibers from water. These authors showed that asbestos fibers reacted to conventional potable water pretreatment processes (coagulation, flocculation, and sedimentation) and filtration in a manner similar to other particulate matter. However, their experiments also pointed out that the usual parameter of effectiveness of the coagulation and filtration processes, namely turbidity, did not relate with any reliability to the asbestos particle content of the finished water at concentrations below 5×10^{10} fibers L^{-1} . Consequently, detailed asbestos analyses have to be carried out on all samples to determine the fiber concentrations. Pilot studies have also been reported by the U.S. Environmental Protection Agency (6) for the removal of amphibole fibers from Lake Superior (amphibole fibers have a negative surface charge, whereas chrysotile fibers are positively charged).

This project was undertaken as a joint venture between the

Ministry of the Environment, Ontario (MOE), and the Canada Centre for Inland Waters, Department of Fisheries and Environment, Canada (CCIW), between 1976 and 1977. The object was to evaluate various pretreatment (coagulation, flocculation, and sedimentation) and filtration processes for chrysotile asbestos fiber removal from surface water at a pilot scale treatment facility equipped with full process control. Also, it was planned to reexamine for any possible turbidity-asbestos concentration correlation.

Asbestos Analysis

At the time that this study was undertaken, there were three common analytical methods available for determination of asbestos in water (7). All used the transmission electron microscope (TEM) for the actual counting of the fibers, but the sample preparation techniques differed significantly. The three methods are designated below as A, B, and C. Method A involves ultracentrifuging the sample, ultrasonically resuspending the residue in 1 mL of water, and placing a 1- μ L drop of this suspension on a 3-mm carbon-coated electron microscope grid. In method B, the sample is vacuum filtered through a membrane filter of 0.1- μ m nominal pore size, the membrane is ashed in an oxygen plasma at 100 °C, and the ash is dispersed ultrasonically as in method A. Method C involved filtering the sample through a membrane filter, carbon coating the filter, placing a small portion of the filter directly on a TEM grid, and dissolving away the filter medium using a Jaffewick assembly. The carbon-coated particles were then supported directly on the TEM grid.

Method A was used throughout this study because that was the method being used by the electron microscope laboratory at CCIW at that time. The dried grids were examined under a "Siemens 101" transmission electron microscope ($\times 20\,000$ magnification). When the concentration of fibers was low (10^5 – 10^6 L^{-1}), it was necessary to count all of the approximately 100 grid openings covered by the 1- μ L drop. At higher concentrations, it was sufficient to count only 20–50 random squares and assume that these squares were representative of the entire drop. Background counts were carried out on each grid before use, and this number was subtracted from the total number of fibers counted for the sample. The limit of detection was 5×10^4 fibers L^{-1} . With the complex sample preparation procedures and the visual difficulty of counting the fibers under the electron microscope, it was felt that all the analytical results obtained during the current project contained an overall uncertainty of at least a factor of 2 (i.e., a sample reported as 1×10^6 fibers L^{-1} could have values ranging from 5×10^5 to 2×10^6 fibers L^{-1}). The precision of TEM analysis of chrysotile fibers has recently been discussed in detail by Hallenbeck et al. (8).

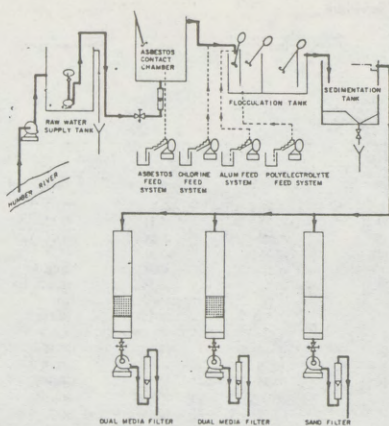


Figure 1. Pilot scale water treatment plant

Since this work was completed, a Ministerial Committee on Asbestos Analysis has recommended that method C be adopted as the "interim standard" method (9).

Pilot Plant Facility

The pilot plant was set up in the Ministry of the Environment Research Test Facility in Toronto. This facility uses the Humber River as its raw water source. Unfortunately, initial analysis of the Humber River water indicated asbestos levels only of the order of 5×10^5 fibers L^{-1} . Hence, it was necessary to spike the river water to approach those higher asbestos levels indicated in the earlier surveys (2, 3).

Figure 1 shows the schematic of the treatment processes employed. Raw water was pumped at a rate of approximately $0.8 L s^{-1}$ (10 imperial gallons per minute (lgpm)) from the Humber River into a 980-L (200 Ig) supply tank with the excess flowing to waste. The water was then pumped at a rate of $0.4 L s^{-1}$ (5 lgpm) through a rotameter to a 3814-L (840 Ig) asbestos contact chamber, giving a retention time of 2.8 h. A long shaft mixer kept the contents of the chamber well agitated at all times.

A metering pump added the asbestos suspension to the raw water in this chamber. From the asbestos contact chamber, the raw water containing asbestos flowed by gravity to a flocculation chamber. A second chemical metering pump added sodium hypochlorite solution for prechlorination of the raw water-asbestos mixture as it left the contact chamber.

A primary coagulant (alum) was added to the chlorinated raw water-asbestos suspension as it entered the rapid mix compartment of the flocculation tank. Two mixers gave an initial rapid mix. Leaving the rapid mix chamber, the water flowed under a baffle, at which point a multiport tube was installed and a coagulant aid (activated silica) was added with a metering pump. The water flowed over a weir into the second slow mix chamber and then under another baffle to the outer chamber. Both slow mix chambers were equipped with large propeller mixers operating at approximately 50 rpm, giving a G value of $20 s^{-1}$ in each chamber.

From the flocculation tank, the water flowed by gravity to a 4086-L (900 Ig) sedimentation tank providing a retention

time of 1.0 h. The water entered the sedimentation tank at mid-depth and was taken off via launders near the surface at the other end of the tank. On leaving the sedimentation tank, the water entered another header system which fed three filter columns located below the flocculation-sedimentation equipment.

The filters consisted of 14-cm i.d. acrylic columns, 2.24 m in height. Details of the media are given in Table I. Water was pumped through the filters with centrifugal pumps, and the flow rate was controlled manually with throttling valves and monitored on rotameters. Flow was adjusted to $8.9 m^3 h^{-1}$ (3 lgpm/ft²) for each filter.

The dosage and selection of primary coagulant and coagulant aid were determined by using a standard jar test procedure prior to each run. Coagulant aids were found to be necessary for good floc formation, especially during the winter period when low water temperatures were encountered. Generally, the dosage required for the Humber River raw water averaged $30 mg L^{-1}$ alum plus $5 mg L^{-1}$ activated silica. The initial dosage of chlorine was determined with a chlorine demand test, and the hypochlorite dosage was adjusted, as necessary, to maintain a free chlorine residual of $0.3 mg L^{-1}$ throughout the system. Asbestos spiking was achieved by metering in a $50 mg L^{-1}$ suspension of chrysotile asbestos, containing approximately 4×10^{12} fibers L^{-1} . Details of the preparation of this suspension and the size distribution have already been published elsewhere (4). The size distribution of the fibers from the suspension after dilution with the feed water was very similar to that of natural samples obtained from various locations in Canada. The asbestos concentrate reservoir was continuously agitated ultrasonically, and the feed lines were kept very short (15 cm) to minimize settling of the suspension. After the first series of runs, it became evident that the fortified water frequently did not contain the expected concentration of fibers. Consequently, it was necessary to investigate the problem of diluting concentrated suspensions in some detail, and the results have been documented in a separate report (10). Other researchers have reported similar difficulties when working with asbestos suspensions (7).

The sampling locations were as follows: (1) Humber River water, taken from 908-L (200 Ig) supply tank prior to the water entering the asbestos contact chamber; (2) feed water, taken at the inflow to the flocculation chamber prior to coagulant addition and after asbestos and sodium hypochlorite have been added (at this point, the asbestos had been contacted with the Humber River water for ~3 h); (3) post-sedimentation water, taken from the collector box at the end of the launders in the sedimentation tank, just before the water enters the header for the filters; (4) dual media effluent 1 (DM-1), the effluent of the dual media filter no. 1 containing 0.45-mm effective size (e.s.) sand and 0.9-mm e.s. anthracite; (5) dual media effluent 2 (DM-2), the effluent of the dual media filter no. 2 containing 0.45-mm e.s. sand and 1.2-mm e.s. anthracite; (6) sand filter effluent, the effluent of the single media column containing 0.70-mm e.s. sand.

The pilot plant was set up and monitored hourly over at least one retention period of the complete process. At the end of this period, intensive half-hourly monitoring was begun and when the turbidity of the effluent had reached a steady state, sampling was started. New, 250-mL "Nalgene" bottles were rinsed 4 times in the water to be sampled and $\frac{1}{4}$ portions taken at 0.5 h intervals until the bottles were filled.

The Humber River water and feed water were also sampled on a $\frac{1}{4}$ -bottle portion method, taking into account the respective retention times of the system. In this way, after reaching a steady-state condition, approximately the same "block" of water was sampled as it passed through the treatment system. If any problems were encountered during the

Table I. Filter Media in the Experimental Asbestos Removal Pilot Plant

filter no.	depth, cm (in.)	sand		depth, cm (in.)	anthracite	
		effective size, mm	uniformity coeff		effective size, mm	uniformity coeff
dual media no. 1	20.3 (8)	0.45	1.5	40.6 (16)	0.9	1.7
dual media no. 2	20.3 (8)	0.45	1.5	40.6 (16)	1.2	1.4
sand	45.7 (18)	0.70	1.5			

Table II. Asbestos Removal Pilot Plant Data^c

run no.	alum ^a	act. Si ^a	feed water ^b	postsed. ^b	DM-1 ^b	filters DM-2 ^b	sand ^b
2	30	5	4.02 (16)	1.5 (4.1)	0.31 (0.7)	0.3 (0.7)	0.73 (1.8)
3	24	3	0.81 (25)	0.23 (5)	0.23 (0.3)	0.24 (0.3)	0.56 (1.2)
4	36	6	7.8 (20)	1.4 (5.1)	0.07 (0.15)	<0.05 (0.16)	0.06 (0.13)
12	30	5	17 (22)	17.0 (4)	0.14 (0.14)	0.8 (0.15)	0.3 (0.18)
13	30	5	2.3 (8)	5.4 (3.0)	1.6 (0.11)	<0.05 (0.10)	1.9 (0.15)
14	30	5	3.4 (20)	0.8 (4.8)	<0.5 (0.14)	<0.5 (0.15)	<0.5 (0.16)
15	30	5	6.9 (28)	1.4 (5.3)	<0.05 (0.16)	<0.05 (0.16)	<0.05 (0.16)

^a Alum and activated silica dosage in mg L⁻¹. ^b Asbestos results in millions of fibers per liter. ^c Numbers in parentheses denote turbidity (Formazin turbidity units, FTU).

run (e.g., with the asbestos feeding system or turbidity breakthrough in one of the filters), the sampling was abandoned, the unit process corrected, and, one retention time later, the sampling resumed.

Results and Discussion

The results of the asbestos counts and turbidity measurements for the pilot plant runs are presented in Table II. Numerous other runs were carried through to completion only to find that the asbestos levels in the feed water were not sufficient to justify counting of postsedimentation and post-filtration samples. Examination of Table II leads to certain general observations. However, these observations must be approached with caution for many reasons; these include: the present state-of-the-art in asbestos counting technology, the experimental problems encountered in the feeding and retrieval of the asbestos, and also the relatively small amount of data obtained.

In three of the six postsedimentation samples reported in Table II, there was a significant reduction in the asbestos fiber counts (with corresponding reduction in turbidity levels) from those levels encountered in the feed water. This is in keeping with the earlier bench scale studies in which conventional potable water pretreatment processes did, in fact, produce substantial reductions in chrysotile concentrations (4, 5). Similar observations have been made regarding the response of other asbestos species to conventional potable water treatment processes in work carried out by the U.S. Environmental Protection Agency (6). However, the fact that three of the six postsedimentation samples reported exhibited asbestos counts that were not significantly different (keeping in mind the uncertainty of a factor of 2 in the analyses) from those encountered in the feed water makes any generalization difficult. The inherent inaccuracies in the analytical methodology also made it impossible to determine the effect of changes in coagulant and coagulant aid on the concentration of fibers in the postsedimentation samples.

Filtration, in the majority of cases, significantly reduced the amount of asbestos in the water from that which was encountered in the postsedimentation samples. In the results

outlined in Table II, fiber concentrations in the finished waters were below 1×10^6 fibers L⁻¹ in all but two of the cases and below 5×10^5 fibers L⁻¹ in 76% of the cases. The dual media filters produced an effluent that was superior to the sand filter effluent in terms of turbidity. The removal of turbidity through the two dual media filters was virtually equal over the duration of the study. As might have been expected, the actual asbestos fiber counts also reflected the superiority of the dual media filters. However, when the asbestos counts were subjected to the scrutiny of the uncertainty factor of 2, there was no significant difference noted between the asbestos fiber concentrations in the three filter effluents.

There does not appear to be any direct relationship between the initial and final asbestos fiber concentrations across the process. Relatively low asbestos fiber concentrations in the feed water did not always produce a correspondingly lower fiber concentration in the effluent. Conversely, high fiber levels in the feed water often correspond to low fiber concentrations in the filter effluent. However, from a general examination of the data it is apparent that the asbestos concentrations in the filter effluents are lower than those in the raw or postsedimentation water, indicating that conventional treatment processes are effective in reducing chrysotile concentrations. The lack of a specific relationship between initial and final concentrations could be due to either inconsistencies in the unit processes or inherent inaccuracies in the analytical methodology.

The lowering of asbestos concentrations across the treatment system generally coincided with a lowering of turbidity. Figure 2 shows a plot of fiber concentration as a function of turbidity for all the samples analyzed during the study. Considering that the data are presented on a log-log scale, there is too much scatter to derive a specific relationship between the parameters (correlation coefficient for the entire set was only 0.5). A similar lack of correlation between asbestos and turbidity was observed by EPA engineers when studying amphibole and chrysotile fibers in Lake Superior (6).

Conclusions

- A subjective analysis of the pilot plant results indicates

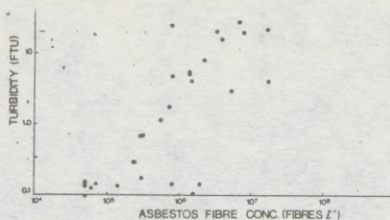


Figure 2. Asbestos fiber concentrations as a function of turbidity: a composite plot of all data reported in Table II

that optimized conventional treatment can significantly reduce chrysotile levels in potable water. It is felt that objective predictions and/or conclusions as to treatment efficiency are presently impossible given the current state-of-the-art in counting technology.

- Analytical methodology for chrysotile asbestos in water is often not sufficiently precise to detect concentration changes across unit processes.
- No definite correlation between fiber concentration and turbidity was observed.
- Consistent quantitative analysis of chrysotile asbestos fibers in river water following fortification with a concentrated chrysotile asbestos suspension could not be obtained.

Recommendations

- It is recommended that further asbestos removal studies

counting method is developed that can measure significant reductions in asbestos across treatment processes at ambient levels.

- Also, given that above, it is recommended that further studies be pursued under pilot plant conditions in an area with a significant asbestos concentration in the raw water.

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Received for review November 27, 1978. Accepted November 26, 1979. This paper was presented at the 175th National Meeting of the American Chemical Society, Anaheim, Calif., March 13-17, 1978, Division of Environmental Chemistry.

CURRENTS

INTERNATIONAL

Sweden will sharply limit the use of cadmium and cadmium compounds, beginning next July. Citing the steadily rising levels of cadmium which have been observed in human tissues, and the dangers of lung and kidney damage which may result from exposure, the Swedish government has moved to ban the use of cadmium in electroplating, as a stabilizer, and as a coloring agent. The country is also working to reduce the level of cadmium impurities in phosphorus fertilizer.

WASHINGTON

The EPA estimates a total cost of \$360 billion for federal pollution control programs for the period 1977 to 1986. \$142 billion of the total represents private-sector capital investment. A sharp rise in private industry's share of the costs of pollution control is foreseen for the 1980's. EPA's estimates are based on the measures necessary for compliance with current environmental legislation, using existing control technology; technological innovations could cut the price, while enactment of proposed legislation creating a hazardous waste clean-up fund could greatly increase the price.

The Tennessee Valley Authority has authorized the spending of \$5 million for the initial design of a coal gasification demonstration plant. Construction of the plant, which depends upon continued funding by Congress, is expected to be com-

pleted by 1989. When operating at full capacity, the plant will convert 20 000 tons of coal to gas each day. Total cost of the project is estimated at \$1-2 billion. The site of the plant, probably somewhere in northern Alabama, will be decided on early next year.



EPA's Costle

The nation is behind schedule in its plan to clean up polluted waters, according to EPA Administrator Douglas M. Costle. Drawn out court challenges to EPA regulations, as well as EPA approval of overly sophisticated and expensive treatment plant designs have contributed to the delay. A General Accounting Office study echoed this last point: Advanced wastewater treatment facilities, expensive to build and operate, have been approved in several areas where they are not needed to meet water quality standards. The EPA has established a review and planning program in an attempt to correct this problem.

Further restrictions on the use of asbestos are being considered by the EPA and by the Consumer

Product Safety Commission. The new regulations could affect the manufacture of household appliances, automobile brake linings, and building materials. The EPA is also considering a limitation on the total annual production and importation of asbestos. Current regulations prohibit using sprayed asbestos materials in buildings and set limits on workplace exposure.

A bill that would provide \$152 million over the next 11 years for a study of acid rain is before the Senate. Acid rain results when pollutants such as oxides of sulfur and nitrogen react in the atmosphere with water to form strong acids. Supporters of the bill (S.1754) have emphasized that the problem is a national one: Acid rain often occurs far from sources of pollution, a result, in part, from use of tall smokestacks built to disperse pollutants and so satisfy local air quality standards. Acid rain is known to have caused direct damage to plant foliage, rendered lakes incapable of supporting fish life, and leached toxic heavy metals from the soil into the water table. State programs would receive \$15 million to develop plans for dealing with acid rain.

The Occupational Safety and Health Administration has cited American Cyanamid Company for working conditions that threaten the fertility of female workers. OSHA ordered American Cyanamid to correct the hazardous conditions in its lead pigment section and pay a \$10 000 fine. The move, apparently represents a new inter-

[COMMITTEE NOTE.—No response was received at time of printing from other witnesses.]

Mr. STUDDS. The subcommittee is adjourned.

[The following was submitting for the record:]

DEPARTMENT OF THE INTERIOR,
GEOLOGICAL SURVEY,
Reston, Va., March 19, 1980.

[Memorandum]

To: Conservation Manager, Pacific OCS Region, Gulf of Mexico OCS Region, Eastern Region, Alaska Region.

From: Deputy Division Chief, Offshore Minerals Regulation.

Subject: Procedures Used for Approval of Drilling Mud Programs.

On April 9 and 10, the OGS Advisory Board Policy Committee will be meeting in Corpus Christi, Texas. At this meeting, material will be presented by oil industry and service company representatives concerning the use of and composition of drilling muds. As you are probably aware, the issue of disposal of drilling mud and cuttings at the well site is becoming increasingly controversial due to the alleged lack of information (scientifically prepared) concerning the effects of muds on marine organisms.

At the upcoming meeting, a background on drilling muds will be presented, and, at the fall meeting of the Board, a discussion of the fate and effects of the disposal of drilling mud will be discussed. We have been requested to make a presentation at the Corpus Christi meeting concerning our role in the approval process for the use of drilling muds. In order to present a consistent total picture, you are requested to send us a short discussion of the procedures used by your District offices in the approval of drilling mud programs. Questions that should be addressed include:

Do we know the chemical composition of all mud additives, and do we review them for possible harmful effects?

Do we approve each individual mud additive to the system or the total mud program?

Are the mud programs general or are they specific for each well?

Have we ever disapproved the use of a particular component?

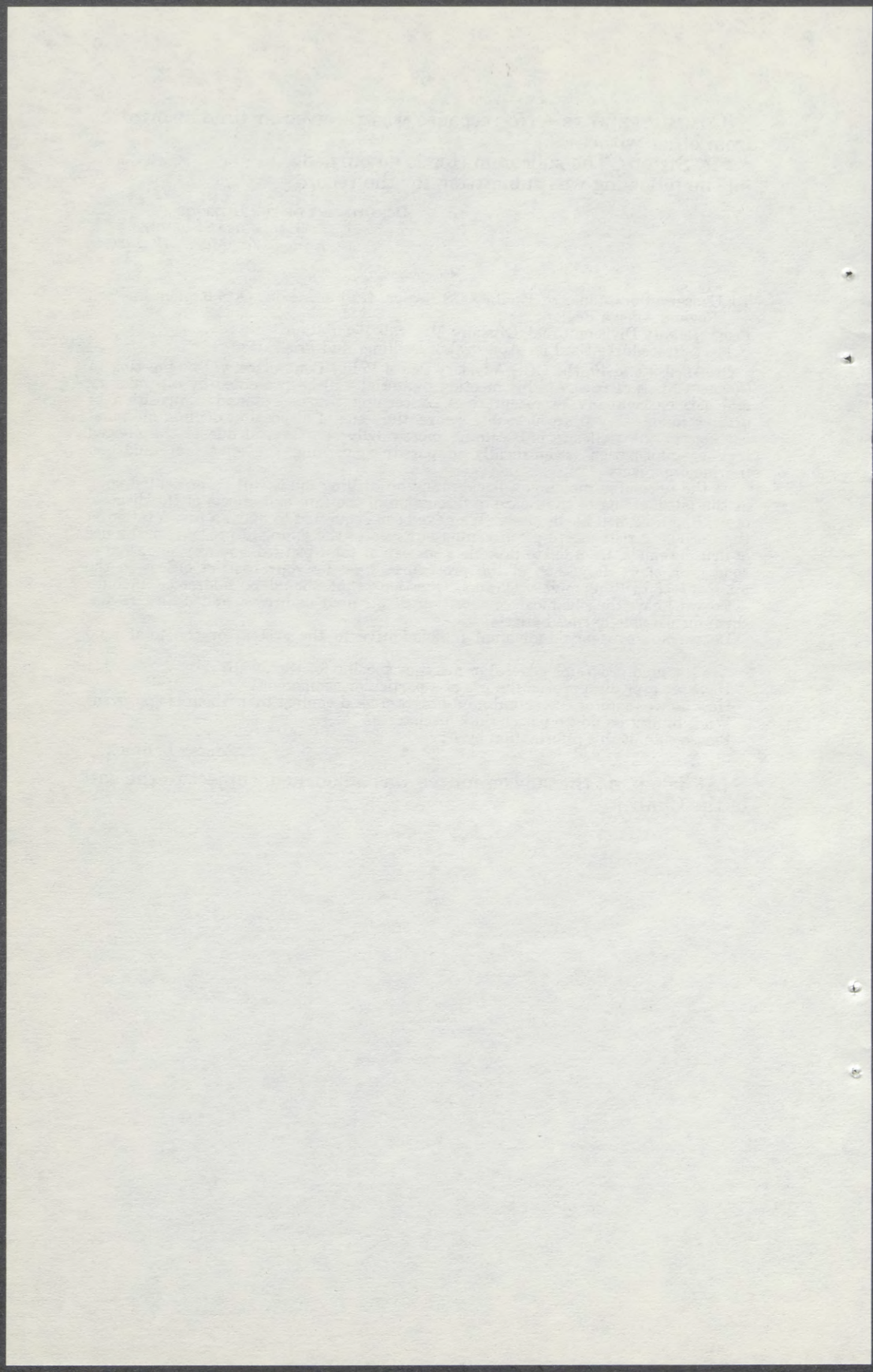
How do we monitor the actual mud program used against that which is approved?

What limitation do we put on bulk discharges?

Please submit this information by April 1.

ROBERT L. RIOUX.

[At 3:05 p.m., the subcommittee was adjourned, subject to the call of the Chair.]



SEA GRANT REAUTHORIZATION

THURSDAY, FEBRUARY 21, 1980

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON OCEANOGRAPHY,
COMMITTEE ON MERCHANT MARINE AND FISHERIES,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:28 a.m., in room 1302, Longworth House Office Building, Hon. Gerry E. Studds (chairman of the subcommittee) presiding.

Present: Representatives Studds, AuCoin, Hughes, Stack, Pritchard, and Forsythe.

Staff present: Ann Land, Diane Lee Hull, Donald Lippincott, and Curtis L. Marshall.

Mr. STUDDS. The subcommittee will come to order.

I apologize to the witnesses who have been waiting. We have waited for a few minutes to see if the Republican conference is going to end. Apparently it is like Democratic caucuses, they are not going to end. We will proceed under the rules of the House. We are not in markup. We have cleared this with the minority staff, which is at least as eligible as minority membership.

The subject of today's hearing is the reauthorization of the Sea Grant College Program Act. Since 1980 has been designated "Year of the Coast," it is all the more appropriate that we carefully examine the direction from which we launch our marine and coastal research programs.

This subcommittee has recently completed six regional hearings on the Coastal Zone Management Act. Several witnesses at the hearings expressed the opinion that the sea grant and coastal zone management programs—which are housed under the same agency—NOAA—should be tied more closely together. The general opinion seemed to be that sea grant scientific research could provide valuable data and information to these coastal management agencies, which in turn could use this information to make sound management decisions. Moreover, it was pointed out that the estuarine sanctuaries program, established under the CZM Act, could provide sea grant researchers with natural field laboratories within which to carry out their research.

We should seriously consider the links between the two programs as we reauthorize sea grant and look for a means to bring CZM and sea grant into closer coordination and cooperation.

Sea grant is also very active in marine education, which involves: the development and improvement of college and graduate school courses; the training of technical personnel through vocational programs; and the development of elementary through high school marine education curriculums. Special marine education courses

for minorities have also been developed recently to aid these groups which in the past have not been exposed to marine-related subjects.

Perhaps the most unique and essential element of the sea grant program is its marine advisory service network. Marine advisory service agents, stationed in various coastal areas throughout the country, disseminate the results of sea grant scientific research to local community members. In turn, the usefulness of the academic research to the community is determined by the feedback from individuals—fishermen, businessmen, et cetera—to the advisory service agents. Some controversy has arisen concerning how to better achieve balanced, applied research—without sacrificing either the principles of ongoing scientific research or the immediate needs of the user community. It is very important that community members be able to apply sea grant research to their daily problems, and it will remain one of our overriding concerns, as we start the process of reauthorizing the sea grant program.

The bill to reauthorize the Sea Grant Act was introduced yesterday by Mr. Murphy, Mr. Pritchard, and myself. It authorizes appropriations of \$55.5 million for fiscal year 1981, \$66 million for fiscal year 1982, and \$75 million for fiscal year 1983.

Our first witness today is Congressman Bo Ginn of Georgia.

Congressman, I am sorry to keep you waiting. It is a pleasure to have you back in the committee where your heart and soul really reside.

STATEMENT OF HON. BO GINN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF GEORGIA, ACCOMPANIED BY DR. ED CHIN, DIRECTOR OF THE MARINE SERVICES PROGRAM AND GEORGIA SEA GRANT PROGRAM OF THE UNIVERSITY OF GEORGIA

Mr. GINN. Mr. Chairman, Mr. AuCoin, and Mr. Stack, I am very grateful for the opportunity to appear before you this morning in support of the reauthorization of the national sea grant college program.

Accompanying me this morning is Dr. Ed Chin, the director of the marine services program and Georgia sea grant program of the University of Georgia. Doctor Chin is available to respond to any technical questions regarding our State's sea grant program, and I am here to offer my full support to the outstanding work of sea grant in my State and my congressional district.

Mr. Chairman, I realize that you have many witnesses scheduled today, and so in the interest of time I will submit my full statement for the record, and with your permission, I would like at this point to briefly summarize my testimony.

Mr. STUDDS. Without objection, your statement will appear in the record.

[The following was received for the record:]

REMARKS OF CONGRESSMAN BO GINN

I appreciate the opportunity to appear before this distinguished subcommittee and am especially pleased to speak in strong support for continuing the funding authorization for the National Sea Grant College Program.

Georgia began its participation in the Sea Grant Program in 1971. In accordance with mandate of the original legislation to promote the wise use of the nation's

marine resources through a coordinated program of research, advisory services, and education, the University of Georgia has led the development of the State's Sea Grant Program. This program has had considerable impact on the people of our state who depend on our marine resources for a livelihood, as well as those who enjoy these resources for recreation. Sea Grant has involved many units of the University System as participants in the program, among them the University of Georgia's Marine Institute on Sapelo Island, Marine Resources Center on Skidaway Island, and Fisheries Extension Center in Brunswick, the Georgia Institute of Technology in Atlanta, and the Skidaway Institute of Oceanography on Skidaway Island.

In Georgia, our marine resources are as varied as those in other coastal states. Our salt marshes constitute one of our greatest and most basic resources. They serve as a nursery ground and as a year round home for many species of shrimp, crabs, fishes, and other seafoods. Despite its deceptively short coastline, Georgia has 450,000 acres of salt marshes which make up almost one-third of the salt marshes in the eastern United States. Most of our coastal islands remain among the nation's most pristine marine environments, providing opportunities for recreation, exploration, and study. Our seafood industry, including the harvesting and processing sectors, constitutes one of the major economic forces on the coast. Each year, our fishing industry lands shrimp, crabs, and fish with a dockside value worth between 20 and 30 million dollars. Our seafood processing industry includes some of the largest plants on the East Coast and handles not only seafood caught locally, but products from other states and nations. Other major coastal industries in Georgia include paper production, paint and chemical manufacturing, sugar refining, an LNG (liquefied natural gas) terminal, port activities, and tourism.

Georgia differs from most coastal states in that it does not have as strong or pervasive a coastal influence. It is a large state, the largest state east of the Mississippi River. About 90% of its population live more than 100 miles from the sea. Our main population centers and major educational institutions lie far inland. The history of its economy is that of a traditionally agricultural state. This singular set of circumstances has generated some unusual challenges for the Georgia Sea Grant Program through its short history.

Today, I offer a few examples of how the Sea Grant Program has met those challenges, how the program has worked to solve real problems for real people and, in the process, how it is helping to modernize and diversify our fishing industry, give guidance to industrial development, promote tourism, and educate our citizens to the economic and aesthetic values of the important and beautiful resource that is coastal Georgia.

Our fishing fleet of more than 300 boats concentrates heavily on shrimp. Like most shrimp boats, ours have used the traditional double rig trawl for many years. Essentially, this consists of fishing one large net on each side of the boat. Sea Grant researchers developed a new system based on a design that had originated in the Gulf of Mexico years before, using two small nets on each side of the boat instead of the traditional large one. The new system is significantly more efficient, outproducing the traditional method often by as much as 100 percent. It is also more fuel-efficient which is an important concern these days. This system is now in use not only in Georgia, but North and South Carolina, Florida, Louisiana, Texas, and in foreign countries. Even with its remarkable success, however, the twin trawl system is undergoing further refinement, and the latest result is the development of an even better system, the tongue trawl, which simplifies the handling of the nets without losing any efficiency.

In recent years many of our fishermen have entered the industry from other water-related occupations such as tow boat operators. The Sea Grant Program has rendered much needed assistance to these people in many ways: providing them with training in how to build and repair nets, in using modern navigational techniques, in constructing trawl doors, in the use of sonar for locating fish, and in other basic fishing skills. One such person has stated that the Sea Grant Program has saved him five years in his goal of becoming a productive boat captain.

Recognizing the need to diversify so that our fishermen would not be totally dependent on the shrimp season which is only about six months long in Georgia, the Sea Grant Program, with very limited support, initiated an effort to explore offshore waters to determine the feasibility of a supplementary fishery based on finfishes. Much remains to be done, but preliminary indications suggest the potential for developing such a fishery. On one trip, three fishermen, with their boats converted to finfishing, followed the University's exploratory fishing boat out to grounds located on earlier research cruises. In about two days of fishing, these three boats caught 17 tons of saleable fish. In the opinion of one of the boat captains, this

particular catch meant the difference between defaulting on his loan or staying in business.

In 1977 and 1978, when severe winter temperature decimated the shrimp crop in the southeast, data gathered by Georgia's Sea Grant Program and the effective liaison between program staff and the federal and state agencies were instrumental in obtaining relief loans for nearly one-half of our fishermen. It is little wonder that many of our fishermen have stated that Sea Grant has been more helpful to them than any previous federal or state program.

Georgia Sea Grant is also involved in seafood product development. Researchers have found that yu-sone, a product already part of a traditional market in the Far East, can be made from species of fish which are underutilized in the United States. Yu-sone is a cooked, seasoned, dried, fluffy flake which is light in weight and needs no refrigeration. If the product proves economically feasible once production has been refined, packaging developed, and the market tested, the export of yu-sone could increase the income potential for our fishermen and help to ease the U.S. trade deficit.

Recreational fishing is a very important component of the tourist industry in Georgia. For most of our citizens, however, saltwater fishing means traveling many miles and a considerable investment in time and fishing equipment. Too often their lack of knowledge about their coastal waters results in futile attempts to catch fish, loss of equipment, and a generally disappointing experience. Sea Grant initiated a project to chart the many miles of our coastal waterways, on a county-by-county basis, and to provide details on where, when, and how to fish. These charts are among the most frequently requested publications ever issued by the University of Georgia and have been praised in major newspapers and national magazines. The strongest complaint that has been made by otherwise happy users is that the charts were not printed on paper that would last an infinite number of fishing trips.

Several years ago, our major seafood processing plants and packing houses were faced with the necessity of complying with the newly-enacted federal and state regulations regarding disposal of seafood processing wastes. For most of them, it meant heavy investment in capital equipment of shutting down their operations. Fortunately, the studies carried out by Sea Grant researchers provided results to eliminate the problem for our packing houses and alleviate the problem for several of the processing plants that were affected.

A walk through these plants today . . . or along the docks . . . reveals ample evidence that the Georgia Sea Grant Program is getting out information to the people who have immediate need to apply it—posters on shrimp boat sanitation, charts outlining dry clean-up procedures, announcements of workshops on business management for fishermen . . . appear on bulletin boards at every turn. The capability of Sea Grant Program researchers and advisory agents to respond to the needs of our seafood producers continues to be an important factor to this industry. The Sea Grant Program in Georgia has essentially established a service and research program analogous to that provided to agriculture by the Cooperative Extension Service and the Agricultural Experiment Stations.

The Program has been a major force in providing educational activities to increase the awareness of our citizens to the marine environment, its resources, its pleasures, and its problems. With most Georgians living so far from the coast, opportunities for exposure to the sea are limited. The marine educational program initiated in 1971 by the University of Georgia with major support from the Sea Grant Program serves more than 20,000 students and countless other visitors each year. Last year, more than 70 of our most populous counties sent their students to the coast for participation in marine educational programs. Opportunities have been provided each summer for the last several years for science teachers to improve their teaching capabilities in the marine sciences.

Time does not permit providing more examples of what the Sea Grant Program has done in Georgia. I would add this, however: Almost certainly the Georgia Sea Grant Program's greatest challenges lie ahead. With the search for offshore oil, phosphates, and other minerals, the impact of the King's Bay Nuclear Submarine Base on the quiet community at St. Mary's, and other demographic factors just beginning to affect Georgia, more than ever before we will need the interdisciplinary approach to problem-solving that is the hallmark of Sea Grant. The Program's track record convinces us that we can count on it. The State of Georgia believes in it as shown by its strong support. In almost every year, the State has provided funds earmarked for Sea Grant activities that have consistently approximated the level of federal grant funds, which is twice the level required by legislation.

In closing, I hope that the committee does not overlook the benefits that have accrued to our society as a result of the Sea Grant Program and compare them with the relatively modest support that has been provided to it over the last 10 years.

Thank you for the opportunity to make these comments.

Mr. GINN. First of all, Mr. Chairman, I want to thank you and your colleagues for the outstanding work you have done and are continuing to do. As you know, my congressional district includes the entire Georgia coast, and your actions greatly influence the lives of my constituents. We appreciate your outstanding service.

Among the many programs which you deal with, I believe that none has proved to be more cost effective and productive than the sea grant program. We are especially proud of the program because next month the University of Georgia will become a sea grant college, and I believe this speaks well of the record of Doctor Chin and his colleagues in the Georgia program over the last 9 years.

Sea grant is important to Georgia because our coastal environment is virtually unique. Our 450,000 acres of salt marshes make up almost one-third of the salt marshes of the eastern United States, and most of our coastal islands remain among the Nation's most pristine marine environments.

Against this delicate environmental setting, the Georgia sea grant program has succeeded in playing a productive role in expanding our commercial fisheries, protecting our coastal resources, and enhancing the marine educational programs of our State.

Let me mention a few of the programs which I believe illustrate the success of sea grant.

Our Georgia fishing fleet of more than 300 boats concentrates heavily on shrimp. Like most shrimp boats, ours have used the traditional double rig trawl. But sea grant researchers developed a new system using two small nets on each side of the boat instead of the traditional large one.

The new system outproduces the traditional method by as much as 100 percent, and it is more fuel efficient. It is now in use in Georgia, North and South Carolina, Florida, Louisiana, Texas and in foreign countries. Even now, sea grant researchers are working on improvements and refinements.

Sea grant has also helped our fishermen with training on building and repairing nets, in navigation techniques, constructing trawl doors, the use of sonar to find fish, and other basic skills.

One of our biggest needs in Georgia fisheries is to diversify. We are now virtually dependent on shrimp, and the shrimp season is only about 6 months long.

In response to that need, sea grant has initiated work to explore offshore waters to determine the feasibility of a supplementary fishery based on finfishes. On one recent exploratory trip, three fishermen following the university's exploratory fishing boat caught 17 tons of salable fish in 3 days. One of the boat captains said this catch meant the difference between defaulting on his loan and staying in business.

In another program, the researchers of the sea grant program were invaluable in helping us in 1977 and 1978 when severe cold weather decimated the shrimp crop. Their studies helped us provide the justification for obtaining relief loans for nearly one-half of our fishermen.

Sea grant is also now at work in seafood product development. They are involved in research of Yu-Sone, a cooked, seasoned, and dried fish flake that shows promise for foreign export.

In addition, sea grant has produced some of the finest charts available on the coastal waters of Georgia. These charts are designed to show where, when and how to fish, and they are among the most frequently requested publications issued by the University of Georgia.

The list of projects could go on and on, but I hope that I have given you some idea of the practical help that sea grant has provided. We are especially proud of the educational programs that are giving our students a much broader understanding of our coastal resources, and we will be reaping those benefits for years to come.

These are the accomplishments of the past, but the greatest needs lie ahead. Those challenges include increasing economic pressures on our fishing industry, the pressures for coastal development, and a multibillion dollar military base expansion. So we need sea grant now more than ever.

My own State has recognized this by consistently earmarking sea grant funds virtually equal to Federal funding, which is twice the level required by the legislation. We understand and appreciate the importance of sea grant, and I urge you to reauthorize and to strengthen the program.

Mr. Chairman, again, I want to thank you and your colleagues for what you have done for sea grant, and for what we hope and know you will do in the future.

Thank you very much.

Mr. STUDDS. Thank you. That is very exciting testimony.

You may recall, in the years in which we served together, my concern with sea grant has been that the research was not getting to the people, and your description of some of the concrete and specific ways that it is helping fishermen is very, very exciting. Your fishermen will actually follow the scientists, did you say?

Mr. GINN. Yes, I think Doctor Chin can speak to that. Maybe that is because we have such an outstanding man in Doctor Chin to head our program. Not only is he an outstanding educator, but he has found a way to reach our fishermen. He does communicate with them very well.

Mr. STUDDS. I think you should come immediately to New England. Our fishermen have not been known for following our scientists at all. In fact, they have had some remarkable things to say about them.

It is also exciting to know, Bo, that the State of Georgia has found a Federal program in which it is participating.

Mr. GINN. That is another subject also that I would like to discuss with you at another time.

Mr. STUDDS. Mr. AuCoin?

Mr. AU COIN. Thank you, Mr. Chairman. I have no questions of the witness.

I want to welcome you back, too, Bo. We miss you on the committee.

Mr. GINN. Thank you.

Mr. AU COIN. I certainly appreciate your testimony this morning.

Mr. GINN. Thank you very much. This is an outstanding committee, and I must say that I do miss my service on it.

Mr. STUDDS. Mr. Stack?

Mr. STACK. I would like to commend our colleague for his very interesting and informative statement. I think you certainly demonstrated the value of the program.

In the context of your remarks, Mr. Chairman, I was interested in seeing, in the GAO report, a comment to the effect that one possible starting point might be the translation of sea grant's many technical and scientific publications into a language readily understandable to the potential user.

Mr. STUDDS. English, presumably.

Mr. STACK. It would appear in Georgia that this is certainly being done, and I commend you for your testimony.

Mr. GINN. Thank you, Mr. Stack.

Sea grant is working in Georgia. It is working in a practical way to assist our fishermen and business people who are involved in the seafood industry, and we are very proud of sea grant in Georgia. We want to come in, not only to thank you for what you have done in the past, but to urge that you reauthorize this vital program and strengthen it if you can.

Mr. STUDDS. While you are here, we cannot resist requesting that with your new committee assignment, the traditional gap between authorized and appropriated funds will narrow.

Mr. GINN. As soon as I leave here I am going to my Committee on Appropriations, and will be working on what you authorize.

Mr. STUDDS. Thank you very much, Bo.

Before we call our next witness, Doctor Ostenso, Director of the Office of Sea Grant, Congressman AuCoin has a statement to make.

Mr. AuCOIN. I appreciate the distinguished chairman's recognizing me at this time.

Mr. Chairman, I simply want to associate with that portion of your remarks that I heard as I walked in the door, and I apologize for not being here at the immediate outset of these hearings.

One of the unique charms about the work we do, Mr. Chairman, is that we have about three committees meeting at any one given hour that we are supposed to be attending. Unfortunately, today the House Banking Subcommittee on Housing is in markup on our major housing bill for the year, and for that reason I will not be able to stay throughout the hearings this morning. I regret that very much, because I feel very strongly about this program and have since I came to Congress. I do, intend to continue to support it in the future, and I think that we have our work cut out for us in terms of maintaining the quality of fiscal support that this program deserves based on its record.

If I may, Mr. Chairman, I would like to make a brief statement before you continue with the witnesses. I would like to say what I have said before, and that is that the sea grant program is a cost-effective and highly productive marine program that has proved to be one of our Nation's best investments. Since its start in 1966 a truly national partnership has developed of practical, applied marine research, education, training, and advisory services.

Oregon was one of the first States to receive sea grant funding, and has continued to demonstrate its success through 12 years of participation in the program. It is finding solutions to the many complex and difficult problems besetting our marine community. A few examples are these: when 41 sperm whales were stranded on the beach in Florence, Oreg., last summer, a team of sea grant scientists rushed to the aid of the mammals. Sea grant has been involved since then in attempting to determine the cause of the beaching.

Another example: Sea grant has supported one of the most technologically advanced seafood laboratories in the Nation, located in Astoria, Oreg. Among other projects, this lab has developed a fish protein concentrate from underutilized species for human consumption. A cooperative project with Mexico is now in the process of putting this concentrate into commercial production.

Sea grant advisory services are helping Oregon's commercial fishermen, coastal zone planners, port managers, and seafood processors.

Sea grant has conducted pioneering salmon and oyster aquaculture research, as well as work to understand and cure fish and shellfish diseases.

Graduate fellowships have supported students in a newly developed program in marine resource management at Oregon State University. Such programs are essential to educate those who will become tomorrow's marine policy makers and resource managers.

Sea grant's contributions over the past decade document the foresight Congress showed when it established the program. In light of increasing demands on our marine resources, it is important that Congress now continue to support sea grant, but more importantly support it at a level consistent with its potential.

It is clear that the program has made important progress in the marine area.

That is why I am concerned about the administration's requested budget. A level-funded fiscal year 1981 authorization would not allow the program to grow. In fact, it would reduce the Office of Sea Grant's funding, once inflation and civil service pay raises are taken into account.

It seems to me that at a time when inflation requires cutting back on wasteful Government spending, we must recognize those programs which have made strong contributions.

I happen to think that sea grant falls without dispute within this category, and for that reason, I think that the Congress, this committee, and hopefully the Appropriations Committee, will give it the support that it deserves.

I thank you, Mr. Chairman, for allowing me to take this time.

Mr. STUDDS. Thank you very much, Mr. AuCoin. It may be necessary to discuss sea grant institutions as missile bases in order to find the funding that the gentleman speaks of.

Now, Doctor Ostenso, the Director of the Office of Sea Grant in NOAA.

Welcome.

Having heard all of these kind things about your program, you may not wish to say very much.

STATEMENT OF DR. NED A. OSTENSO, DIRECTOR, NATIONAL SEA GRANT COLLEGE PROGRAM, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, DEPARTMENT OF COMMERCE, ACCOMPANIED BY ROBERT WILDMAN, DEPUTY DIRECTOR OF SEA GRANT

Dr. OSTENSO. Possibly I should quit while I am ahead, yes.

In that line I would like to submit my prepared testimony for the record and give an oral summation.

Mr. STUDDS. Let me say that that is not only possible, but it is welcome. We have a long list of witnesses and we are going to be in great difficulty as it is.

Your statement will appear in its entirety in the record.

[The following was received for the record:]

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

Thank you, Mr. Chairman, for your invitation to give my views on the National Sea Grant College Program.

Since my last appearance before this Committee two years ago, the Sea Grant Program has made substantial progress on the course established for us by the Congress under the Sea Grant Program Improvement Act of 1976. Under that legislation, Sea Grant was asked to expand its horizons and to sail into what, at the time, were relatively uncharted waters for our program. Until the scope of the program was expanded in 1976, Sea Grant had been fashioned primarily to develop the intellectual and scientific capabilities of American colleges and universities that could be called upon to resolve marine-related problems and to exploit the opportunities of the marine environment on a local, state and regional basis. Under the 1976 legislation, the program's definition was enlarged to incorporate a greater identification of national priorities in the marine environment, the development of an international cooperation assistance program for developing countries and the strengthening of our educational program. Additionally, the 1976 Act provided for the initiation of a fellowship program so greater opportunities could be available to those desiring careers in ocean-related professions.

I would like to emphasize, Mr. Chairman, that while significant progress has been realized in these extended areas of Sea Grant activity, the program continues to focus on local and regional needs and that Sea Grant efforts in research and public service have continued in the program's past tradition. Additionally, the Sea Grant Colleges network expanded with the designation in January of our joint program at the Universities of Maine and New Hampshire as a Sea Grant College. The Maine-New Hampshire program is the first bi-State program to achieve that status and they now bring the total number of Sea Grant Colleges to fourteen. The University of Georgia is expected to gain similar status in March, and the University of Alaska has made formal application for designation, based upon sustained excellence for over three years in the three programmatic areas of research, education, and advisory service.

Since its inception, Sea Grant has been regarded as a valuable component of our overall national program for dealing with marine science, technology, and marine resources. The program contributes materially to the United States' leadership in these fields.

Sea Grant pursues an integrated approach of research, education, and advisory services to develop low cost projects aimed at prompt and practical results.

The Congress—through the 1976 legislation—created an international Sea Grant component. As envisioned, this component was to be a small, university-based pilot effort which could develop a new capacity within existing institutions to work cooperatively with institutions in developing nations to develop their marine research capability for their own benefit and to create a spirit of goodwill and cooperation that will enhance the access of our research vessels to their waters.

Our International Cooperation Assistance Program (ICAP) now involves projects at seven institutions in the U.S. They include the University of California, Florida Sea Grant Program, University of Hawaii, Louisiana State University, Maryland Sea Grant Program, Oregon State University, and the University of Rhode Island. The project at the University of Hawaii is particularly noteworthy, by virtue of the

vast geographic area it covers. In cooperation with the University of the South Pacific, the educational needs and marine public service needs are being addressed in eleven Pacific nations: Solomons, Fiji, Tuvalu, Kiribati, New Hebrides, Cook, Nauru, Tokelau, Tonga, and Western Samoa. To date, we are supporting projects in Chile, Columbia, Costa Rica, Egypt, India, Israel, Malaysia, Mexico, and the South Pacific Nations already mentioned. Thus, we are supporting projects in Latin America and the Caribbean, in the Middle East, in Southern Asia, and in Oceania. Tropical Africa is the only principal area of the developing world in which ICAP is not supporting any projects whatsoever, and we are making a sincere effort to include Africa in the future.

In the international field, Sea Grant works closely with the Department of State. Copies of all formal proposals, for example, are reviewed by the State Department's Office of Marine Science and Technology. Additionally, some of the proposals for international assistance are reviewed by the Interagency Group on Human Rights and Foreign Assistance, which is chaired by the Deputy Secretary of State and includes representatives of Treasury, Defense, the National Security Council, and the Agency for International Development. Representatives of the Departments of Agriculture and Commerce, and the Export-Import Bank also participate in the group's deliberations.

Elliot Richardson, our Ambassador to the Law of the Sea Conference, mentioned Sea Grant as a resource to developing nations during remarks he made at the Pacem in Maribus Conference in Cameroon last year. Ambassador Richardson has made numerous references to ICAP throughout recent LOS sessions. Our Sea Grant ICAP program will be discussed at the Training, Education, and Mutual Assistance (TEMA) meeting in Buenos Aires this April. TEMA is an international working group which has as its purpose an effort to help developing nations participate in international marine scientific investigations.

I would like now to turn to national projects. Even as I speak here today, Sea Grant scientists from California, Delaware, Massachusetts, and Washington are working together in a major field experiment at Leadbetter Beach in Santa Barbara, California. The purpose of the experiment, being conducted by more than 50 oceanographers and coastal engineers and a number of volunteers, is to increase our knowledge about the dynamics of the movement of sand by waves and currents which someday could enable scientists to predict more accurately the effects of proposed alterations of the shoreline environment. The project is known as the Nearshore Sediment Transport Study, or NSTS, and it is the first national project upon which Sea Grant has embarked.

The experiment now taking place is the second major field study to be conducted under the program. Previous experiments were conducted during a month-long, intensive investigation of the forces at work in the near shoreline off Torrey Pines Beach, near La Jolla, California. The current experiment was started January 30 and will continue until February 27. In addition to the scientists from five Sea Grant institutions, experts from the Navy and from the California Department of Boating and Waterways are taking part in the experiment, the largest of its kind ever undertaken. More than 100 electronic instruments are being used to measure wave height and current speed and direction, as well as sand concentrations. These measurements are transmitted simultaneously to onshore equipment for computer processing. Additional measurements will be made by surveying crews and by an automatic profiling tractor that "crawls" into the surf zone to record the slope of the ocean bottom. Over the month-long period, more than one-half billion data points will be recorded, according to the scientists.

The long-range goal of this ordered series of field experiments is the development of mathematical models that will enable engineers to predict sand behavior from knowledge of the local wave climate and to provide recommendations for actions to change an undesirable shoreline condition.

As you know, Mr. Chairman, national projects have been a matter of vital interest to this Committee and to us in Sea Grant. We have attempted to focus effort on problems of high national importance, with broad application and that are ripe for a significant advance in understanding. For a variety of reasons, we selected a five-year program in beach protection. Subsequently, we have received more specific instructions from this Committee that National Project funds should selectively be used on a project-by-project basis to give broad programmatic direction along lines identified in the Federal Register as being of particularly high national priority. Accordingly, a list of 14 additional problems was published in the Federal Register on August 8, 1978.

Because it would have been irresponsible management to abort a program of such importance and into which such a major investment had been made, we elected to

continue the effort while trying to broaden the base of support amongst other Federal agencies. The Corps of Engineers and the Navy are sufficiently impressed with the quality and importance of this major experiment that they are now planning to provide major contributing support to its conclusions. Thus, we feel that we have conceived of and executed the largest experiment ever attempted in the world to understand the process of beach erosion while shifting from one management *raison d'être* to another.

During the early years, the thrust of the Sea Grant education and training program was toward the development of specialists. The emphasis was on graduate level professional training, community college technician training, and occasional courses in specialized four-year undergraduate areas. Throughout Marine Advisory Service, the emphasis was on the translation of research findings to the user community outside school and institutional settings. The target audiences largely were adults involved in marine-related business and industry and in school-age youngsters in groups such as the 4-H, Boy and Girl Scouts. As Sea Grant matured, greater focus was placed by the Congress on the development of curricula in marine education for elementary and secondary schools. Recognizing the importance of delivery mechanisms for Sea Grant-produced educational material, we moved toward the development of a closer working relationship with offices of education, at the Federal, State, local levels.

Sea Grant is working toward stimulating greater introduction of marine education into the schools of America. The Council of Chief State School Officers (CCSSO) instituted a policy statement encouraging the States to engage in and forward marine education. In addition, that organization established a network of marine education coordinators for the State education agencies across the Nation. In working closely with the U.S. Office of Education, subsequently the Department of Education, Sea Grant was instrumental in the establishment of a marine education unit in the Office of Education.

Additionally, the Federal Interagency Committee on Education, Subcommittee on Environmental Education created a Marine Education Task Force, which Sea Grant chairs. Within the Sea Grant network itself, our directors and educational specialists have been working in conjunction with the national office, and, as a result, there is a much wider recognition of the need for marine education to carry out the goals of the program and an integration of effort throughout the multi-state Sea Grant network. Finally, we have strengthened our Marine Education Materials System (MEMS) at the Virginia Institute of Marine Science which provides precollege advisory and educational assistance to school systems, science centers, and teacher groups. We look upon these developments as major achievements which should bring about extremely productive results.

I have already mentioned the increase in the number of institutions which have achieved Sea Grant College status. I would like to add that the mission of completing the network of Sea Grant Colleges is moving along well. We now are in a position to concentrate our efforts more toward the utilization of this network than toward developing that capability *per se*. One of our goals, of course, will continue to be to improve the effectiveness of the program. We will continue to expand the utilization of our capabilities, striving to maintain a fair balance of research for the present against research for the future in such a manner that the investments in Sea Grant prove useful to the public. In other words, economic benefits of our research as they can be applied to assisting the user will remain an important and significant consideration.

To be more responsive both to the heterogeneity of the program and to the needs of the Nation, we have restructured the National Office of Sea Grant along mission lines. This reorganization has permitted us to focus more on functional than on institutional lines and has given us a much better perception of what is taking place throughout the network in areas such as aquaculture, fisheries, coastal protection, and the like. In another recent operational change of office procedures, we have gone to a two-year cycle of awards to Sea Grant Colleges. Our belief is that these programs have matured to the point where annual reviews, which encompass the devotion of a great deal of time, energy, and expenditure, are no longer necessary—although we will continue to monitor progress throughout the period. We already have launched this program, and while there still are a few improvements we can make, the innovation has saved both time and money. Most importantly, this new procedure permits the Office of Sea Grant and the State Directors to focus more of their attention on the substance of management rather than the form of management.

The Sea Grant Program is widely diversified in its activities, in part due to the variety of problems and opportunities that exist from region to region and from

State to State where our Sea Grant institutions exist. I do not think anyone can look at the wide spectrum of research being carried out by Sea Grant scientists without being impressed. For that reason, allow me, if you will, to tick off a few of the areas of investigation in which Sea Grant is engaged:

Aquaculture—Nearly 100 of our projects in fiscal year 1979 were devoted to plant and animal aquaculture. The studies involve a wide variety of finfish and shellfish, and the investigations center on greater production at lower costs, reproduction in captivity, the development of salt-tolerant plants, ocean farming, genetic and dietary improvements, and closed cycle mariculture in which oysters and clams might be raised to marketable size in one-third the time they reach that size in nature.

Energy—There were 15 energy-related projects in fiscal year 1979 in five categories: two in power conversion, six in environmental research, two in power plant impacts, three in exploration and production, and two in the social sciences. Our research in the conversion of saltwater to freshwater through a wave-powered desalination system shows great promise, and our studies on the disposal of thermal effluents are expected to have considerable influence on the future design and operation of power plants.

Engineering—We had 106 projects in ocean engineering or engineering at 22 institutions during fiscal year 1979. We are encouraged by the studies into biofouling and corrosion on offshore structures, the use of acoustics for fisheries assessment, and the developments in remotely-controlled submersibles.

Fisheries—Our fisheries projects embrace the full spectrum of activities important to the industry. They include: economics, engineering, and law, in addition to research into fish life histories, environmental interactions and fish pathology. Our most significant activities were in general fish biology, population dynamics, and environmental interactions. These are the research areas which contribute most to our understanding of any species, what its potential is for extended harvest, and what effect the harvest might have on the species and on other species in its food chain.

Medicines from the Sea—We have a number of projects at several institutions which are exploring the extraction and assessment questions related to marine compounds. Our studies show great promise in the control of cardiovascular, nervous system, and neoplastic (cancer) diseases.

Environmental Research—Nearly every coastal state program has at least one integrated series of projects studying a bay, estuary, or wetlands system. Areas being studied include Alaska's Bering Sea, Hawaii's Northwest Islands, Washington's Puget Sound, three areas in California, Corpus Christi Bay, Louisiana's Barataria Basin and Atchafalaya River, Mississippi Sound, Florida's Apalachicola Bay, Georgia's Savannah Harbor, North Carolina's barrier islands, the Chesapeake Bay, salt marshes and ponds in Delaware, Rhode Island, and Massachusetts, and Lake Michigan's Green Bay. In fiscal year 1979, we supported 164 separate projects in marine environmental research, of which 70 were ecological in nature, 73 were concerned with pollution, and the others with models and applied oceanography.

Those are some of the primary areas of Sea Grant research. There are many others just as significant and important. For example, we are developing marketable new seafood products. We are studying chitin, a shellfish waste product, and its derivative, chitosan, both of which have important chemical properties in the binding of such commercial products as paper, paste, and film emulsions. We have many studies looking into the problem of water pollution, one of which is the heavy concentration of PCBs (polychlorinated biphenyls) in the Great Lakes. We are experimenting with frozen fish eggs and frozen fish sperm, an activity which shows promise of bringing to fish breeding what artificial insemination has given to cattle breeding. We have developed a number of major improvements in diving procedures and developed a greater interest in the exploration of the peculiar problems women face in diving. Our research showing that individuals who "drown" in cold water stand a much better chance of survival than ones who "drown" in warm water has been accepted universally resulting in the saving of literally hundreds of lives which might otherwise have been lost. In addition, Sea Grant recently sponsored, in cooperation with other agencies, the First International Conference and Workshop on Hypothermia. The conference attracted experts from five nations and brought into focus the problems of severe cold exposure, such as might be experienced by fishermen or sportsmen.

There are any number of examples in our Sea Grant history to indicate that value comes out of Sea Grant. One recent example I would like to cite is the case of Transfresh Corporation of California. As a result of Sea Grant research in seafood technology, that corporation successfully has used a carbon dioxide atmosphere shipment system to transport more than 5 million pounds of fresh fish from Alaska

to Seattle by ship during the past year. The cost of shipment by this method runs about 4 to 5 cents a pound versus the 15 to 40 cents for the cost of air shipment. The carbon dioxide atmosphere provides the same quality flesh as fresh fish and is sold as a product equivalent to day-old air freight. This technology transfer represents a major breakthrough for the company and should result in savings to the consumer.

Another example is the use we are making of a NOAA satellite to measure sea temperatures from space and relay to earth for dissemination through our Sea Grant Marine Advisory Service on the West Coast to fishermen. Ocean surface temperature patterns are important indicators of commercial quantities of fish. And by knowing the location of the proper temperatures, the fishermen can save time and fuel which otherwise would have been expended in searching for the schools. Fishermen have credited the temperature charts for increased catches of salmon and albacore. The increased profits from the catches combined with the fuel savings represent an estimated benefit of more than \$2 million for the vessels on the West Coast.

Still another example is the case of a major seafood processing plant in the southeast. It was faced with a decision to expend more than \$113,000 in capital costs to comply with regulations of the Environmental Protection Agency. The company was faced with a decision of closing the plant or moving to another location. In response to the plant manager's request, the Georgia Sea Grant Program's Advisory Service made a study of in-plant practices and recommended a number of changes. A major plant official has stated that adoption of these changes resulted in a 90 percent savings in capital costs and the continuation of operations at that plant.

These examples, of course, are indications of our genuine interest in having Sea Grant work cooperatively and effectively with industry, be it in fishing, processing, manufacturing, or whatever. This interfacing is a conscious effort on our part, as exemplified by the Marine Industry Advisory Service (MIDAS) Program at the Massachusetts Institute of Technology. That program, started in 1975, is designed to foster greater involvement in and awareness of marine-related product and business development and opportunities for the Nation's industries. The link between industry and Sea Grant extends far beyond that definition, of course, for we not only have assisted in the development of marine-related industries, but also in helping those industries overcome problems that have been identified to our researchers. Evidence of the success of this program, which now is being expanded to other institutions in the Sea Grant network, can be found in the fact that participation in the MIT program now includes more than 100 corporations, government agencies, and other organizations.

On March 26, 1979, the Secretary of Commerce transmitted to the Congress draft legislation which reflected the Administration's view that the authorization of appropriations for this law should be extended for two years for such sums as may be necessary. We continue to support this position. In order to continue all the useful programs which I have mentioned today it is vital that the authority for funds for the Sea Grant Program be continued. I urge you to enact legislation which would enable us to continue our work.

Again, I want to thank you for the opportunity to appear before you. I will be happy to answer any questions you might have.

Dr. OSTENSO. Thank you, Mr. Chairman, Congressman AuCoin, Congressman Stack. It is a pleasure to be here to testify on the development of the program in sea grant since we last testified before you 2 years ago.

With me to my left is Robert Wildman who is the Deputy Director of Sea Grant, and I would like to introduce him to you and you to him. He is the mainstay in the day-to-day operation of the Office of Sea Grant.

I would like to confine the bulk of my testimony to a discussion of the major management issues within the Office of Sea Grant, some of the accomplishments we feel rather proud of and some of the difficulties that we feel we are facing. I shall address in less detail the programmatic accomplishments in the sea grant program, which will be developed more fully later on in the testimony by those people who are more directly involved in these accomplishments.

As you know, Mr. Chairman, this is my third year as Director of the national sea grant program, and I am pleased to say that I feel it is an unqualified success. I came to sea grant from being, for a number of years, the senior oceanographer for the Office of Naval Research. The frustrations I felt there are the frustrations that most researchers feel—that is, the barriers that exist between disciplines, the barriers that exist between discovery and application, and the fractionalization that the funding of research from the Federal Government tends to bring to our university structures. These are all characteristics that the sea grant program overtly tries to overcome, and I think, as you will hear later today, successfully overcomes.

So I feel I came to the program knowing very little about it and, after 3 years exposure, I am really a convert to the concept of the sea grant approach as well as, of course, strongly identified with the substance of the sea grant program. The sea grant program in the first 10 years of its history has been outlined in this publication that came out just last year called the "First 10 Years." It is an interesting history of the development of this innovative program. This publication has been widely distributed and I suspect you all have copies. If not, they are available.

Now, I would like to just tick off what I think are some of the highlights of the past 2 years. One is that the sea grant network is continuing to develop. As you know, we have viewed that the marine resource development, husbanding and protecting the environment of the 30 coastal States and trust territories could be met by a network of sea grant colleges.

In the past year, we have designated the University of New Hampshire/University of Maine as the first bi-State sea grant college. The University of Georgia's application for sea grant college status has been approved by the sea grant review panel as set up by this Congress, and we look forward to Georgia soon becoming the 15th sea grant college in the network. The University of Alaska has made formal application now to be considered as a sea grant college, and other programs are well on their way to development, such as Maryland, New Jersey, Virginia, South Carolina, and others. We feel that we are making real progress.

Another item that occurred within the last 10 years was the publication in the Federal Register of formal regulations that establish the legal dimensions and processes of sea grant college status. Historically, the development of sea grant programs in the hierarchy from project to sea grant colleges affected mainly the relationship of the Office of Sea Grant with that State program. As it matured, more and more management responsibility was vested at the State level.

Because of the success of the sea grant concept, more and more legislation made specific or oblique reference to sea grant colleges as being eligible participating institutions or models to be followed in implementing the legislation. Such things as the Food and Agricultural Development Act of 1975, the Ocean Pollution Research and Development and Monitoring Planning Act, the climate bill and others. So it became incumbent upon us to develop by regulation just what the consequence of designation of sea grant college status meant.

In doing this, we clarified that all administrative entities of the sea grant college were eligible institutions as under the act. That means when the University of Florida, University of California and University of Wisconsin systems were declared sea grant colleges, that all participating campuses were qualified institutions under any legislation that refers to sea grant.

Further, we made provision for the bringing in of separate administrative entities, separate universities, formally into the sea grant network of the State. This is currently going on in Florida now for the University of Miami, who initially struck out on their own to develop their own sea grant college, their own advisory service, their own education program, as well as their own research. They thought it was within their interests as the University of Florida to form together a State of Florida sea grant college program.

We are encouraged to see this. We think that sea grant college program should be statewide or bi-State programs.

Through this mechanism, we expect to see marshalled the full talent and institutional resources of the institutions of higher education to meet the needs of the State.

Another item over the past 2 years was the reorganization of the Office of Sea Grant itself. In the early stages, we thought it was incumbent to organize along institutional lines because the development of the very concept of sea grant at the State level commanded most attention. As this concept has been developed, proven, and we have models to fall back on, now the effort is more to utilize that capability and to interphase the sea grant capability with the mission and needs of States and other Federal agencies. Accordingly, the Office of Sea Grant is now organized along major programmatic lines such as beach protection, although we still view the principal management function as our direct relationship with the Statewide programs. These are still the key organizational elements of the sea grant program.

In line with this reorganization, we have, for the first time this year, produced what we expect to produce annually, and that is a rather detailed program review in two volumes of all the sea grant programs.

This gets wide distribution although it is more of a reference document than something you would sit down and read. It is a critical review of the sea grant programs in engineering, aquaculture, beach protection, energy, and marine transportation. It lists in detail all the participants in the program. It gives a critical evaluation of what is going on in the program. This document is very well received. It opens up the doors of sea grant in a sense so that if someone either within NOAA, within other agencies or here in Congress is interested in knowing where some expertise resides on a given issue, they can refer to this book and find out who within the sea grant program they can contact for assistance.

Just as an aside, the bi-annual report that we are asked to produce every year, which is a more descriptive document for wider distribution, less of a reference document than a historical record, is in final review and publication. I have a draft copy here.

The other advantage of the reorganization of the Office of Sea Grant along programmatic lines is that it helps the Office to facili-

tate what we refer to as networking the sea grant program for transferring expertise, understanding and talent between the States that participate in the program.

Another item that has been accomplished over the last 2 years is the conducting and the completion of a study on the educational needs of the commercial fishing industry. This study was requested by the Congress. It is now in its final printing. It not only reviews the status of educational facilities available for the commercial fishing industries, but it goes into some detail in describing how other nations have approached this problem.

Again I would emphasize that the scope of this study is to look at commercial fishing as a vertically integrated industry and the formal educational research needs of the industry.

Next, I would like to mention briefly the progress in our international cooperative assistance program. Within the last 2 years, this program was implemented with the funding that was made available for it. We now have 11 projects working through 11 universities, dealing with a number of foreign countries. This is described in detail in this annual report that I referred to.

As some of you know from previous testimony before this committee, I had some restiveness about how well sea grant could function in the international arena since it was designed to be a State oriented program. I had questions of the real need for such a program that was predicated on the assumption that a consequence of the law of the sea negotiations would be widely promulgated unilateral concept regimes for research out to the 200-mile limit. In fact, this need has been demonstrated since today over 44 nations have unilaterally gone to the concept regime.

Second, I had some concern over the interests and capacity of our universities to participate in a program that was really designed to develop a marine capability in less developed countries. We have had a substantial response from the universities who have come forward with outstanding programs. They have executed them with vigor and sound judgment. There is clearly a capability within the sea grant program to function in this very complex arena.

Third, I had some concern over the Office of Sea Grant's ability to manage such a program, bearing in mind that the Office of Sea Grant is a very small office. The management of the sea grant program is vested at the State level. We view our Office as being mainly a stewardship office.

I think we have in the past 2 years demonstrated our capacity to sensitively manage this program with a minimum of overhead, with a maximum participation of other agencies that are interested in this area, and most importantly with an absolute minimization of expectations in developing countries that cannot be equated with our limited budget. In fact, just yesterday I heard the Executive Secretary of the Academy of Sciences Ocean Policy Committee comment that this was the best international program in this area. I feel very pleased about that.

The next item I would like to touch on was another legislatively mandated program. I would like to dwell on this a bit because I feel we owe you an explanation of the chain of events.

The national projects program was added by our 1976 reauthorization. There was not clear guidance in the legislative record as to what the intent of the program should be. Barring guidance to the contrary, we went forward with our interpretation of the congressional intent, which was a focusing of effort and attention for a finite period of time on a program that was ripe for a quantum advance.

For a variety of reasons that subsequently proved to be true, we determined that this focusing of attention should be in the area of nearshore sediment transport. We scoped out a 5-year program which would involve the participants of many—in fact, almost all the experts in the United States in this area. It involved the most massive experiments that have ever been attempted in this area. We have completed the first of these ordered series of experiments last year. The second is now in progress on the coast of California in the Santa Barbara area.

One of the problems with beach erosion is that it is in geologic time. It may be a continuing incremental process but, in terms of human time, this long-term erosion process is done in episodic steps. Accordingly, society tends to be lured into complacency by a long sequence of rather benign environmental conditions. We encroach where we should not encroach with buildings and then the sort of thing that is happening off California right now occurs. There is massive destruction and loss.

This experiment takes into account the episodic aspects of nature. They design their experiments to take place during the stormy seasons. In fact, that is why the experiment is going on in California right now. I think they got a little bit more than they bargained for this year. In fact, the 50 some participating oceanographers and innumerable volunteers taking part in this experiment, those who are not in the hospital with broken bones from surf action, are keeping the data together. They have had to relocate their data sensors because of the massive erosion that is going on in California right now. The next two experiments are planned for the Gulf of Mexico and the east coast of the United States in sites that have yet to be determined.

Bearing in mind that once we started this program, we then got specific congressional guidance that the national projects program should attack a broader front of issues to be identified in the Federal Register—we have identified a total of 15 national priority areas in the Federal Register—and that we should selectively fund on a project by project basis programs without the requirement of non-Federal matching funds as an effort to overtly steer efforts into these areas.

The Corps of Engineers, the Office of Naval Research have explicitly indicated that they are going to come in with funding for the nearshore sediment transport study. We expect to get additional support from other agencies with which we are dealing. This is widely recognized as being a landmark experiment.

Next, I would like to mention briefly the fellowship program. This again was added to our 1976 reauthorization. We have scoped this one dimension of our overall education program to be specifically directed toward developing expertise in interdisciplinary areas which are a shaky area for a student to get into.

And, second, to reach out to students who, by virtue of race or sex, or poverty, cultural ethics or disability, have been historically proscribed from being involved in marine careers. We now have 11 programs going in this specific area at an expenditure of something like \$160,000 per year. We feel that the programs we have going are substantive programs, they are soundly based, with tangible accomplishments that will prepare students in jobs that we expect that they can handle and will be available for them when they graduate.

Next, I would like to touch on our intern program.

Mr. STUDDS. You had better hurry. You have 2 minutes before the second bell for our vote.

Dr. OSTENSO. In the internship program, we are bringing in young students to get some experience in the workings of Government so that they can finish their degrees as scientists and come back to work in their field with the familiarity of the Government program.

Mr. STUDDS. I hate to interrupt you. We are going to have to pause here for 10 minutes to vote, and then we will come back and ask you to wrap up and then go into questions.

This subcommittee will be adjourned for about 10 minutes.

[Short recess.]

Mr. STUDDS. Doctor Ostenso, if you could conclude in 2 or 3 minutes, then we will proceed.

Dr. OSTENSO. I will conclude by saying that the success of the program, I think, is assured by virtue of the excellence of the leadership that we have in the sea grant program. Not only are the State sea grant program directors of extraordinary ability, but the support that the State program gets from the leadership of the State, both the academic administration and the State legislatures, and leadership of State agencies, I think assures the success of the sea grant concept.

Mr. STUDDS. Thank you very much.

I apologize again to you, and to the following witnesses for our schedule. Not only do we have an unusually large number of witnesses, but we are going to have a day that is going to be inevitably interrupted by a series of votes, and we will do our best to be as concise as we can.

How do you respond to the finding in the recent GAO report that contended that much of your research is not relevant to the user community?

Dr. OSTENSO. I will respond to that. I would also like to leave that question open to some of the sea grant directors. They may have their own thoughts on it.

The GAO report is a little bit of a mystery to me because they did not do a study, but they came out with some conclusions. They talked to some people, as sort of a prospectus for a study.

One of the problems that the sea grant program has, as Bill Ackerman testified before this committee some 2 years ago, is that it promises to be everything for everybody. Clearly, no program can do that.

When you go out and talk to the oyster fishermen, the fin fishermen, the coastal engineers, and the many other constituents that they serve, of course, they would like to see the full focus of

the sea grant program on the area that is most germane to their interests.

The sea grant directors in the State have the awesome job, in a balanced way, to try to meet the needs of a broad constituency effectively and fairly. The translation of the research that is performed in the sea grant program, to the user community, and the translation of needs from the community back to the sea grant researchers, I think will be more fully developed in the subsequent discussions by the witnesses that are scheduled for today.

Mr. STUDDS. That has been a running concern of my own, as you know. When I first arrived here, roughly 8 years ago, I could not find any of my fishermen who knew that there was a sea grant program,

It is highly unlikely to find a farmer that does not know about a State extension service. This program is supposed to be analogous to the land grant colleges for the traditional farming community. It was my concern that we had not reached that early in the program—a kind of a reasonable balance.

I take it from your response that you are satisfied that insofar as there was an imbalance in that respect it has been corrected in those intervening years?

Dr. OSTENSO. I feel that short of doing a thorough study by the GAO, and specifically outlining where the problems may exist, they raised issues that we have constantly been aware of, and issues to which we have to be sensitive.

The marine advisory program is only 12 years old. We think we have some outstanding agents. You will be exposed to some of them later today. They are trying to serve a wide constituency. We do not have the luxury, as the Cooperative Extension Service does, of having one or more agents per county. Someday when we achieve that degree of maturation, I would like to believe that there would not be a fisherman who had not heard of the sea grant program.

Mr. STUDDS. It is not necessarily to your advantage to have been heard of by everybody always.

Do you have a list of States that you anticipate becoming participants in the program and a timetable, roughly?

Dr. OSTENSO. We do not have it quite that way, because sea grant college status is something that has to be achieved, and people, institutions and States, have progressed and retrograded on the basis of their performance.

As I mentioned, we have Georgia, which is about to be designated, whose application has been approved by the review panel; formal application has been made by the University of Alaska. Other States that are in advanced state of development are Maryland, Mississippi, Alabama, and Michigan.

Have I missed any?

Mr. WILDMAN. We could provide you with a list of the States that are now participating, and in what status they are, and there are very few coastal and Great Lakes States that are not now participating in any way.

[The following was received for the record.]

STATES IN SEA GRANT PROGRAM

States with sea grant college programs: California, Delaware, Florida, Georgia, Hawaii, Louisiana, Maine-New Hampshire (Joint), Massachusetts, North Carolina, Oregon, Rhode Island, New York, Texas, Washington, and Wisconsin.

States with sea grant institutional programs: Alaska, California (in addition to Sea Grant College), Maryland, Michigan, Mississippi-Alabama (joint program), and Virginia.

States with coherent area support: Massachusetts (in addition to sea grant college), Minnesota, New Jersey, Ohio, South Carolina, and Virginia (in addition to institutional program.)

States with project support: Arizona, Connecticut, Idaho, Oklahoma, and Puerto Rico.

Mr. STUDDS. Is it possible, under the law, to have two sea grant colleges in one State?

Dr. OSTENSO. Yes; it is possible.

Mr. STUDDS. Is it likely?

Dr. OSTENSO. It has not happened yet. It is hard to say that the problems of a State the size of California might not warrant two sea grant college systems. You would have problems with that in that you could have, presumably under the law, two autonomous advisory programs, and that could cause some problem.

There were two States that had independent sea grant programs in development. Florida was one, and the University of Miami was elected to become part of a Florida-wide sea grant network.

There is only one other State where we have a sea grant college program and one at an institutional status, that is in California where the University of Southern California has been in institutional status for 6 or 7 years now.

It is very difficult for a single campus to marshal the wherewithal that is required to achieve sea grant college status.

Mr. STUDDS. Where do the one-third matching funds come from—State governments, universities, private source? Do you have a breakdown of these sources?

Dr. OSTENSO. It is specified that it must be non-Federal matching funds. Many States have special appropriations for sea grant matching funds.

In the case of MIT, which is a private institution, most of those matching funds come from private sources. They come from a variety of sources, but State appropriations is the single largest source.

Mr. STUDDS. I would appreciate if you could provide the Subcommittee with a breakdown of those matching fund contributions, just for the record.

Dr. OSTENSO. If they are available, I would be happy to do that, sir.

[The following was received for the record.]

LIST OF GRANTS AND MATCHING FUNDS

University and grants number	Sea grant funds	Matching fund	Source of matching funds
Oregon State University, NA79AA-D-00106.....	\$1,950,000	\$1,385,600	State of Oregon, Oregon State University, Clatsop Community College, University of Oregon, Oregon Department Fish and Wildlife, Oregon Aqua Foods, University of Idaho, Washington State University, Oregon Department of Education, Domsea Farms, Undersea Gardens, Oregon Department Transportation, Oregon Concrete Aggregate Producers Association, Port of Umpqua, Lewis Clark College, Clatsop County, Tillamook County, Lincoln County, Coos County.
University of California, 04-8-MO-189.....	2,840,000	2,016,228	State of California, California Resources Agency, Department of Fish and Game, Aquarium Museum Docents, Foundations for Ocean Research, Kelco, Marine Colloids, San Diego Gas & Electric, Southern California Edison, Union Oil, Zoecon, California Institute of Technology, Humboldt State University, San Diego State University, San Diego State University Foundation, San Jose State University, Stanford University, University of North Carolina, University of California, Soil Control Laboratory.
State University System of Florida, 04-8-MO1-76..	1,450,000	1,443,400	Coastal Plains Center for Marine Development, Florida Department of Environmental Regulation, Florida Department of Natural Resources, Franklin County Board of Commissioners, Pensacola-Escambia Interlocal Advisory Board, Tampa, City of various county extension programs, Florida Atlantic University, Florida State University, Nova University, University of Florida, University of South Florida, University System allocation, American Petroleum Institute, Bream Fishermen's Association, Pensacola Party Boats and other Fishermen.
University of Washington, NA79AA-D-00054.....	1,895,400	1,129,100	University of Washington, Domsea Farms, Washington State Department of Natural Resources, Small Tribes of Western Washington, WSU Cooperative Extension (Grays Harbor and Pacific Counties), Pacific Science Center, Clover Park Education Center, KCPQ-13, Clover Park School District, Bellingham Vocation-Technical Institute, Highline Community College, Unidentified, Washington State University, Alaska Department of Fish and Game, Workshops, Meetings and Committees, Seattle City Light, RAPCO, Marine Colloids, Oregon State University, Loughborough University England, GE Foundation, University of Idaho, Port of Seattle, Alaska Salmon Industry, Port of Bellingham, General Foods Corp., Crane, Russak, Alaska-Pacific Halvorsen, Bio-Med Laboratories, Hawaiian Department of Fish and Game, SEAFDEC Laboratory, Washington State Department of Fisheries, Clam Growers.
University of Delaware, NA79AA-D-00118.....	964,000	767,641	University of Puerto Rico, State of Delaware, Industry Partners.
University of Alaska, NA79AA-D-00138.....	1,150,000	834,852	University of Southern California, State of California Resources Agency.
University of Hawaii, NA79AA-D-00085.....	\$1,598,000	\$1,031,119	University of Hawaii, State of Hawaii, Office of the Marine Affairs Coordinator, State of Hawaii, Aquaculture Development Program, Department of Planning and Economic Development, State of Hawaii, Department of Land and Natural Resources, State of Hawaii, City and County of Honolulu, County of Hawaii, Department of Health, State of Hawaii, Department of Education, State of Hawaii, University of Arizona, University of Washington, Jon Pegg, M.D., American Gas Association, Kamehameha Schools, Bishop Estate, Membership fees (private contributions.)
Massachusetts Institute of Technology, NA79AA-D-00101.	\$1,451,000	\$1,281,452	Commonwealth of Massachusetts Metropolitan District Commission, Commonwealth of Massachusetts, Henry L. and Grace Doherty Charitable Foundation Inc., Intevop Project, JBF Scientific Corp., Kawasaki Heavy Industries, Massachusetts Maritime Academy, Marine Industry Advisory Services Collegium Members, MIT State-Industry Advisory Council, Martha Vineyard Commission, Multi-Sponsor Industrial Support, New Bedford Schools System, New England Aquarium, N.E. Marine Studies Consortium, S.G. Lecture Endowment Funds, Town of Barnstable, University of Massachusetts, Various educational institutional participants.
Mississippi and Ababama, NA79AA-D-00049.....	\$785,000	\$429,404	Mississippi Institutions of Higher Learning, Alabama Institution of Higher Learning.

University and grants number	Sea grant funds	Matching fund	Source of matching funds
Virginia Institute of Marine Science, NA79AA-D-0005.	695,400	434,562	Virginia Institute of Marine Science, College of William and Mary, University of Virginia, Old Dominion University, George Mason University, Norfolk State University, Virginia State College.
Texas A. & M. University, NA79AA-D-00127.....	1,570,000	1,279,146	State of Texas Legislature, Brazoria County Mesquito Control District, Nueces County Navigation District No. 1, Brazoria County Court, Calhoun County, Cameron County Court, Magagorda County, Galveston County Court, San Patricio County Court, Sam Houston State University, University of Houston, University of Texas at Port Arkansas, Texas State Technical Institute, Baylor College of Medicine, Texas Southern University.
State University of New York, NA79AA-D-00053....	1,158,000	865,221	State University of New York, State of New York, Cornell University, Shelter Island Oyster Co., Monsanto, Sea Lane Service, Jack Prince, St. Lawrence Tourist, Study, Stony Brook Foundation, Link Foundation, New York Dept. of Environmental Conservation, N.Y. Dept. of General Services, N.Y. Job Development Authority, New Y. ERDA.
University of Southern California, NA79AA-D-00133.	575,000	533,195	University of Southern California, State of California Resources Agency, California Department of Education, California State Lands Commission, California State University Long Beach, Department of Boating and Waterways, Department of Water and Power, KCET-TV KNX News Radio (CBS), KUSC, Los Angeles City School District, Los Angeles County Superintendent of Schools, Los Angeles Harbor Department, Newport Beach Chamber of Commerce, Marine Division, Occidental College, Southern California Edison, Tinker Foundation Corp.
University of South Carolina, NA79AA-D-00132.....	385,000	406,700	State of South Carolina, University of South Carolina, Clemson University, College of Charleston, S.C. Wildlife and Marine Resources Department.
University of Maryland, NA79A-00058.....	724,900	704,700	Maryland University.
University of Minnesota, NA79AA-D-00134.....	355,000	294,194	University of Minnesota, Minnesota State Legislative Special Appropriation.
University of Minnesota, NA79AA-D-00025.....	321,800	222,991	Stearns Manufacturing Co., Minnesota Department of Natural Resources, Regents of the University of Minnesota.
University of Michigan, NA79AA-D-00093.....	953,278	487,240	The University of Michigan, Michigan Department of Natural Resources, Michigan State University, State of Michigan.
New Jersey Marine Science Consortium, NA79AA-D-00063.	430,000	286,900	Farleigh Dickinson University, Kean College of New Jersey, Lehigh University, Montclair State College, New Jersey Marine Science Consortium, Princeton University, Rutgers University, Stevens Institute of Technology, Burlington County Girl Scout Council.
University of California, 04-8-M01-193.....	545,200		Not applicable.
Louisiana State University, 79AA-D-000128.....	1,126,700	711,928	Louisiana State University, Louisiana Health and Human Resources Department.
University of Georgia, NA79AA-D-00123.....	758,000	761,400	University of Georgia, Skidaway Institute of Oceanography, Herty Foundation, Georgia Bookkeeper's Association.
University of Rhode Island, NA79AA-D-00096.....	1,370,000	757,900	University of Rhode Island, Pt. Judith Fishermen's Coop, State or local governments.
University of Wisconsin, 04-8-M01-172.....	1,700,000	828,000	University of Wisconsin.
University of North Carolina, NA79AA-D-00048.....	950,000	500,000	North Carolina Department of Administration.
University of New Hampshire/University of Maine, NA79AA-D-00057.	1,340,000	697,929	Maine Department of Marine Resources, University of Maine at Machias, University of Maine at Orono, University of New Hampshire.
W.H.O.I. NA79AA-D-00102.....	675,000	490,796	W.H.O.I., Pew Foundation, Boston University.

Mr. STUDDS. Did I understand you to say that you had published a list of 15 general topic areas for the national projects program?

Dr. OSTENSO. Yes, they are published in the Federal Register.

Mr. STUDDS. What is the status of those? Is that what you have determined will indeed be the program in the immediate future, or what?

Dr. OSTENSO. Yes, this list was developed by a rather involved collegial process. They represent areas in which we do already have substantial programmatic participation.

Mr. STUDDS. Are they broad? Give me some examples. What is on that list?

Dr. OSTENSO. I will give you some specific examples. One is to assist in the management of fisheries out to the 200-mile limit, as major high priority.

Mr. STUDDS. It is in that order of magnitude, rather than to study the larval stage?

Dr. OSTENSO. Yes, marine corrosion is one. Also, potential effect of Federal and State laws as they may be impacted by the Law of the Sea.

Mr. STUDDS. I get the general idea, yes.

Is there one under which, for example, the toxicity of drill muds and cuttings might fall?

Dr. OSTENSO. We have one called the reexamining of the ocean for the disposal of wastes from a land-based society.

Mr. STUDDS. Are you sure this was not developed in a sociology class?

Dr. OSTENSO. This was to look at the pernicious effects of pollutants.

Mr. STUDDS. How is it determined what specific projects will be funded under the national projects program?

Dr. OSTENSO. The criteria we have published in the Federal Register indicate that they have to fall within these 15 subject areas.

Mr. STUDDS. I cannot think of anything that would not, do you?

Dr. OSTENSO. Yes, there are quite a few.

Second, they have to be of high quality, third, there has to be an aspect of the program that makes it fundamentally noncompetitive for matching funds. Fourth, there is no geographic specificity, or it comes from an institution that is not part of the sea grant institution, and thus does not fall under their blanket of matching funds.

The other criteria we have is that this piece of work is a key element of a full spectrum program in that subject area. Like, for instance, a specific study in genetics that we feel is missing from our aquaculture program.

Mr. STUDDS. OK. This is not the time to pursue it, but some of us would be more than excited if you could take a look at the possibility of investigating the whole question of drill muds and drill cuttings.

You speak with great excitement about the international program, yet it is so modest, at least in terms of funding. What is so exciting about it?

Dr. OSTENSO. To me the exciting aspect of it is, even with the small size of the program in the 2 years that it has been in operation, a sense that it is being effective, being received by the recipient countries, and is adding a new dimension and real benefit.

Mr. STUDDS. Who are the participating countries? What is happening for \$900,000?

Dr. OSTENSO. The program is fairly varied. One is looking at sedimentation problems on the Nile Delta, which as you know, is a serious problem, and improving their expertise in dealing with it.

One is assisting fisheries education in Malaysia. It involves a variety of exchanges. The thrust of the program, the unique part of the program is its focus toward training education, and mutual assistance to the participating countries, where we are trying to

bootstrap them up, we are trying to develop capabilities in most countries where they have very limited or no capability in the marine area.

Mr. STUDDS. What countries in addition to Malaysia and Egypt are involved?

Dr. OSTENSO. It would be faster if I read them.

Mr. STUDDS. It could not be too many for \$900,000.

Dr. OSTENSO. No, there are 11. The University of Hawaii is dealing with the University of the South Pacific, which involves a number of administratively separate nations, or commonwealths. We are dealing with Chile and Mexico, India, Egypt, Malaysia, Costa Rica, Israel, Colombia. We have no current programs in black Africa, we are sensitive to this, we are trying to develop programs in that area.

Mr. STUDDS. With that kind of funding, where does most of it go? For travel for scientists?

Dr. OSTENSO. The funding is very limited. This limits what our capability is, and accordingly, we are focused less on participatory cooperative research, which costs more money, than on training people in those countries to provide an educational basis for developing their own marine resources.

Mr. STUDDS. What does our money go toward? To pay U.S. scientists to go abroad?

Dr. OSTENSO. It involves U.S. scientists to go abroad, it involves foreign scientists and students to come to the United States, it prepares training packages to go abroad, it involves experts to go work with people in the field, in contrast to formal educational sort of things.

Mr. STUDDS. Do you coordinate this with the State Department and their governments?

Dr. OSTENSO. Very much so, yes.

Mr. STUDDS. Very good.

Mr. Stack?

Mr. STACK. I think perhaps this opens the door to what you were thinking, expressed earlier, Mr. Chairman. We might find, through this sort of effort, means of getting part of the Defense budget to reinforce our efforts here.

Mr. STUDDS. We might even get Massachusetts in that list of "other countries."

Mr. STACK. I do believe that there is urgent need that we check on the University of South Pacific, to see how this program is working there. You and I should go, at the first opportunity, to check that out.

Seriously. You have a very limited budget, and a very ambitious program, that seems to be working well. I certainly commend you for this, the diversity of the program is staggering, and the amount of your budget is, I think, very dismally low. It is hard to see how you are going to achieve the objectives with the amount of funds that you have available to you.

I just wondered, in light of this, what care you exercised in avoiding duplication? For example, I come from Florida, and I am a new member of this committee, I do not have the great depth of knowledge that our chairman, for example, has in this field. I am in a learning process.

We are interested in, certainly, our commercial and our recreational fishing, we are very much interested in beach erosion, which as you know is a severe problem, particularly in south Florida where I happen to come from, and this has been, as I understand it, one of the responsibilities of the Army Corps of Engineers. They have been actively engaged in the dumping of sand from offshore onto our beaches, to restore them on a temporary basis. It seems to work quite well.

I know the University of Florida for years has been studying the question of beach erosion. They have built models, and so forth.

The question I would have is perhaps a word of caution. Are you spread too thin and, do you get into questions, let us say, that other agencies, such as the Corps of Engineers, could perform that have the larger budgets to do what you are also involved in to an extent?

Dr. OSTENSO. Yes, Congressman Stack, I think you asked me two questions.

One was about the size of the international program. I agree, it is a stretch of credulity to say that you have an international program at the \$900,000 level. This obviously caused us some problems of—especially the raising of foreign expectations that are going to be unrequited.

I feel that the small funding of \$900,000 that we have is soundly invested in programs of some substance. We have a process for trying to operate the program. It is so small, so to avoid raising expectations, we receive a preliminary letter of proposal intent from universities, which can be submitted without dealing with the foreign countries which generates that expectation. These letter proposals are reviewed by an interagency group. We have propriety on that.

In the case of Florida, we said yes, we think your proposed program in India does make sense. We then encouraged them to deal with the Indians to develop the substantive proposal that was finally funded. So we are sensitive to this problem, sir.

With regard to being spread too thin, with specific reference to the beach erosion program, we are not sure that rearranging sand on the beach in perpetuity is probably the smartest way of handling this. We are not going to go into the dredging business. We are trying to better understand nature, using the intellectual resources that are more available to us singularly than to the Corps of Engineers.

Mr. STACK. I would certainly agree with your position. Obviously the beaches is only one expedient. The first hurricane that comes along will take the sand out again and it has to be done on a continuing basis. It is our view in Florida that it is better than nothing and, for many years, the University of Florida has been conducting laboratory studies to find the cause and treatment, if you will, for the beach erosion.

I am simply throwing out a word of caution. Obviously the Corps of Engineers is going to do the dredging. One answer perhaps that is implicit in what you are saying is that whatever applies to the farm program would apply to other programs. As you develop knowledge through the sea grant colleges, as you draw up a fund of knowledge, it does not cost much money to share this with other

countries, other areas. I think that would be your best procedure and I think that is basically what you are saying.

Dr. OSTENSO. Absolutely.

Mr. STACK. That if you develop an information flow through research and so forth, that it is not very costly to provide this to other nations, friendly nations, and certainly we want to effectively get out to our own people in this country, our fishermen and so forth, the knowledge that you accumulate in understandable language and I rather agree with your observation, I do not want to characterize it in so many words about the General Accounting Office, whatever they put out does not necessarily become gospel, and I do not—I think when I referred before to this caution about necessity for putting out materials and language that we understood by the people to whom it is directed, I was really following the lead of the chairman in an attempt to be somewhat facetious. I do not necessarily agree that what you do put out is incomprehensible to those to whom it is directed.

I would commend you on your testimony. I think you have done an excellent job here in giving to me a better understanding of what you are trying to do.

Dr. OSTENSO. Thank you, sir.

Mr. STACK. Thank you, Mr. Chairman.

Mr. STUDDS. Thank you very much, Dr. Ostenson. I hope you have an equally successful second 10 years.

Now comes the hard part. We are going to have to discipline ourselves—both the members and the witnesses. I am going to ask, on the basis of sheer necessity of time, that each person confine himself or herself to 5 minutes of oral testimony. I understand that some of the witnesses have written statements that are quite long. All of them will be delivered in the record in their entirety. If we do not restrict the witnesses to 5 minutes, then we will not get through today.

I profusely apologize. It is awkward since particularly two of the people are from my State, my district even, but we are going to have to proceed that way and we are going to proceed in panels, and the first panel is a panel of sea grant college program directors, Dean A. Horn of MIT; James Sullivan, University of California; Donald F. Squires, State University of New York; Alfred M. Beeton, University of Michigan; and David A. Ross, Woods Hole Oceanographic Institution.

Are you all here? Gentlemen, I again apologize and I am going to ask my staff to keep time, and I am going to impose it on myself and on the other members of the committee and also on you.

Do you want to go in the order in which you appear on the witness list?

STATEMENTS OF PANEL OF SEA GRANT COLLEGE PROGRAM DIRECTORS CONSISTING OF DEAN A. HORN, MIT; DR. JAMES SULLIVAN, UNIVERSITY OF CALIFORNIA; DR. DONALD F. SQUIRES, STATE UNIVERSITY OF NEW YORK (SUNY); DR. ALFRED M. BEETON, UNIVERSITY OF MICHIGAN; AND DR. DAVID A. ROSS, WOODS HOLE OCEANOGRAPHIC INSTITUTION

Mr. HORN. We will go ahead in the order which we appear.

My name is Dean Horn. I am the director of the sea grant college program at the Massachusetts Institute of Technology.

My remarks, which are my own personal remarks, do not reflect the official opinions of MIT or the national sea grant college program and are based on my 10 years of experience with sea grant. While in my written statement I make a very strong plea for the renewal of the sea grant program, increased funding, and some changes in the act that I think are very important, I will leave my written statement to present those. I would like to jump into what I think are two important elements.

First off, sea grant is—the strength of and the characteristic of sea grant—is the fact that it is an integrated system, totally integrated. It is not research. It is not education. It is not advisory services. It is a coupling of all of these and the melding of more than one university resource into action. By virtue of this complete program and the dedicated advisory service that exists, it extends the useful life of research, making sure that the results get out to those people in a form and a format that can be applied and put to work.

I would like to just cite, for example, very quickly, the hook-up block that we developed in 1975 for fish trawlers, side trawlers, to hold the lines into the stern so that the ships can maneuver while they are towing the nets. The people that use it think it is great. In fact, Joe Novello from Gloucester has used one for 5 years and his crew would not go to sea without it. Very recently, because of this continued activity of the advisory people to make this information available, we got a call from the Coast Guard. They wanted to know could we adapt one of our hook-up blocks to their fishery inspection cutters, 210-foot class. We said sure, we could. We put it on and it has been out at sea on test. It appears that it is going to be the answer to their problem and we are now working with the Coast Guard to modify it and configure it to their needs.

The second thing I want to mention is the opportunity for sea grant to really be a forerunner, a doer in the area of high risk. A university is a place to do this. Businesses and industries will not take on some of this because of the low probability of success. For any university, negative results or the failure of an experiment have positive educational benefits that can justify the research in the educational environment by itself, and those few that succeed can have tremendous payoff, I use our dogfish skinning machine to illustrate that. About 4 years ago, the industry came to us from Gloucester and said, can you develop a machine that will skin dogfish? I did not know. Nobody around there knew.

We put together a team and tried. We tried four or five different things that did not work.

Finally, Professor Wilson, who is a design engineer, went to sea and said the only solution to this is to duplicate the hand process mechanically, and that is exactly what he has done. They are assembling the final components of the machine today and tomorrow we will be skinning dog fish. We expect by the end of March to put on an industrywide demonstration of this prototype that has taken us about 2½ years to build.

The chief engineer of Arenco, who was over here at Fish Expo 2 years ago, saw the machine, and he said his company would have

had to devote 5 years and at least \$500,000 in their budget to even consider taking on that kind of a job. It has taken us 5 years from the beginning, the budget expense is about half of what he was talking about.

The interest that we have received is great. If I do not get a phone call each week. I am disappointed, coming from Canada, the west coast, all over the United States, both manufacturers and processors who have heard about that machine and want to know when can they see it? When can they get hold of it? It is a prototype. It is a concept in steel and aluminum that is ready to demonstrate the feasibility but, once demonstrated, it will be ready to turn over to a manufacturer for production. This will open up a marvelous opportunity for answering an export market, an under-utilized species and a financial return to fishermen by getting a better ex-vessel price.

I do not know how I am doing on time.

Mr. STUDDS. Your time has expired.

Mr. HORN. Thank you very much.

[The following was received for the record:]

STATEMENT OF DEAN A. HORN, SEA GRANT COLLEGE PROGRAM, MASSACHUSETTS
INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.

INTRODUCTION

Mr. Chairman, Members of the Subcommittee: Thank you for this opportunity to appear before the House Oceanographic Sub-Committee to testify in support of the National Sea Grant College Program and to urge reauthorization of the Act. My name is Dean A. Horn. I am Director of the Massachusetts Institute of Technology Sea Grant College Program. I have been associated with Sea Grant since 1970 when MIT formally established a Program. I served first as Executive Officer and have been Director since November 1975. The following remarks are my personal opinions and recommendations based on almost 10 years experience with Sea Grant. They do not represent the official position of the National Sea Grant College Program nor of the Massachusetts Institute of Technology.

I see the National Sea Grant College Program as a very successful, grand experiment, that combines and organizes university, industry and government efforts in wise and proper marine resource development and utilization. It is a low cost, highly leveraged program that effectively applies the great reservoir of knowledge and expertise—the brain power of this nation's university faculties, staffs and students—to marine related issues, problems, and opportunities.

In my testimony today, I want first to support and urge the re-authorization of the National Sea Grant College Program Act for a period of at least three years and to present a case for a significant increase in the limits of Authorization for Appropriations. In addition I will recommend three specific changes in the Act that I believe will significantly improve the Program's operation at both the local and national levels.

Finally, from the perspective of a university-based program, I want to address what I see as the special or unique features of the National Sea Grant College Program and to discuss some of MIT Sea Grant's activities and accomplishments that illustrate these features.

REAUTHORIZATION OF THE ACT

I believe that the National Sea Grant College Program Act should be renewed because the Program today, represented by the NOAA Office of Sea Grant and 28 university programs, is the most successful, cost efficient, federally assisted Research and Development Program in the nation. I also believe that the return on the federal investment in Sea Grant is without peer. To support these beliefs I cite the following specifics:

First, the annual management and operating cost of the National Sea Grant Office averages less than 4 percent of the total Sea Grant appropriation. All other funds are used to support the work of the network of university programs and the other individual project grants. This means that over 96 percent of the federal Sea

Grant funds goes toward the program objectives set forth in the Sea Grant Act. These data indicate to me that the National Sea Grant Program administrative cost is minimal by any standard. This funding distribution also illustrates the non-federal orientation and management of Sea Grant and why the Program has succeeded and achieved a high level of responsiveness to local user needs.

Second, almost all of the federal Sea Grant funds require non-federal matching equal to 50 percent of the federal support; more than any other federal R&D program of which I am aware. This means that the \$35.5 million appropriated for fiscal year 1979 has resulted in a Sea Grant effort totaling \$56.7 million because there was \$21.5 million in matching, non-federal funds that year. This requirement for match is an important and strengthening concept which leverages the federal dollars for much greater impact and benefit. To me Sea Grant is a successful, application oriented, working partnership; it is not a federal give-away Program.

Third, this matching fund requirement ensures an interest, commitment, participation, and dedication by both the project leaders and the potential users; important characteristics more strongly evidenced in Sea Grant than in other federally supported R&D Programs. The matching fund requirement successfully ensures our efforts are focused on true needs that others are willing to support. It strengthens the inherent partnership of interest and effort among the government, the university, and the users of Sea Grant results.

Therefore, based on the past successes and the even greater potential of this unique partnership program, I strongly urge this Committee to recommend the reauthorization of the National Sea Grant College Program for at least three more years.

INCREASED APPROPRIATION LIMITS

Relative to the Authorization for Appropriations, Section 212 of the Act, I strongly recommend an increase to \$75,000,000 for fiscal year 1981, this increase will overcome the inflation effect since 1976. I also recommend an annual increase of 15 percent in the Authorization limit for each succeeding year until the National Program network is fully established. Permit me to discuss the basis for my recommendation.

The National Sea Grant Program has clearly benefited from the close attention, the careful counsel, the judicious advice, and the strong support of the Congress; both through the timely oversight reviews by this Committee and the Senate counterpart, and from the strong interest and funding support of the House and Senate Appropriations Committees. Without this Congressional attention and support, Sea Grant would probably not exist today. And, according to the 1981 budget just announced, it may not survive in the future unless Congress continues to act and support the Program.

I have prepared the enclosed table (Table I), based on data available to me, covering the Sea Grant funding actions for the fiscal years since 1975. I think this table clearly illustrates the important role of the Congress.

The annual dollar increase in Sea Grant appropriations since 1975 totals \$16.2 million, an increase of over 70 percent since 1975. However, in constant 1975 dollars, inflation reduces this to only a \$3 million and less than 15 percent gain in real program support.

Most significantly, of the \$16.2 million in increased appropriations, 97.5 percent has been by the initiative and action of Congress. Had Congress not acted as it has and assuming that only the OMB recommended changes had been applied, the 1980 appropriation would now be only \$22.7 million in current 1980 dollars, essentially level funding for the past five years. Given that level of support, coupled with inflation, Sea Grant's effective funding would have shrunk disastrously to an equivalent level of only \$14.9 million in 1975 dollars. I am convinced that the National Sea Grant College Program would have ceased to exist without the continuing interest and support of Congress. I am equally convinced that the immediate future of this vital and successful program is once again dependent on action by the Congress.

TABLE I.—REVIEW OF SEA GRANT APPROPRIATIONS SINCE FISCAL YEAR 1975

[In millions]

Fiscal year	OMB budget proposed	OMB budget change relative to previous appropriations	Congressional increase in funding	Appropriation final	Appropriation in 1975 dollar
1975.....				¹ \$22.3	\$22.3
1976.....	\$21.0	\$-1.3	² \$2.1	23.1	22.0
1977.....	23.7	.6	4.0	27.7	24.8
1978.....	27.3	— .4	4.4	31.7	26.0
1979.....	33.4	1.7	1.8	35.2	25.5
1980.....	35.0	— .2	3.5	38.5	25.3
5-year increase.....		+ 0.4	+ 15.8	16.2	3.0

¹ \$23,300,000 appropriated but \$1 million held back by administration.² Includes \$1,000,000 held back in fiscal year 1975, release required by Congress.

But what has been the increase in need for the Sea Grant funding during this same five year period? The Sea Grant Program has grown in productivity and effectiveness in response to local needs. The number of Sea Grant College Programs has increased from 8 to 14. Five Coherent Area Programs have matured and advanced to Institutional Program status. Two new Coherent Area Programs have been added to the university network. Each of these new or expanded Programs developing in response to local needs and opportunities also represents an increased need for Sea Grant funding.

In addition, the Sea Grant Improvement Act of 1976 mandated four additional areas of emphasis and responsibility for the National Sea Grant Program: the pre-college or K-12 marine education; the International Cooperative Assistance Program; National Projects; and Sea Grant Fellowships. Each of these added areas has taken a part of the total funds annually appropriated for Sea Grant. Even on the basis of the \$16.2 million total budget increase since 1975, the percentage of Sea Grant funds allocated to research had decreased so that there has been virtually no overall growth in the established university programs which constitute the base and heart of the Sea Grant College Program network.

Mr. Chairman, I am firmly convinced that we are at a critical point, a crossroads for the future of the National Sea Grant Program. These questions arise frequently: is the Program going to mature to its full productive potential and capacity, to include all the 34 eligible coastal and Great Lake states and territories provided for by the Act, to grow so that each participating university has an equal opportunity to achieve Sea Grant College status? Or, will we be forced to consolidate and support only a limited number of Programs at the expense of the others?

There is a great body of evidence that this nation must increase its productivity if our industries are to become more competitive in the world market—reducing or reversing our balance of trade deficit and strengthening our economy. A recent White House report strongly recommended that one avenue to increased productivity is established closer, stronger linkages between universities and industries in research and development efforts of mutual benefit, and that federal funds should be used to foster such linkages. The Congress has before it two bills, HR4672 and S1250, both proposing the establishment of an Office of Industrial Technology in the Department of Commerce with Centers for Industrial Technology at a few major universities and research institutions. The 25 January issue of Science has a feature article, entitled "Research, Innovation and University-Industry Linkages," which eloquently argues for the United States to invest in and build on such linkages to improve industrial productivity and our nation's economy.

If in the White House report, the House and Senate bills, and the Science article, the word "marine" is inserted ahead of the word "industry" or "business," each of these documents could be taken as describing or discussing the National Sea Grant College Program. My letter (attached) to the editor of Science makes this point more fully. Sea Grant is a successful marine-based model for others interested in university-industry linkages to use. We have already built such linkages between Sea Grant and elements of the marine industry. Sea Grant is an important national program that needs your continued interest and support for the future; not just to survive but to develop, to further strengthen and succeed, and to become the fully effective Program the sponsors of the original Act envisioned.

Mr. Chairman, the foregoing is why I urge this Committee not only to approve the reauthorization of the National Sea Grant Program but also to increase the Authorization for Appropriations to \$75,000,000 for fiscal year 1981 and an annual increase of 15% for each succeeding year until the National Program network is fully established. Establishing these increased authorization limits will clearly demonstrate that it is the intent of Congress to provide for, and to maintain, a viable and effective National Sea Grant College Program.

CHANGES IN THE ACT

While on the subject of the Act, Mr. Chairman, I would like to recommend three specific changes: first to provide for the assignment of patent rights, second to extend the tenure of the National Review Panel members, and third to make an editorial change for administrative clarity.

PATENTS

Relative to the patent rights question, the National Sea Grant Program Act emphasizes and encourages the participation of and cooperation with the full spectrum of marine industries and local communities for developing and utilizing of the Nation's marine resources. In order to stimulate utilization and to protect the government's interests and investment, university Programs are required to file patent applications for each invention developed under Sea Grant sponsorship. Once the patent application is filed, a request can be made to the Department of Commerce to have the patent title assigned to the university with the provision that all government use will be royalty free. To the best of my knowledge, every requested assignment by a university has been approved by Commerce. The problem is one of how to foster the earliest application of Sea Grant results, increasing industrial interest and participation, and decreasing management expense.

Innovation and invention have been two of the economic strengths of the United States. It has been traditional that those who are willing to take the risks should share in the rewards. However, major obstacles to effective university-industry linkages and interaction include the issues of proprietary data and patent rights. Very properly, I believe, industry wants to protect its interests and investments; just as the federal government does so by the regulation requiring "royalty free use". However, because the patent assignment decision is not made until after the work is completed and there can be no preagreement or assurance of initial licensing priority or preference, industry will often not release valuable proprietary data or enter into a project with high market potential. In such cases everyone loses—industry, university, government, and probably most of all, the economy.

In an effort to attract more industry participation in Sea Grant and to promote the earliest utilization of project results, I strongly recommend that the Sea Grant College Program Act be amended to stipulate that all patents developed with Sea Grant support are to be assigned to the cognizant university grantee subject only to unlimited and royalty-free use by the U.S. government. In addition any royalties resulting from commercial licensing agreements should be reapplied by the university Sea Grant Program to the direct support of Sea Grant project activities after the direct costs of patent processing have been recovered.

The principal advantages of such a patent provision would be, first, to foster closer university-industry interaction and matching support because agreements to license any resulting patents could be established at the project's beginning. Second, a clear patent policy would facilitate marketing and utilizing the research results at the earliest practicable time. Third, financial benefits from patents would be directed toward furthering the goals and objectives of Sea Grant while protecting the government's interests in the future as well as today. Fourth and most importantly, this action is in keeping with several other similar efforts and proposed or recommended legislation to liberalize federal control of patents to encourage better development and utilization of government sponsored research. The National Sea Grant College Program Act would once again demonstrate its foresight and leadership.

Specifically, I recommend inserting in the Act the following provision, or words to this effect, as a new sub-paragraph (4) in Sec. 205, with the existing sub-paragraph (4) renumbered as sub-paragraph (5).

"(4) All patents resulting from work funded, fully or in part, by funds appropriated under this Act, shall be assigned to the university grantee subject to the limitations that—

(A) There shall be unlimited, royalty-free use by the U.S. government of all resulting patents; and

(B) All royalties received by the university, after reimbursement for the direct costs of preparing, filing, receiving, and licensing such patents, shall be applied to the operation and activities of the university's Sea Grant Program."

NATIONAL REVIEW PANEL

Continuing on the subject of specific changes to the National Sea Grant College Program Act; my next recommendation is relative to increasing the term of service for members of the National Review Panel as set forth in Sec. 209(C) of the Act. At present the members are limited to a single three year term. Reappointment is specifically forbidden. In my opinion, which I think is shared by many Sea Grant Program Directors, this limitation is against the best interests of the National Sea Grant Program and the university network. The present limitation of three years, at two meetings per year, is barely enough time for a Panel member to become familiar with the National Program and to start making real contributions to the review process. With Sea Grant College Programs now operating on a two year grant cycle, two-thirds of the Review panel members can only act on a given university College Program once and that action with no prior official historical perspectives. This amendment recommendation is based on my personal experience of having worked with and observed the contributions of the original Sea Grant Advisory Board members, many of whom served for five, six or more years. These individuals had the experience and opportunity to make effective, long lasting inputs and improvements to the operation, administration, and management of the National Sea Grant Program.

Therefore, I recommend and urge that the Act be changed to read as follows in Sec. 209(C)(3) (note: wording changes are italicized):

"(3) Any individual appointed to fill a vacancy occurring before the expiration of the term for which his or her predecessor was appointed shall be appointed only for the remainder of such term. *An individual may be appointed as a voting member for one additional full term after serving one full term as a Panel member.* A voting member may serve after the date of the expiration of the term of office for which appointed until his or her successor has taken office, or until 90 days after such date, whichever is earlier."

EDITORIAL CHANGE

I recommend that the Sea Grant activities identified and listed in Sect. 203, (11)(B) be changed to recombine "(ii) education" and "(iii) training" into the single category of "education and training."

The original Act and all regulations and documentations prior to the 1976 Amendment listed only three activities, viz. research, education and training, and advisory services. The recombination of "education and training" into one activity instead of the two now in the Act is, I believe, important because education and training are very closely related and not clearly separable in many of our programs. The separate identity has had no demonstrated benefit since 1976 while the existing separate identification could be interpreted as deemphasizing research and advisory service activities by making both education and training independent and co-equal activities. Finally, I believe that the recombining "education and training" into a single category better presents the original intent and concept of Sea Grant.

SPECIAL NATURE OF SEA GRANT

To this point I have stated that the Sea Grant Act should be renewed and expanded and have recommended four specific changes to the Act. Now I want to present some examples intended to show that the National Sea Grant College Program is a national asset and that it merits the kind and extent of continued Congressional support I have proposed. From now on I will talk mainly about the Program activities and accomplishments of the MIT Sea Grant College Program; so if I sound prideful, it is strictly intentional.

I will give you a quick Program overview to establish the context of my remarks. MIT Sea Grant has matured from a small, Coherent Area Project in 1970 to a university-wide, major Institute Center, encompassing in our current fiscal 1980 program, faculty and students from 13 MIT departments, laboratories and centers. In addition we have joint projects with several other institutions including the University of Massachusetts, the Massachusetts Maritime Academy, Salem State College, Northeastern University, the New Bedford Public School System, the New England Aquarium, and the State's Metropolitan District Commission (MDC) for the Boston area. MIT, one of the original Land Grant Colleges, was designated a Sea Grant College by the Secretary of Commerce in December 1976. We are very proud of this designation and take seriously our responsibilities attendant thereto.

In this context, I want to talk about some of the special or unique characteristics that I believe make Sea Grant different. What does Sea Grant do that other programs can't or don't do? I have identified eight such characteristics that I consider especially important. These are: the integrated total system of research, education and advisory activities which provide a continuity of project efforts; the ability to take on high risk projects; the linkage of university education to real world problems; early application of results; the credibility of university research; the quick response and new initiative capability; the advisory bridge; and the educational mandate.

To illustrate or emphasize each of these important Sea Grant characteristics, I will cite a few of the many project examples and results from the MIT Sea Grant College Program.

INTEGRATED SYSTEM AND PROJECT CONTINUITY

First, Sea Grant is a total system; it is not just research or education or advisory services. The Program is the sum of all these efforts, integrated and coordinated to make research relevant useful and workable at the local level, thereby also achieving maximum responsiveness and effectiveness regionally and nationally. Sea Grant can also draw on the resources and expertise of other schools, both in and outside the Sea Grant network. As a result of this, the total program is the sum of many diverse and mutually strengthening parts.

In addition, every Sea Grant Program uniquely provides a continuity of effort that extends the effective life of a project well beyond the original research or study effort. While there are many spin-offs to our educational activities, it is principally Sea Grant's public service advisory staff that pick up the project results, translate and communicate them to users, and continue working with users to assure the successful application of results.

To illustrate this, I cite our 1975 project to develop a side trawler hook-up block. The hook-up block secures the net cables to the stern of the fishing boat so the ship can maneuver while towing the net. The antique device in general use today is heavy and dangerous to use. It has injured and crippled many fishermen. Our block, a double acting, snap-on device is released remotely and safely. The boats that are using it think it is great. Joe Novello and his crew out of Gloucester say they won't fish without this block. They have had one in continuous use for five years. Because we have a total program and continuing interest, we have kept working to introduce this idea at every chance we get; directly with fisherman, at Fish Expo, at local meetings, anywhere we can. We are making special efforts right now to get major marine insurers to endorse the use of the block through a premium benefit to the boat. We have some positive indications from two companies and are pursuing these.

Through our efforts, we have introduced the block to the U.S. Coast Guard for use on lifeboat falls. The Coast Guard has had a modified block at sea, testing it on the 210 ft. Cutter ALERT for use with their new, inflatable boat which is replacing the existing heavy motor whale boat. Our hook-up block allows a single point lift, quick connect and remotely controlled, instant, safe disconnect. The new inflatable boats were selected by the Coast Guard for use in the fisheries patrol for greater ease of handling alongside fishing vessels. The successful initial tests of the block indicate that this concept, configured to the Coast Guard's requirements, will be the answer to their problem. We are continuing to work with the Coast Guard toward the successful adaptation of the block.

In any other R&D program, this novel, safe, effective device would have probably ended with a research report.

Another example is the all steel, streamlined trawl door that we developed from a Naval Architecture and Marine Engineering Master's Degree thesis. This door is now commercially available from Boston's Wharf Forging and Welding Co. who provided matching support to our Sea Grant project. The trawl door is the device that spreads the net, holds it open, while it is being towed. Our streamlined door greatly reduces the drag, the resistance of the net system, while providing the same opening force as the conventional flat doors. This means reductions in fuel consumption while towing, a direct benefit to the fisherman.

We optimized the door for drag reduction based on model tests, which resulted in the initial towing bracket placement tending to make the full sized doors trip over too soon in a cross current or in a turn. Flat doors, all doors, trip at some operating point.

MIT Advisory Service people have, with the Massachusetts Maritime Academy fisheries training staff, run extensive field tests with our quarter scale model doors to determine the optimum towing bracket adjustments for minimum drag and maximum stability. We have taken underwater TV tapes of these doors under many

operating conditions. The tripping problem appears to be solved. The bracket design derived from this field testing will be installed and tested on a set of full sized doors that Wharf Forging is modifying.

The final bracket adjustments is a trade off between minimum drag and maximum stability for the streamlined door. However the drag will still be much less than that of a flat door. There will still be a potential fuel savings of about 15 to 20% when trawling with the modified streamlined doors. In these days of soaring fuel costs, this will be a major benefit.

Two additional benefits of this continued advisory service effort will be, first, the edited TV tapes. These will be narrated and used to show fishermen how changes in door attachments affect operation and how to adjust their doors to operate most effectively. An educational spin-off example. Second, we have been working with Wharf Forging to develop a streamlined steel door for mid-water trawls.

Again, if the original research had not been under Sea Grant, there would have been no dedicated, directed effort toward making this innovative concept work. Without Sea Grant, it would have been a great thesis idea and it might have ended there.

HIGH RISK ACCEPTABLE

A second important characteristic, Sea Grant can and should take on high risk, applied research. A university is expected to advance all frontiers of knowledge, and here failure of research or negative results are part of the education process and thereby produce positive benefits. Industry and government laboratories are profit and performance oriented, where failure usually receives a bad mark. High risk research usually means high returns when successful. In the university environment, the benefits derived through the educational process alone justify Sea Grant support for high-risk research and those few projects that are then successful become an added benefit to the National Program.

A current example is our chitin and chitosan research. Chitin is a long chain polymer similar to cellulose found in the shells of crabs, shrimp, lobster, insects such as beetles, and in many fungi and plankton. Chitosan is a chemically active derivative of chitin having a strong positive charge. Sea Grant's interest in chitin and chitosan began at the University of Washington about 1972 because shellfish processors had a serious waste disposal problem to which Washington Sea Grant responded. Since then, various complementary efforts of the material research have been initiated by other Sea Grant programs. At MIT, for example, we are looking for innovative industrial applications for this marine waste, to turn it into a resource. Industry looks at it in a "chicken and egg" fashion—i.e., show them the market and industry will produce the material at the right price. Or, show them the material at the right price, and they will use it. Sea Grant can and has stepped in to break this stand-off. Sophisticated research is investigating a wide range of potential uses—in the medical field, for water purification, for edible food wrappings, as a bonding agent, and as a matrix for engineered foods.

In his Sea Grant research, Professor Averbach has analyzed the molecular structure of these materials, developed procedures to produce uniform and consistent quality extracts, and has developed the techniques to produce clear plastic films of chitosan. Because of the strong positive chemical charge, chitosan has the ability to remove heavy metals and radioactive particles from very dilute solutions of both fresh and salt water. These films have also proved to have near zero gas permeability giving them excellent potential for food wrappings. For example, the material is being investigated for use as sausage casings.

In MIT's Department of Nutrition and Food Science we are studying the use of chitin as a matrix in which to engineer or fabricate foods. This technique will permit us to use protein extracts, minced fish flesh, and both natural and synthetic flavors to duplicate natural food forms, ones that are readily acceptable by custom or tradition. This will let us utilize unused species of fish and the edible wastes now lost by standard fish processing techniques.

Another good example of high risk research is development of a dogfish skinning machine. Dogfish shark represents a major potential fishery resource with an excellent export market. Today, no machine exists that will process dogfish to export standards so that presently all such processing is by high cost hand labor. Food processing machinery companies seem to be reluctant to invest because the machinery market may be limited, the cost of development is very high, and the probability of success very low.

In 1976, at the request of fishing and fish processing interests in New England, MIT Sea Grant agreed to organize a project team and try to come up with some new ideas. We looked into a variety of techniques but it was Professor Wilson, a mechanical engineering design professor who, after watching and studying the fishing

and skinning process, decided the answer was to mechanically duplicate the hand skinning operation. Now, after two and a half years, the Professor and his students have a prototype machine—not a production unit—a design concept in metal that works. It takes whole dogfish of varying sizes, cuts off the tail and fins, slits the belly flap, peels off the skin, and drops off the carcass ready for the head to be cut off. The belly flap is then processed separately. The peeled body is ready to be cleaned and frozen. Our machine is designed to handle 6 to 10 fish a minute—a finished production machine could easily double or even triple this rate. A production version of this machine should be able to process about 25 to 30 thousand pounds per 8 hour work shift; the work equivalent of about five expert hand skimmers. Lower processing costs will permit an increased ex-vessel price to the fishermen.

We know from the many and frequent expressions of interest from machinery manufacturers and fish processors that this machine is needed. We have received calls from all over the U.S. and Canada wanting information about this unit: When will we finish? How can they get one? Jointly with the National Marine Fisheries Service, we plan to put on an industry demonstration in March. We want to put our prototype unit in a processing plant this spring and summer to get real operating experience, to debug the unit, and to let the machinery manufacturers witness the operation. I believe that a machinery company will be able to take this design and have a production machine for general industry use in about a year.

This is also an excellent example of how the patent provision change I recommended earlier would accelerate the final development and availability of production equipment to the fishing industry. After we apply for the patent, we must wait for the Commerce Department to decide where to assign the title, and only then can negotiations with the manufacturers regarding licensing and production begin. This could result in additional delay of many months.

EDUCATION LINKAGE TO THE REAL WORLD

As a third attribute, Sea Grant brings the real world into the education process by using students and faculty to study and resolve current problems; to learn by doing. There are or have been several such projects in MIT's Sea Grant Program, I will cite two important current examples.

Professor Quinlan and a team of students and faculty from MIT and Northeastern University are working with the Metropolitan District Commission's Division of Environmental Quality Engineering to try to understand and overcome the brown algae that inundate Nahant Bay beaches every summer. These algae create a thick foul smelling mass on the Nahant, Lynn and Swampscott beaches. This is not a new problem; records show that the problem goes back for at least fifty years and that it seems to be getting worse. The research team is studying the algae itself; its life cycle, reproduction, and nutritional needs to find out why it is so dense in this area and to determine if it can be controlled. The team is modeling the Bay area circulation to better understand the transport of the plant, under what conditions it accumulates where, and can conditions be changed by any physical modifications. Also, we are working closely with the MDC on the coastal engineering and physical clean-up of the beach areas. Participating students are having an exceptional learning experience through this three year project. They are seeing science and engineering in action. I am sure they will be better mechanical, coastal, and ocean engineers because of it.

Professors Nyhart and Psaraftis have another important team effort with faculty and students working closely with a government and industry advisory committee to develop a deterministic model of the existing and alternative systems for oil spill clean up in the United States. In parallel, they will also develop an optimization model for locating emergency clean-up capability for small to moderate spills. This project evolved from one of our Marine Industry Advisory Service Opportunity Briefs and Workshop sessions that reported on earlier technical work on oil spill containment and collection. After the Workshop, the President of JBF Scientific Inc. cited a need for such models and offered to help develop and support a project—the matching fund concept at work. With this industrial assistance, we obtained the strong endorsement and some financial support (more matching funds), from the Spill Control Association of America. With this Association, industry and Sea Grant support, the work has gained the participation and additional support from both the U.S. Coast Guard and the U.S. Navy. The project team is working jointly with all these supporting interests to assess the current technology and to project the economic costs and regulatory requirements that will achieve the desired level of clean-up capability. Not only are these students working on a real, current engineering, economic, legal, and socio-political issues, they know that their results will

be put to the acid test of use by the sponsoring agencies when the work is completed.

EARLY APPLICATION OF RESULTS

Another unique and special characteristics that Sea Grant offers is the early application of project results. Sea Grant provides an opportunity for the user community to work directly with the researchers, both to provide valuable input data and also to better understand and apply the products of the research. Our project to study and model saltwater intrusion into island and coastal freshwater aquifers is an important example of this. Professor Wilson has developed a mathematical model, based on U.S. Geological Survey test well data, to predict the rate and extent of seawater intrusion into Martha's Vineyard's fresh water supply. He is working closely with the Martha's Vineyard Development Commission managers so they will be able to use his model to effectively plan and control future Island development. This is also an example of research and local advisory services working together.

RESEARCH CREDIBILITY

A Sea Grant team often provides credible, objective, and acceptable assessments of highly polarized, socio-political issues. Professor Kildow's, Boston Harbor Management Project is a excellent, ongoing example. This project is a direct response by the MIT Sea Grant Program as well as numerous other members of the Massachusetts community to local initiatives demanding better utilization and management of the excellent potentials of Boston's historic and valuable harbor. The project team is interacting with the Massachusetts Legislature to provide the data, interpretation, and recommendations which will contribute to a legislative effort to implement new strategies for better harbor use and management by June 1981. The project will not attempt to produce a general plan for Boston Harbor, but rather to clarify the current issues and potential trends which could cause problems in the harbor area and to recommend strategies and mechanisms to alleviate the problems or facilitate their resolution. The newly authorized Boston Harbor Development Commission will have this study for background information and baseline data for their future efforts.

QUICK RESPONSE AND NEW INITIATIVES

Quick response and seed funding to develop new ideas are two important characteristics that provide a special flexibility to Sea Grant operations. The MIT Sea Grant Georges Bank Petroleum Study to assess both the economic and environmental impacts of potential Georges Bank petroleum development on New England was initiated in response to a need and request from two regional commissions. Early planning for the Nahant Bay study of the brown algae, was initiated in response to needs identified by public interests, the City of Lynn, and the MDC. Professor Milgram's valuable analysis and report of the *Argo Merchant* sinking is another example of quick response funds at work. Perhaps MIT Sea Grant's most dramatic and potentially most far reaching seed project is the irradiation and pasteurization of sewage sludge with high energy electrons. This concept is an entirely new approach to sewage disposal that seeks to turn the waste into a resource. A small laboratory feasibility and demonstration project was initiated in midyear with Sea Grant seed funds. In only 18 months and for about \$25,000 this project provided the background data and basis for a \$750,000 full scale test operation funded by the National Science Foundation and EPA at the MDC's Deer Island Sewage Treatment Plant. This proven system is now approved for implementation as part of a new sewage treatment facility for the Miami Dade Water and Sewer Authority.

ADVISORY BRIDGE

Sea Grant provides the means for the application of basic science and high technology to current practical problems and needs. Sea Grant is the bridge to the user. The most effective means for creating and utilizing this bridge is the professional assistance provided to all levels of marine industrial and business interests, to state and local governments, and to citizen groups and individuals.

MIT Sea Grant has developed a unique Marine Industry Advisory Service (MIDAS) as a linkage to marine industries. Through MIDAS we have transmitted research results that are being applied to offshore structures to reduce vibrational or fatigue stress and to make structures both safer and longer lived. Last November the MIDAS Collegium workshop on unmanned, underwater vehicles focused on systems to reduce the hazard of deep undersea work operations. This meeting attracted 75 experts representing 23 industrial concerns, the U.S. Geological Survey, the U.S. Coast Guard, five Navy laboratories, and university researchers from the University of New Hampshire, Scripps Oceanographic Institution, Louisiana State

University, Woods Hole Oceanographic Institution, as well as MIT. From another MIDAS Opportunity Brief, MIT Sea Grant's wave energy project results are being used right now by the Sea Energy Corporation in their R&D efforts to economically harness wave energy.

MIT Sea Grant has originated and now publishes a national newsletter entitled, "Research in Ocean Engineering: University Sources and Resources." This is supported by the NOAA Office of Ocean Engineering and by Sea Grant. The newsletter uniquely reports on current ongoing research, not just at MIT but throughout the Sea Grant network. The response to this publication has been amazing. For example, within two weeks of distribution of the winter issue, Dr. Duedall of New York's Stoneybrook Campus began to receive calls and letters requesting information about his work on "Coal Wastes to Artificial Reefs." In just the first month he reports he has received dozens of serious inquiries from across the United States and Canada. I believe this clearly demonstrates the need and desire of industry for information and the opportunity for Sea Grant to respond.

MIT Sea Grant also focuses on the two-way transfer of information and professional assistance to our state and regional user audiences through our Massachusetts Marine Liaison Service and our two joint advisory projects; one with the University of Massachusetts Cooperative Extension Service and one with the Massachusetts Maritime Academy (MMA). We are very proud of our successful joint efforts with MMA to develop and provide a training and education program for commercial and recreational fishermen and for recreational boaters. The courses in this program now include navigation, seamanship, engine operation and maintenance, electrical systems, hydraulics, net maintenance and construction, and business records. The MMA courses are taught jointly by Academy faculty and marine professionals. I recently visited the bottom trawl workshop and talked to several of the fishermen. I was greatly impressed by the comments of a New Bedford fisherman with over 30 years of fishing experience. He stated he had now learned, for the first time, the proper way of laying out and mending nets, and that this would save him a lot of time and money. Another fisherman from Martha's Vineyard commented that he had taken other courses offered by MMA and MIT Sea Grant, and he thought every one was excellent. At one of these, the hydraulics course, he learned enough to install hydraulic equipment on his boat himself and that had saved him hundreds of dollars. There are many, many more examples like these two.

This type of professional service has proved so valuable and the demand great enough that Mr. Ralph Goodno, our Extension Sea Grant Advisory Agent for the North Shore has developed a similar training program in cooperation with the Essex Agricultural and Technical Institute at Hathorne. Building his program on the successful MMA model and using some of the same course materials, Mr. Goodno's first course offering on "Net Mending" attracted 34 participants, both full time and part time fishermen, mostly from the Gloucester and Boston areas but also one from as far away as Cape Cod.

In addition our Marine Liaison and Extension Sea Grant specialists have been working with the State Office of Coastal Zone Management, using the MIT Sea Grant Massachusetts Bay Model to evaluate potential sewage outfall locations in the Bay. Mr. Andrew Gutman, our coastal engineering specialist, worked with Nantucket authorities to develop a survey of shoreline erosion and ascertain trends that have occurred since 1846. A reference report of the survey has been published and will be a guide for building regulations and future developments on the Island.

EDUCATIONAL MANDATE

The last but not least important special characteristic of Sea Grant that I want to mention is the Program's special mandate and opportunity to contribute to the full range of educational processes, from kindergarten through college and to the continuing and professional education for adults.

MIT Sea Grant is involved in the full range of educational efforts. We are helping the New Bedford Public School System and its Sea Lab to develop teaching modules that will introduce the marine and water element into their regular secondary and high school curricula. This effort has the endorsement and support of the Massachusetts Department of Education and earned for New Bedford a Title IV-C Grant to expand this effort and build on the activities originated by Sea Grant.

At the college level in addition to the MIT curriculum developments, we have just this spring term brought to fruition an inter-institutional consortium offering of a new subject, an introduction to marine studies. Responding to the strong interest and participation, including matching funds, of 18 colleges and universities in the greater Boston area and in cooperation with the New England Aquarium, MIT Sea Grant is providing the coordination and partial funding to present this new course,

"Into the Ocean World". It will introduce the many disciplines that touch upon the sea: maritime history, marine sciences, marine politics and economics, marine arts and literature. Team taught by experts in these fields, students will learn of the many perspectives needed to understand the marine environment. Individually the member schools could not afford to develop and offer such a course, but collectively the consortium has created a needed cost-effective educational opportunity. The student interest level is high and we project that after one more year, this course will become self-sustaining. Some of the consortium members are already looking toward opportunities to develop similar joint courses in the future.

SUMMARY

Mr. Chairman and members of the Sub-Committee this has been a rather lengthy overview. I could go on with many more examples and in much more detail.

In quick summary, I want to thank each of you and the entire Congress for the creation of the National Sea Grant College Program and for sustaining this national asset to date. I am pleading for your increased support so that the Program can achieve its full potential for success.

I have asked that you make four changes in the Act that I believe will make Sea Grant even more effective.

I have tried to describe some of the unique or special features of the National Sea Grant College Program, with examples from MIT's Program, in an effort to demonstrate the value of Sea Grant to the nation and to justify the Act extension and program expansion I have recommended.

Mr. Chairman, I thank you for your time and this opportunity. I will be pleased to respond to the Committee's questions.

Enclosure: Attachment A.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY,
SEA GRANT PROGRAM,
Cambridge, Mass., January 23, 1980.

EDITOR,
Science Magazine,
Washington, D.C.

DEAR SIR/MADAM: I want to offer a constructive criticism of the outstanding article, "Research, Innovation, and University-Industry Linkages" by Denis J. Prager and Gilbert S. Omenn in 25 January 1980 issue of *Science*, pp 379-384. The authors have made a thorough, thoughtful, and balanced presentation of the crucial national needs, the many opportunities, and the serious impediments that control the establishment of university-industry R&D linkages. They suggest several actions or initiatives that the federal government can and should take in order to develop and enhance these vital linkages. They cite several exciting examples of successful industry-university cooperation. However, the writers failed to cite and draw on the experience of the most effective, successful, on-going joint university-industry-government R&D program, one that is the perfect model for the activities and actions they propose. I am referring to the National Sea Grant College Program, of the National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

The National Sea Grant College Program, initiated by the 89th Congress under Public Law 89-688, Title II, was the vision of and is the monument to such far sighted individuals as Dr. Athelstan Spilhaus, Dr. John Knauss, Senator Claiborne Pell and Florida Congressman Paul Rogers. Sea Grant has grown from the germ of an idea in 1966 to a major national program that utilizes the reservoir of talent and expertise available in our nation's universities toward the proper and environmentally sound development and utilization of this country's marine resources for the economic benefit of everyone. The original Act stressed the need to build strong industry-university ties in effective joint R&D. Today, thanks to the continued interest, close oversight, and increasing support by the U.S. Congress, the National Sea Grant College Program is a mutually supported, university based program doing for marine industries and businesses exactly what the authors propose to start doing on a general, nationwide basis.

To state the point dramatically, if the authors had used the term "marine industry" throughout the article, they would be talking about the National Sea Grant College Program.

I strongly urge all who are interested in and dedicated to developing strong university-industry linkages to study and learn from the experience of the National Sea Grant College Program. Twenty-eight major, successful university based Sea Grant Programs now exist; from Maine to Hawaii, Alaska to Florida and the Great Lakes states between. It is not necessary to re-invent the wheel. By expanding,

strengthening, and broadening the Sea Grant concept and principles, the existing university base can provide the model and spring-board for the general national industry-university linkage recommended by the authors.

Sincerely yours,

DEAN A. HORN,
Director.

Mr. STUDDS. There are 2 minutes between the expiration of your time and the second bells approximately. We have a vote.

I cannot resist asking you, first of all, to not sell the darn thing to the Canadians.

Second, what would happen if it turns out to be a major breakthrough in processing technology and would be of commercial value. Who reaps the commercial benefits from such a discovery?

Mr. HORN. That is one of the elements in my written testimony, Mr. Chairman.

Under the Sea Grant Act we are required to file a patent application. That process is going on right now and the patent application will be filed before a public demonstration is made. That is one of the things that controls the demonstration date.

After the application is filed, then we will apply to the Department of Commerce for the patent assignment to MIT. It is up to the Department of Commerce to assign it wherever they want to. If it comes to MIT, we will then license a manufacturer under the rules of the Department of Commerce for a maximum of 5 years I believe; exclusive license to any one manufacturer.

Mr. STUDDS. Would the profits be accruing to MIT?

Mr. HORN. The profits would accrue to MIT as any other Government sponsored patent that is assigned that way. It would go to the MIT research program.

Mr. STUDDS. Where are you having your demonstration?

Mr. HORN. It will be at MIT.

Mr. STUDDS. What a shame. The middle of Cambridge?

Mr. HORN. Well, it is a little hard to haul a machine out there. I think that is a delightful place.

Mr. STUDDS. The Speaker of the House—

Mr. HORN. It would be great to have some of the fishermen come up there and see that we know how to tie our shoes, Mr. Congressman.

Mr. STUDDS. If you have any kind of a dialog between fishermen and faculty at MIT, you have achieved one of the eight wonders of the world anyway.

I know you knew that was my concern. I appreciate your testimony.

We will pause for exactly 10 minutes and we will be right back. I apologize. There is yet another vote.

[Short recess.]

Mr. STUDDS. The participants and the timekeeper are in place.

Dr. Sullivan from the University of California.

Dr. SULLIVAN. Thank you, Mr. Chairman.

My name is James Sullivan. I am the director of the California sea grant college program. This is a 14 campus, public and private, intercampus effort involving approximately 450 individuals throughout the State.

I am also delighted to be here, and in some sense, I guess, humbly, as the unofficial representative of the Pacific States, even

though I would not presume to speak for them. And as my flanking colleagues here recognize, we are from the leading edge of the continent.

Mr. STUDDS. I am not going to say anything on your time.

Dr. SULLIVAN. The national sea grant college program has as its primary goal the accelerated development and wide use of ocean and coastal resources. It is an action oriented, interdisciplinary program, which seeks to link the efforts of universities, industries and government in a new and cooperative fashion through application-oriented research activities, the professional and vocational training of manpower, and the effective prompt dissemination of research results.

As evidenced by the inter-university nature of the California sea grant college program, a cooperative, productive and active network of the State's institutions of higher education now spans the 1,100-mile California coastline, a distance equal to that from Marblehead, Mass., to Savannah, Ga. I strongly believe that solid linkages have been established between this network and marine-related industries, State and Federal agencies with ocean management responsibilities, a large community of users, and the public in a manner unprecedented in the State's history.

These are detailed in considerable length in my written statement which I have submitted to the committee.

In response to the chairman's request for a description of the type of projects sea grant supports, I have also submitted for the record the attached document entitled "The California Sea Grant College Program: A Summary of Benefits." It describes some recent projects of our program and outlines some of the economic, social, and environmental benefits that have been realized through sea grant supported research, education, and advisory services in California.

In my view, sea grant's success in addressing the important coastal and ocean problems and opportunities of this country, when measured against the financial resources available to it over the years, has been extraordinary.

On the question of continued effectiveness and future direction of sea grant, however, I am less than optimistic. In October of 1977, when I testified before this committee's oversight hearings on sea grant, I commented:

Unfortunately, our research efforts today are actually less than the 1973 level. Needed research is either underfunded or not funded at all. And, if my understanding is correct, our experience is not atypical. My contention is that the loss of practical and pragmatic research results hurts the advisory service's efforts and, more importantly, is at the expense of the potential users of the new information. The increased funds for 1978 hold out a hope that we can quickly move to bring our research effort closer to the level needed for the serious and numerous needs of our society which can be competently and productively met by Sea Grant.

Unfortunately, Mr. Chairman, the record since 1977 reflects a continuing decline in the percentage of the national program's resources that go into research and, ultimately, into application through a now greatly expanded advisory service's staff nationwide.

It has declined from 1976 to 1979 over 6 percentage points. The situation is even made worse by the fact that the dollar increases for practical research activities each year fail to cover inflationary

costs. So, for two reasons, redistribution of resources and decreased purchasing power, badly needed research endeavors are either underfunded or not funded at all.

Within the California program, the situation is as bad as, if not worse than, the national figures indicate. Unfortunately, our research effort is still below the 1973 level, even though in dollar terms, the advisory service activity has increased from 9 to 25 percent of the program.

As I understand it, our situation is comparable to that of other sea grant colleges, which also have been severely constrained to facilitate the establishment and growth of new sea grant programs. This strategy has clearly and seriously affected these institutions, ones which have made substantial tangible commitments of their own resources and have been recognized for their leadership and productivity by the award of sea grant college status. Certainly, the financial constraints hurt these institutions and hamper their productivity. But the real victim is the ultimate user, not the research, advisory or education activities.

I submit that we face a real crisis, not simply a fiscal nor one only of foregone opportunities, but a crisis of confidence. Expectations have been heightened in the users of sea grant results and in the institutions and their staffs who hope to make substantial contributions to ocean and coastal resource development and use.

As resource allocation issues become more critical for educational institutions and alternative opportunities for funding become more attractive to their staffs, serious questions arise about the continually inadequate support from the national program for its sea grant colleges.

In summary, Mr. Chairman, I have touched in my written testimony directly and indirectly on several recommendations. I would just like to summarize three now.

I recommend that the level of authorization be raised and that funding for the research component of the core sea grant program be increased by \$8 million over each of the next 2 years to redress the serious imbalance of the present that has resulted from both the distributional and inflationary effects.

Second: Except for a cost of living adjustment, the advisory, education and management components be held to current levels nationally also for the next 2 years, and that the national office be asked simultaneously to review and evaluate its efforts in these areas with the goal of attaining increased effectiveness and efficiency of operations through redistribution and/or consolidation of effort as needed to attain this goal.

Thank you, Mr. Chairman, for this opportunity to assist the committee, and I am more than happy to answer any of your questions.

Mr. STUDDS. Well done. Were you watching your watch? You are precisely 5 minutes.

Dr. SULLIVAN. Thank you.

[The following was received for the record:]

STATEMENT OF JAMES J. SULLIVAN, DIRECTOR, CALIFORNIA SEA GRANT COLLEGE PROGRAM

Mr. Chairman and members of the committee, I appreciate this opportunity to comment on the National Sea Grant College Program and to report on California Sea Grant College activities. I know how seriously the committee takes its authorization and oversight responsibilities, and I am pleased to be of assistance to you.

I am the Director of the California Sea Grant College Program—an interuniversity effort involving seven University of California campuses; Humboldt, San Diego, and San Jose State Universities; Moss Landing Marine Laboratories (which is a consortium of six State Universities and Colleges); the California Institute of Technology; and the California Academy of Sciences.

Before proceeding to the specific questions the Chairman has raised, I believe it will be helpful to the Committee if I provide some background for my comments.

The National Sea Grant College Program, as I understand it, has as its primary goal the accelerated development and wise use of ocean and coastal resources. It is an action-oriented, interdisciplinary program, which seeks to link the efforts of universities, industries, and government in a new and cooperative fashion through application-oriented research activities, the professional and vocational training of manpower, and the effective, prompt dissemination of research results.

Because of the importance of the Sea Grant College Program to the University of California, management responsibility for the Program is fixed in the Office of the President of the University. As the primary academic research unit for the State and one of a limited number of national research universities, the University of California must be concerned with national as well as state needs. With the history of international oceanographic operations of its Scripps Institution of Oceanography (and, nearer to home, Scripps' long-term cooperative programs with Mexican institutions), and the worldwide research endeavors of many of its other faculties, the University is naturally interested and actively involved in international research and education. The basic nature of the university, its commitment to make its expertise more readily available for the solution of contemporary problems, and the National Sea Grant College Program framework have guided us in developing the California Sea Grant College Program.

Now let me turn to some specifics. The Chairman has inquired about the effectiveness of Sea Grant interactions with government, industry, and the community of users and how this interaction takes place.

As evidenced by the interuniversity nature of the California Sea Grant College Program, a cooperative, productive, an active network of the state's institutions of higher education now spans the 1100-mile California coastline—a distance equal to that from Marblehead, Massachusetts, to Savannah, Georgia. I strongly believe that solid linkages have been established between this network and marine-related industries, state and federal agencies with ocean management responsibilities, a large community of users, and the public in a manner unprecedented in the state's history.

When, for example, the California legislature re-enacted the Sea Grant matching funds bill in 1978 for another five years, the legislation continued the committee to advise the Secretary of the Resources Agency on the use of these state matching funds. This committee includes representatives from the California Coastal Commission, Department of Fish and Game, Department of Conservation, State Lands Commission, Department of Boating and Waterways, the fish industry, the aquaculture industry, the ocean engineering industry, and public and private higher education.

The Council that advises the University President on Sea Grant matters is composed of 15 members drawn from government, industry, and the public, and 15 members from California universities. We have been designated by the University President as the liaison to the National Marine Fisheries Service on fisheries management matters for the Pacific Fisheries Management Council. The Seafood and Aquaculture Industry Advisory Committees provide advice and counsel in selected program areas. Our squid fishery development and abalone enhancement projects are jointly directed by university faculty members and staff members from the Department of Fish and Game. The wider community and consumers are involved through townhall meetings, workshops, and training sessions conducted by advisory services staff and others.

Through such institutional mechanisms as these and person-to-person interactions, each Sea Grant program chooses those participatory processes that are most effective in making its services and products known and available to users and potential users. Very simply, this network of higher educational institutions and its

linkages to industry, government, and the public would not exist in California except for Sea Grant.

In response to the Chairman's request for a description of the type of projects Sea Grant supports, I have submitted for the record the attached document: "The California Sea Grant College Program: A Summary of Benefits." It describes some recent projects of our program and outlines some of the economic, social, and environmental benefits that have been realized through Sea Grant-supported research, education, and advisory services in California. This document, I believe, substantiates the validity of the concept that underlies Sea Grant: that cooperation and collaboration among universities, industries, and government can be institutionalized for the benefit of those who use, manage, or simply enjoy our nation's marine resources. In fact, Sea Grant's unique ability to act as a catalyst in spurring and sustaining such collaborative efforts has been its hallmark. In my view, Sea Grant's success in addressing the important coastal and ocean problems and opportunities of this country, when measured against the financial resources available to it over the years, has been extraordinary.

To illustrate this point, let me briefly describe a few of our projects. At Scripps Institution of Oceanography, a young research geologist has completed a two-year historical analysis of coastal erosion in San Diego County. His research—which demonstrates that coastal erosion is not a gradual process, as has long been assumed, but is highly episodic, site-specific, and directly related to fluctuations between calm and stormy periods—is of tremendous importance to the state's coastal planners.

Right now, southern California is emerging from a relatively dry period of many years' duration, during which most of the development of coastal areas occurred. Coastal homeowners in northern San Diego County—and elsewhere in California—are now experiencing the tragic consequences of development based on false assumptions as their property has been damaged and destroyed in severe winter storms, such as those of the past few weeks. Local and regional planning groups that must prepare comprehensive local coastal plans by the end of this year are using the research results obtained at Scripps for development of regulations for coastal development that reflect the realities of coastal hazards. The historical and field observation research methodologies developed by this researcher are now being used in northern California, where only limited coastal development has occurred to date.

During the past year alone, the researcher in this project has presented his findings to more than 70 local, regional, and state planning groups. This active, technical advisory work on his part has already resulted in a reassessment of bluff-top setback regulations in San Diego County and revision of them.

In another project, involving researchers from several University of California campuses, Sea Grant has integrated formerly isolated research efforts to discover marine sources of new chemical compounds that have potential for use as pharmaceuticals and in chemical control agents, such as pesticides and insecticides. Through a pharmacological evaluation program established by Sea Grant at UC Santa Barbara, compounds that show promise for development are screened and tested before being submitted for further evaluation and possible product development to several cooperating commercial laboratories.

An entire new universe of pharmaceuticals may be discoverable in the sea, complementing and even exceeding the contributions of the vast array of active substances mankind has learned to elaborate by centuries of investigation of the plants and animals of the land. This comprehensive approach to the exploitation of useful marine products is typical of the kind of effort Sea Grant encourages and supports in California. In this instance, all aspects of research and development of new marine chemical products are being investigated in a coordinated program, involving university and industry-based researchers—from collection of potentially active samples in the field, through the various stages of screening and testing, to further evaluation and, eventually, product development.

In much the same way, Sea Grant has supported crustacean aquaculture research that involves an interdisciplinary team of researchers from several campuses working on all aspects of culture. Our work with lobsters, for example, has included broodstock development, endocrinology, larval biology, pathology, and aquacultural engineering. This work, and that of researchers in other parts of the country as well as Canada, has demonstrated the biological feasibility of lobster culture. We now know, for example, that lobsters can be raised for between two and three dollars per pound, if certain conditions are met. All that remains is for industry to test the economic feasibility of lobster culture on a commercial scale. And that is precisely what is happening now. Two firms, one on the East Coast and one on the West

Coast, are building pilot plants for this purpose. In the latter case, a public utility has joined forces with the aquaculture firm to raise lobsters in thermal effluent on a commercial scale.

Finally, because the national network of Sea Grant programs exists, we have the framework in place for collaboration among researchers and advisory personnel on regional and national problems. This prevents costly duplication of effort and allows a coordinated approach—using the skills and knowledge of the best talents in the region and nation—to solve common problems.

During the past two years the Sea Grant institutions of the Pacific states have been expanding activities of the Pacific Sea Advisory Program. Last year a Pacific marine education workshop was sponsored by PASGAP to encourage exchange of education information, cooperation, collaboration, and state planning on a regional basis. Teams from each Pacific state comprised of a marine education specialist, a teacher, and a public education official participated. Results of the workshop are now being forged into comprehensive plans for increasing the level of marine education in the several states.

Next month PASGAP is supporting a symposium that will focus on useful seaweeds of the warm Pacific and involve researchers from universities and industries in California, Oregon, Washington, Alaska, British Columbia, Hawaii, Guam, and Maine (location of the nation's largest commercial supplier of marine colloids). Participants in the symposium will exchange information developed through research on field and laboratory methods for manipulating potentially useful seaweed crops in the Pacific. Their aim will be to assess these methods and, in cooperation with marine advisory personnel, to transfer the technology and methods to Pacific rim countries that are interested in developing seaweed resources for industry.

I believe these examples of the kind of projects Sea Grant funds in California demonstrate the value and effectiveness of combining application-oriented research, education, and community service to find meaningful solutions to local, regional, national, and even international marine and coastal problems.

On the question of continued effectiveness and future directions of Sea Grant, however, I am less than optimistic.

In October, 1977, when I testified before this committee's oversight hearings on Sea Grant I commented:

Unfortunately, our research efforts today are actually less than the 1973 level. Needed research is either underfunded or not funded at all. And, if my understanding is correct, our experience is not atypical.

Several factors account for this decline but basically, inflation and the need to develop strong advisory programs, within the limited Sea Grant budget are the causes. Some argue that the increase in advisory services has been at the expense of research. I disagree. Sea Grant badly needed to increase its nationwide advisory efforts. My contention is that the loss of practical and pragmatic research results hurts the advisory services' efforts and, more importantly, is at the expense of the potential users of the new information, techniques, and developments that we have had to forego. Identified research needs are fed back by the advisors, but we can only address a few. Expectations have been heightened, but the total capability to meet them is not yet available.

The increased funds for 1978 (fiscal year 1979) hold out a hope that we can quickly move to bring our research effort closer to the level needed for the serious and numerous needs of our society which can be competently and productively met by Sea Grant. In our efforts we must continue to address regional problems because of the partnership nature of Sea Grant, but at the same time, continue to do so in a way that develops a fundamental understanding of the issues and processes involved so that this new understanding will have broad applications to that set of issues and processes—nationally and internationally.

Unfortunately, the record since 1977 reflects a continuing decline in the percentage of the national program's resources that go into research and, ultimately, into application through a now greatly expanded advisory services staff nationwide.

From fiscal year 1976 to fiscal year 1979 the percentage of Sea Grant funding directed toward research declined by more than 6 percentage points: from 56.4 to 50 percent. And the situation is severely exacerbated by the fact that the dollar increases for practical research activities each year fail to cover inflationary costs. So, for two reasons—redistribution of resources and decreased purchasing power—badly-needed research endeavors are either underfunded or not funded at all.

Within the California program, the situation is as bad as, if not worse than, the national figures indicate, which Table 1 shows. Unfortunately, our research effort is still below the 1973 level, while the advisory component has been substantially increased.

TABLE 1.—CALIFORNIA SEA GRANT SUPPORT COMPARISON OF MAJOR PROGRAM AREAS

	1972-73		1979-80	
	Sea grant	Percent of total	Sea grant	Percent of total
Research	\$1,114,215	67	\$1,501,433	53
Advisory	146,937	9	695,999	25
Education	257,033	16	396,734	14
Management	131,815	8	245,834	8
Total	1,650,000	100	2,840,000	100

As I understand it, our situation is comparable to that of other Sea Grant colleges, which also have been severely constrained to facilitate the establishment and growth of new Sea Grant programs. This strategy has clearly and seriously affected these institutions; ones which have made substantial tangible commitments of their own resources and have been recognized for their leadership and productivity by the award of Sea Grant college status. Certainly, the financial constraints hurt these institutions and hamper their productivity. But the real victim is the ultimate user not the research, advisory, or education activities. Simply stated, the rate of development and wise use of ocean and coastal resources will be slowed and opportunities lost or, at best, postponed for some time.

I submit that we face a real crisis—not simply fiscal, nor only of foregone opportunities—but a crisis of confidence. Expectations have been heightened in the users of Sea Grant results and in the institutions and their staffs, who hope to make substantial contributions to ocean and coastal resource development and use. As resource allocation issues become more critical for educational institutions and alternative opportunities for funding become more attractive to their staffs, serious questions arise about the continually inadequate support from the national program for its Sea Grant colleges.

In our case, for the second year in a row we have experienced a decline in manpower (effort), as measured by the number of full time equivalents, in the program. And to make matters worse, of the \$2.84 million received from Sea Grant this year, only \$97,000 is programmed for new equipment. The increased salary costs alone were greater than the increased support we received from the national program. Other costs increased significantly as well. We are very concerned about the future and how to relieve these serious strains building in what we believe is an excellent example of the Sea Grant concept in operation.

In this connection, let me make three points that I believe are crucial to Sea Grant's continued success, if not existence, as a useful program in the future:

Sea Grant attracts highly qualified scientist, engineers, and others;

Sea Grant research spans the range from developing new fundamental understanding to practical application; and

Sea Grant builds on the vast federal investment in more traditional university research.

Table 2 presents a breakdown of grants and contracts received by participants in our program, which supports these three points that are so important for successful university-based programs. It clearly shows the high caliber of scientists we attract as measured by the standard indicators, the spectrum of research endeavors by source of funds, and the amount of other effort—that beyond the tip of the iceberg—which Sea Grant builds on and extends for ultimate application.

TABLE 2.—CALIFORNIA SEA GRANT PARTICIPANTS OTHER CURRENT RESEARCH SUPPORT 1979-80

Agency	Number of projects	1979-80 (in millions)
National Science Foundation	44	4.8
National Institutes of Health	6	.3
Office of Naval Research	7	2.9
Other Federal	12	2.1
State	17	1.0
Private industry, etc.	8	.2

Another keystone of success over the longer term will be the explicit recognition that, in most instances, meaningful research results and successful application of them requires time as well as adequate support. Too short a time horizon forces site-specific or problem-specific solutions, which later can be classified as "band-aid" approaches or result in reinventing the wheel in different regions or over time. It is much better to take a more measured, rather than expedient, approach so that we develop a fundamental new understanding, applicable to entire classes of problems, wherever they may occur, as well as seize the immediate opportunity or solve a pressing problem.

Such an approach requires patience and commitment. Yet, with adequate support, we can take the longer view and provide a substantial commitment when the potential payoff calls for it, while preserving the characteristic flexibility and action-orientation for which Sea Grant is noted.

As to specific recommendations for the future, I have touched on several through-out my comments, either directly or indirectly, and I will briefly summarize.

In order to build on the network of universities and linkages to the user communities already in place and the high quality and productive participants presently in the program, I recommend that:

The level of authorization be raised and that funding for the research component of the core Sea Grant Program be increased by \$8 million over each of the next two years to redress the serious imbalance of the present;

Except for cost of living adjustments, the advisory, education, and management components be held to current levels, nationally also for the next two years; and

The national office be asked, simultaneously, to review and evaluate its efforts in these areas with the goal of attaining increased effectiveness and efficiency of operations through redistribution and/or consolidation of effort, as needed, to attain this goal.

I would be happy to answer your questions.

Mr. STUDDS. I particularly apologize, although I have to confess to you that somebody in my own profession does get sort of a cold delight watching other people finding themselves in a situation that we are in all the time, that is, to have someone put a television camera on you, and ask you to answer what the major problems of the United States are in 25 seconds.

Doctor Donald Squires, of the State University of New York.

Dr. SQUIRES. My name is Donald Squires. I am director of the New York Sea Grant Institute, which is an extension of the sea grant college in New York State, the State University of New York's system, the largest educational system in the country, and Cornell University, the land grant college in the State.

We were the first State to have a multiinstitutional sea grant college, we are the only State thus far that has to embrace in its activities both marine coasts, Long Island, New York City, and the Great Lakes, Lake Ontario and eastern Lake Erie, St. Lawrence River.

In my prepared statement I have outlined, at some length, a research program which I believe exemplified the strengths of sea grant. I shall not go into it further than to say that it deals with the very difficult problem of the provision of sand and gravel for the metropolitan region of New York. Sand and gravel is a very prosaic mineral. Yet it is in New York one of the critical elements in the construction industry costs.

New York City pays at least twice for each cubic yard of sand and gravel what Philadelphia or Boston pay. There is a scarcity: It is growing, it has become quite critical over the last 3 years. Working closely with State agencies and the industry, we have been able to resolve the environmental conflicts that brought the mining of sand from the lower harbor of New York to a halt.

A long-term management program has been developed, which meets at least the preliminary needs of State and Federal agencies. We have assisted the private sector in adjusting to an offshore supply, even when that sector is traditionally supplied sand and gravel from terrestrial sources, and will, in essence, be in competition with itself. We have, with economic models, been able to work with each supplier, showing them what kind of mix of sources to anticipate for the future.

The mining of sand in the harbor has opened a new dimension, which is equally important to the State and to the city. That is the disposal of dredge spoils. Contaminated dredge spoils plague harbors all over the country.

The Port Authority of New York and New Jersey has just announced that it will not be able to accept the few remaining major passenger vessels that call at the Port of New York because the passenger ship terminal has silted in, and it is no longer possible for them to dock there. It is a critical issue not only in New York but in every major port in the country.

We have now been able to develop an innovative idea of disposing of contaminated spoils in the burrow pits, or the holes created by the mining of sand and gravel.

Up to now, sea grant has been the sole source of support for this research. Now, we have been joined by the Maritime Administration, and by the State, by the Corps of Engineers, by the Port of New York and New Jersey Authority, and others, in carrying out the disposal tests to see if this idea is in fact feasible.

The point I want to make by that example, Mr. Chairman, is that sea grant gains strength in its program because it is, in essence, a local program. By being able to mix effectively State and local funds, by being present on the scene, and being able to converse with the affected agencies and individuals and constituencies, we are able to respond to needs, and to have the flexibility to carry out programs that are otherwise impossible.

We are also, as has been mentioned earlier, in testimony, able to carry out very high risk programs. When the idea of underwater landfills was first suggested, every Federal agency said it was impossible. None of them would provide any funds in support of the investigation of the idea. Sea grant was able to move ahead with this.

I think it is very critical that we retain and strengthen the local support—the local guidance of the sea grant programs.

Staff had asked me to also look at some of the problems associated with sea grant. Very briefly, I would like to say that the major problems that we in New York face, is that we have been, in large part, living off the capital accumulated in the University community over the last 100 years, particularly in the land grant system. We are using agricultural funds to subsidize sea grant.

In the budget tightening that is going on right now—and I might call attention to the fact that Governor Carey's budget calls for a cut in the State university system of over \$30 million, a sum almost equal to the national sea grant budget. With that belt tightening comes a calling in of all the chits in the reserves that we have been using.

The Dean of the College of Agriculture reminded me recently that I have subverted three of his poultry scientists.

Mr. STUDDS. Good for you.

Dr. SQUIRES. To study seafood, and to do seafood technological research. He wants to know where they are going to come up with the money to replace those three scientists, because the poultrymen want them back.

We began, if one goes back to 1965, in John Knauss' statement, in a growth economy with the idea that we could change the interest and dispositions of researchers to marine subjects. We were not going to buy our own. Now that is going to be very, very difficult. We are going to have to be very creative in the years ahead on how we are going to accomplish our tasks with the limited resources that we have.

Mr. STUDDS. Thank you very much.

It is about time you started raiding the agricultural schools, and teach them that fishermen are farmers of the sea. See if you cannot grab a few more away from them.

It is very exciting. What is not exciting is that you can hear that there is another vote on the floor. At least you get to sit here. I do not know if your research funds could come up with a pedometer to see how many miles we walk or run across that street to vote. But I will be back as quickly as I can.

We will be adjourned for 6 or 7 minutes.

[Short recess.]

Mr. STUDDS. Truly one of the best things I did this morning was run 4 miles.

[The following was received for the record:]

STATEMENT OF DONALD F. SQUIRES, DIRECTOR, NEW YORK SEA GRANT INSTITUTE

My name is Donald F. Squires. I am director of the New York Sea Grant Institute of the State University of New York and Cornell University, the Sea Grant College of New York. I have been director of New York's Sea Grant activities since their inception in 1970.

Sea Grant activities in New York span the marine coast of Long Island, New York Harbor—the waterways of the world's busiest port, and the coasts of Lake Erie and Lake Ontario, the easternmost of the Lower Great Lakes. The program involves faculty and students from the state's land-grant college, Cornell University, and from the largest educational system in the country. (SUNY). Our program reaches out still farther to include faculty and students from City University of New York and many of the private colleges and universities in the state. In 1975, State University of New York and Cornell University were designated the eighth Sea Grant college: the first to be multi-institutional.

During the 1978 Sea Grant reauthorization hearings before this Subcommittee, Byron Battle of MIT made some recommendations worthy of repeating:

1. Sea Grant should concentrate in strengthening its unique university-community partnership;
2. Sea Grant should give priority to substantive research areas rather than institution building;
3. Sea Grant should support imaginative projects;
4. Sea Grant should give attention to defining market demand and sectoral needs;
5. Sea Grant should develop active relationships with the private sector.

My testimony will show how New York's Sea Grant activities, in the pattern defined by Battle, are of great importance to the states and the nation.

The story I will relate concerns five years of research sponsored by the Sea Grant Institute on sand mining in New York Harbor and the dramatic turn in this program now leading it in new and important directions. We have accomplished something no other federal, state, or academic program could. This was achieved because of Sea Grant's important, vital, and unique attributes among federal/university programs: Sea Grant has a great deal of flexibility deriving from the

mixing of state and federal funds; it also has the ability to provide continuity of support for projects as they evolve. By placing decision-making at the state level, Sea Grant can achieve goals not possible for other federal programs simply because of its organization, perception, and sensitivity to local issues.

For over 25 years New York Harbor has been a major source of sand for fill and construction work in metropolitan New York and New Jersey. Since 1963, the harbor has been the principal source; by 1985, it may be the only source. Rates of mining have been as high as 19 million cubic yards per year but averaged 3.6 million cubic yards per year between 1950 and 1975, enough to make the harbor the largest sand mine in the country. This rate of mining occurred because the source was close to the need and because inexpensive barge transportation could be used. The resource is becoming increasingly valuable because on-land sources, primarily sand pits on Long Island, are becoming exhausted and housing developments preclude new sites.

By 1973 it was becoming increasingly difficult to obtain harbor mining permits from the New York State Department of Environmental Conservation (DEC) because of pressure from public groups. In 1977 DEC placed a moratorium on new permits pending resolution of questions posed in its policy statement on sand mining in the harbor.

The New York State Office of General Services (OGS), which licenses mining operations and collects royalties from mining operations, is also involved. This agency has a particular interest in continued mining as royalties have provided an income to the state in excess of \$1 million per year.

From a Sea Grant extension specialist, OGS learned of the possible role of Sea Grant in resolving the impasse and in developing a research program to meet the informational needs of the State. At the request of the agencies, Sea Grant sponsored a meeting of federal and state agencies, developed a strategy, and made funds available to researchers to plan a program. In 1976, a full program of research was underway, directly addressing the policy issues raised in the sand mining question. Those were:

1. The effects of mining on water quality, flushing rates and circulation of water in the Lower Harbor in which water quality is already severely degraded.
2. The effect of deepening of the harbor on the already severe rate of erosion on the south shore of Staten Island—a primary source of public opposition to mining.
3. Determination of the impacts of mining on the shellfish and finfish breeding grounds. Many shoal areas of the Lower harbor are intensively fished by hundreds of charter boats and party boats.
4. The quantity and quality of the resource had not been established so that a rate of withdrawal could not be developed.
5. The rate at which the sand mined was replaced by sand transported into the harbor by Longshore currents was unknown. Could the resource be treated as one naturally replenished?
6. The effects of dredging of deep holes in the harbor upon the aquatic life was unknown.

Sea Grant's research plan stressed the need for a management plan for sand mining. This required the development of appropriate tools to answer questions about the environmental effects at a number of sites, under varying conditions. In other words, the studies, to be useful, had to be other than site specific and time dependent. Further, it was clear that more had to be known about the role of this resource in the economy of the metropolitan region for the economics of sand mining and sales would be a factor in any long-term program administered by the State. Accordingly, research after three years had accomplished the following:

1. By means of a finite element, hydrodynamical-numerical model, changes in tidal circulation and tidal elevations resulting from modifications in the bathymetry of the harbor could be assessed. This model allows managers to evaluate the effects of mining at different locations, at different scales, and to different depths, upon circulation and tidal elevation. Results of the research show that, in general, mining operations can change both magnitude and direction of tidal currents. This suggested that potential of using mining operations to improve water quality in the harbor by altering circulation patterns. It was also found that tidal elevations on the south shore of Staten Island could be affected by mining. It is clear that mining operations far from Staten Island at the mouth of the harbor have a greater effect on tidal range (hence on erosion) than do those close to the shore. Examination of model runs on hypothetical mining strategies shows that, in general, it is better to dredge small deep holes than large shallow ones.

2. A wave refraction computer simulation model was developed to test the effects of mining on the distribution of wave energy along the shore to complement the

model described for tidal effects. The changes in bathymetry resulting from mining could act to focus or defocus wave energies on the shore. By simulating mining, it is possible to trace wave rays as they enter the harbor and approach the shore. Used in connection with the first model, a powerful tool for predicting the possible consequences of mining on shore erosion exists.

3. It was determined that mining of deep holes results in pits that accumulate fine-grained, often highly contaminated sediments, and that oxygen levels in the holes are depressed relative to waters around them. The effects are local and confined to the pits.

4. Surveys of resources showed that rates of replenishment are generally less than mean demand in the last decade of mining and that utility of sand transported to the harbor is less than that existing elsewhere in the harbor. Important and significant resources were located, defined in three dimensions, and characterized.

5. It is clear that the physical mining of sand is destructive to shellfish and can be disruptive to fish breeding. By careful siting of mining operations, such impacts can be directed to lesser value resources. This kind of trade-off is precisely that made when environmental considerations are factored into terrestrial mining.

6. There is a feasibility for an extensive market for aggregate materials mined from the harbor—this is the sand and gravel used in construction as concrete. The texture and properties of such material is highly specified according to the nature of the construction. Regional shortages of aggregate materials, now mined on land, are expected by the year 2000, but long before this prices will be astronomical. The price of delivered aggregate doubles each 25 miles if truck transport is used; with diesel fuel costs soaring, this doubling may now be in the range of 15–20 miles. These increasing costs affect all construction, public or private, using concrete.

7. Cost analyses showed that an offshore mining industry was economically viable and would not be jeopardized by fluctuations in annual demand. Potential annual savings realized by the establishment of a least-cost offshore industry over no offshore industry ranged from 35 to 41 percent.

With these, and other results, the federal and state agencies involved are moving toward the development of a long-range managed mining program that will be environmentally acceptable. Through the activities of Sea Grant extension specialists, meetings with the aggregate supply industry have been arranged resulting in concrete expressions of interests in an offshore aggregate mining activity.

Sea Grant research conducted in concert with state and federal agencies is leading to a resolution of conflict, the development of tools for the deliberate management of a resource to have minimal environmental impact, and development of a new industry to participate in the resource utilization—a factor that could have an important role in stabilizing the capital construction costs in the metropolitan area.

But there is more. The inherent flexibility of Sea Grant research, managed at the local level and in concert with the parties concerned—government, industry, and the public—can result in highly creative results. In this instance, the idea of combining sand mining with the disposal of contaminated dredge spoils emerged and was explored. Perhaps no other problem than that of disposing of contaminated spoils plagues harbor authorities. Acceptable disposal sites and techniques are few and far between and options are severely limited—but harbors continue to silt up. New York's harbor is no exception. The Port Authority of New York and New Jersey has disclosed that three major Luxury Liners (Queen Elizabeth II, Rotterdam and Norway) will be unable to dock at the Passenger Ship Terminal because of silting of the slips. National Port Week was celebrated at the Port of New York by a meeting of federal and port officials on the problems associated with spoil disposal.

Sea Grant researchers Schubel and Bokuniewicz saw mining which created deep holes as an opportunity rather than a hazard. Such holes, if left open, could have a negative effect on the harbor. Why not back fill these with contaminated spoil and then seal them by capping with clean materials? The mix was about right—the amount of material potentially mined is about the same as the quantity of highly contaminated fine grained spoils. The mining and the dredging go on in close enough proximity to make disposal costs negligible. Because the exploration of this option was possible (other federal agencies approached shied away from the idea; quoting numbers of technical problems) through Sea Grant funding, the concept was developed. Possible negative environmental effects of holes resulting from mining can be eliminated. The harbor bottom can be restored to its original bathymetry. Utilization of the resource is more efficient.

Early last year a permit to carry out an experiment in dumping (conducted with clean fine grained spoils) was requested from the US Corps of Engineers. Last Fall, the US Maritime Administration, MARAD, through its University Grants Program, provided support for capping experiments to be conducted later this year. The Port

of New York and New Jersey Authority has agreed to furnish clean fine-grained spoil and to transport it to the site for the dumping experiments. Finally, after the MITRE Corporation's report of dredge spoil disposal recommended to the Corps that underwater landfill operations be given high priority, the Corps has indicated that it will financially participate in what is now becoming a major new research area having significance to all ports in the nation.

In summary, I believe the Congress should be proud of itself for the creation of a program that has the creativeness, ingenuity, and flexibility of Sea Grant. By placing the focus of administration at the state level, by combining the talents of the university community with the needs of industry and local governments, by providing for an outreach activity such as Sea Grant extension, a program has been developed having great relevance and responsiveness. Without great distance between sponsor and researcher, between user and producer of knowledge, with quick turn-around times in support of projects, and with flexibility engendered by the absence of a bureaucracy, Sea Grant can achieve that which other programs cannot.

In this testimony I have tried, by telling the story of sand mining in New York Harbor research, to show how Sea Grant uniquely carries out multi-disciplinary studies accomplishing the mission of the program: "Assisting the state and the nation in the development, exploitation, wise use and management of marine and coastal resources."

There is another aspect of Sea Grant that requires attention. The Sea Grant program in many states has been living off accumulated capital and intellectual resources; reserves built in past times with other funds. In a general atmosphere of belt-tightening, there will be difficult days ahead for Sea Grant for these reserves will be less available to us.

In 1965, Dean Knauss, University of Rhode Island, convened a Conference on the Concept of a Sea Grant University. Throughout the proceedings of that conference, which I have recently reread, runs the theme that construction of Colleges of the Sea in the pattern of the Land Grant colleges would be prohibitively expensive. The concept that evolved was to use Sea Grant funds to torque the system, to bend the priorities of faculty and of the institutions themselves to new directions. Fundamentally, this works by luring, by use of the bait of research or student support, an otherwise occupied faculty researcher to marine-related problems. Remember that something like 5 percent of the faculty of the colleges and universities of the nation do approximately 80 percent of sponsored research, it is this 5 percent we want to involve in marine research. Once scholars have made a commitment of their time to learn enough to be effective researchers, Sea Grant has captured them for a long time into the future.

But these faculty members, these researchers, were not usually emplaced by Sea Grant resources. They were there as a result of other needs, priorities, and financial resources. We have "borrowed" their time, their laboratory facilities, their intellectual abilities and their connections. Generally speaking, Sea Grant lacks the resources to replenish that store of capability we—merely spread it more thinly.

Put another way, the dean of the College of Agriculture and Life Science at Cornell recently said to me: "You've taken three of the seven faculty of poultry science and converted them to seafood research. The poultrymen of the State want to know how you are going to give them back those three faculty lines." Our constituencies are often not well enough developed to cause state legislatures to appropriate funds to serve these new groups, particularly at a time when all the pressures are to reduce the numbers of faculty and the costs of higher education. As student enrollments continue to fall, these pressures will intensify and Sea Grant will increasingly be forced to compete for scarce intellectual resources.

One of my colleagues has stated that his strategy, as a Sea Grant college director, will be to identify a core of resources and to increasingly "stay with them"—that is, support their work—rather than continue to broaden the scope of the program, introducing new facility and new subject areas. That, I submit, is retrenchment.

Sea Grant emerged in the years of national growth and expansion. The concept of a new program serving new constituencies by financial suasion alone seemed sound and was sound—given the conditions. The economic and demographic tides have turned. University budgets are under severe pressure as tax cutting moods prevail. Numbers of college age youth are diminishing, increasing the likelihood of a reduction in numbers of faculty and facility support budgets. How Sea Grant can respond to a contracting research and support environment is the management challenge lying ahead. I hope that we, the Sea Grant directors, together with our associates in the national office, and you, the members of the Congress, can develop imaginative and innovative solutions to this growing problem in the very near future.

Mr. STUDDS. Doctor Alfred Beeton, University of Michigan.

Dr. BEETON. I am Alfred Beeton, director of the Michigan sea grant program, which is a cooperative program between the University of Michigan and Michigan State University.

We are now attempting to make our program a statewide one by bringing in some of the smaller universities. My prepared statement addresses the importance of the Great Lakes, and the importance of sea grant to the citizens of the Great Lakes region.

In addition to Michigan, sea grant programs have been established in the region in Minnesota, New York, Ohio, and Wisconsin, and talks are underway as to possible programs in Illinois and Indiana. Coordination of the programs in the region is carried out through the Great Lakes sea grant network.

The Great Lakes are a major resource which we share with Canada. The lakes provide a transportation route into the heartland of North America; the fishery resource supports a major recreational fishery and a commercial fishery; the waters are used by industry and municipalities; and the coastal zone is used for homes, recreation, and industry. Few people realize that the lakes contain one-fifth of the world's surface supply of fresh water, and in general, these waters are of excellent quality, and provide drinking water to 23½ million people.

It is not surprising that 70 percent of the U.S. steel, and 62 percent of the Canadian steel is produced in the region, since this industry needs a plentiful supply of water, and the low cost transportation provided by Great Lakes shipping.

The above beneficial uses often result in conflicts. For example, shipping and hydroelectric power interests prefer high water levels, which property owners fear because of severe shore erosion problems, and resulting property damage. It is in this setting that the sea grant programs have been able to provide a great service through their marine advisory service, education, and training, and research to the citizens of the region.

Unlike many other research efforts, sea grant research is explicitly designed to deal with problem solving in the community. Once the research is completed, sea grant extension agents, communications specialists, and educators deliver results where they are needed.

In turn, as problems arise along the Great Lakes coastal zone, or in the open waters of the lakes, if information does not exist to deal with these problems, then the sea grant programs will develop research projects to provide the needed information.

Now, among our collective programs in the region, we have subprograms in fisheries, recreation, coastal zone, toxic substances, transportation, and water safety.

I will just touch on a couple of high points. Of all the problems in the Great Lakes region, none has raised more concern or confusion than contamination of the lakes with toxic materials like PCB's, and petroleum products. The Great Lakes are especially vulnerable to accumulation of toxic materials, and we have a much greater problem than in many parts of the country.

Sea grant scientists are trying to clear up questions along every step of the way, from manufacture to human consumption. How did the chemicals get into the lakes? What happens to them once they are there? How do they get into the food chain? What effects

do they have on living creatures, including humans? What chemicals may prove to be bad actors in the future?

There are 3,000 chemicals already in use in the Great Lakes basin, and hundreds of new chemicals are introduced each year. On which do we spend limited research dollars to safeguard the environment and residents of the Great Lakes region?

A Michigan researcher is using the chemical, physical, and toxicological characteristics of chemicals to try to predict the sort of compounds which are apt to cause environmental hazards. This "dragnet" for future chemical problems will help scientists and regulatory agencies set priorities for research and action on chemicals needing immediate attention.

In the area of water safety, Michigan, which pioneered the work on survival of persons who appeared drowned in cold water, is now pioneering a mass education effort about cold water survival. The program aims at teaching all rescue personnel, emergency room physicians, and parents of young children about treatment of these victims.

Michigan's research and public information about cold water drowning has already saved many lives. This new effort anticipated continuation of this success.

The problem that I see for sea grant is that although the sea grant programs have been very important for assisting many people with diverse interests in wise use of our marine resources, the program has been limited in its growth.

It is obvious that the programs have been very effective. Unfortunately, the sea grant program has not been permitted to realize its full scope and potential, since there have been small increments in funding, and the appropriations have been substantially lower than the amount authorized under Public Law 94-461.

The fiscal year 1981 budget does not include a request for an increase in funding for the national sea grant program. In the face of inflation, this means a cut in program funds.

My recommendation is that the authorization for appropriations should be increased to \$75 million. This would enable establishment of sea grant programs in States that do not have them, and the much needed strengthening of the existing programs, especially those that have been started recently.

I also recommended that members of the sea grant review panel should be eligible for reappointment to the panel as voting members. This is not possible under the present legislation, and means that some especially effective panel members can only serve one full term.

Thank you.

[The following was received for the record:]

STATEMENT OF ALFRED M. BEETON, DIRECTOR OF THE GREAT LAKES AND MARINE WATERS CENTER, UNIVERSITY OF MICHIGAN

I am Alfred M. Beeton, Director of the Michigan Sea Grant Program of Michigan State University and The University of Michigan and Director of the Great Lakes and Marine Waters Center of The University of Michigan. For twenty-five years I have been directly involved in research on the Great Lakes as a Federal employee, professor, advisor to the Wisconsin Department of Natural Resources, consultant to the Metropolitan Sanitary District of Chicago, consultant to the U.S. Environmental Protection Agency, as well as to industry and international agencies. At present I serve as Chairman of the International Environmental Programs Committee and as

a member of the Environmental Studies Board of the National Research Council/NAS. I am not presenting this statement as a spokesman for The University of Michigan, but as a concerned citizen.

My statement addresses the importance of the Great Lakes and importance of Sea Grant to the citizens of the Great Lakes region. In addition to Michigan, Sea Grant Programs have been established in the region in Minnesota, New York, Ohio and Wisconsin. The Ohio and Minnesota Programs are the most recent. Discussions are underway in regard to possible Programs in Illinois and Indiana. Coordination of the Programs in the region is carried out through the Great Lakes Sea Grant Network. The attached table shows the Federal and State contributions to the Sea Grant Programs in the Great Lakes region.

The Great Lakes are a major resource which we share with Canada. The lakes provide a transportation route into the heartland of N. America; the fishery resource supports a major recreational fishery and a commercial fishery, the waters are used by industry and municipalities, and the coastal zone is used for homes, recreation, and industry. Few people realize that the lakes contain one-fifth of the world's surface supply of freshwater and in general these waters are of excellent quality and provide drinking water to 23.5 million people. It is not surprising that 70 percent of the U.S. steel and 62 percent of the Canadian steel is produced in the region since this industry needs a plentiful supply of water and the low cost transportation provided by Great Lakes shipping.

The coastal zone of the lakes is almost 10,000 miles and therefore it is longer than the U.S. west coast. The Great Lakes coastal zone includes many important recreation areas such as the National Lakeshores of the Indiana Dunes, Sleeping Bear Dunes, Apostle Islands, Pictured Rocks, and many state and county parks. This coastal zone is very important for a variety of recreational activities which provide a part of a major tourist industry in the region, e.g., tourism is the second major industry of the State of Michigan. In addition to recreational use, the coastal zone provides water for public consumption, industry, cooling of many power plants, the major spawning and migration areas for fish, and as a receiving water for the wastes of industries and municipalities, and the runoff from agricultural lands.

The above beneficial uses often result in conflicts, e.g., shipping and hydroelectric power interests prefer high water levels which property owners fear because of severe shore erosion problems and resulting property damage. It is in this setting that the Sea Grant Programs have been able to provide a great service through their marine advisory service, education and training, and research to the citizens of the region. Unlike many other research efforts, Sea Grant research is explicitly designed to deal with problem-solving in the community. Once the research is completed, Sea Grant Extension Agents, communications' specialists and educators deliver results where they are needed. In turn, as problems arise along the Great Lakes coastal zone or in the open waters of the lakes, if information does not exist to deal with these problems then the Sea Grant Programs will develop research projects to provide the needed information.

Many problems are being dealt with through the Sea Grant Programs and I cannot deal with all aspects in this brief statement. Consequently, I have chosen a few examples which illustrate the importance of Sea Grant activities in the region.

FISHERIES

Though not as vigorous as it once was, the commercial fishery of the Great Lakes is still a vital source of freshwater fish, whitefish, perch, walleye, carp, alewives, lake trout and other species are still harvested from the Lakes' waters. At the same time, a multi-million dollar sport fishing industry has developed on the lakes.

The common aim of all five of the Great Lakes Sea Grant programs has been to foster the use of the fish resources of the Great Lakes. This has meant developing better commercial fishing methods and new uses for Lake fish; investigating the trophic dynamics of the Lakes' ecosystems; examining special fishery problems which effect the productivity or quality of various species (see Toxic Substances); analyzing the social and economic impact of the Great Lakes fishing industries; and providing advisory services to fishers, management agencies and the general public.

Lake trout are perhaps the most prized upper Great Lakes catch. Despite state and federal stocking programs, however, they fail to thrive in Lake Michigan. To help understand this problem, a Wisconsin Sea Grant investigator is following the success of three strains of hatchery trout. He is trying to identify factors influencing fish spawning and homing . . . key problems with lake trout. Michigan Sea Grant biologists are examining the competition between young salmon and trout during the critical period they spend in spawning streams. In New York, the emphasis is on documenting the movements and population data of salmonid fish in general.

Midwesterners have always loved the succulent yellow perch, a favorite of both sport fishers and consumers who create an ever-growing demand for the fish. Ohio Sea Grant researchers are studying the life history of an important perch parasite. Meanwhile, Michigan and Wisconsin scientists have deployed teams to locate natural perch spawning areas in southern Lake Michigan and Green Bay. This research will help fish management agencies protect spawning areas and encourage new perch populations in spots similar to natural spawning areas.

Of course, once the fish are caught, the problems become food science issues rather than harvesting issues. Commercial fish processing research is important in the New York, Ohio and Wisconsin Sea Grant Programs. New York and Wisconsin pioneered the development of nutritious, palatable and economic convenience products from underused fish of the Great Lakes. They haven't stopped there however; researchers have left their labs and worked with commercial food processors to get their new ideas into the industry. The products are tested in grocery stores and institutions on a mass scale. New York has developed pet food products made of the wastes from fish processing.

RECREATION

Over 1,000,000 recreational boats ply Great Lakes waters, everything from six-foot sailboats to fifty-foot sloops, from speedboats to charter fishing boats. What special considerations help make boating pleasant and profitable on the Great Lakes? How can attention to those considerations improve boating on the Great Lakes?

Minnesota and Michigan Sea Grant Programs are looking at recreational boating patterns, where, when and how people use boats on the Great Lakes. They want to determine whether more boating facilities are needed, how they might fit in with other local needs, and how best to work through systems to satisfy boaters and other residents. Minnesota's study focuses on harbors and will be used by the Army Corps of Engineers to plan boating facilities, and by the Minnesota Department of Natural Resources to plan parks.

Michigan's researchers are looking at economic aspects. They will develop economic models for local officials to use in judging how facilities will affect the economy of their communities.

Advisory Services in New York, Minnesota, Wisconsin and Michigan work with marine managers in communities and also hold annual conferences to update them on the latest business practices, government regulations and technical information.

COASTAL CONCERNS

With about 10,000 miles of Great Lakes coastline, Sea Grant Programs around the Lakes have much territory and many problems to cover. This year researchers are working on erosion, wetland resources, and legal problems.

Wisconsin Sea Grant is conducting an engineering analysis of what factors influence erosion. The study considers climate, ground water, vegetation, wave action and lake levels. Another Wisconsin project analyzes how vegetation can slow erosion. New York Sea Grant is looking at the ways currents move sediments near coastal structures. These studies will give us a better understanding of how shores erode and how we can work toward dealing effectively with erosion.

Ohio Sea Grant is looking into flooding on Lake Erie. They are working of forecasting the destructive storm surges which flood the shores of Lake Erie.

Another shore concern is wetlands. Wetlands resources are subject to many competing uses in the Great Lakes region and are the subject of many controversial plans and laws. How are decisions on wetlands made? Michigan Sea Grant is examining the way public policies on wetlands are developed. Wisconsin is looking at it from an economic perspective. They are identifying economic incentives and barriers to coastal wetland protection. These studies will help local decision-makers resolve some of the competing use problems.

TOXIC SUBSTANCES

Of all the problems in the Great Lakes region, none has raised more concern or confusion than contamination of the Lakes with toxic chemicals like PCB's and petroleum products.

Sea Grant scientists are trying to clear up questions along every step of the way from manufacture to human consumption. How did the chemicals get into the Lakes? What happens to them once they are there? How do they get into the food chain? What effects do they have on living creatures including humans? What chemicals may prove to be bad actors in the future?

To learn to deal with these chemical hazards, scientists must do some basic work on where they come from and how they travel in the Lakes. Michigan, Minnesota,

New York and Wisconsin are all studying these questions. Wisconsin and Michigan are measuring different aspects of atmospheric inputs of various chemicals. Minnesota is checking to see if there is seepage from coal storage areas adjacent to the Duluth-Superior harbor. New York is tracking Mirex attached to the sediments in Lake Ontario. Michigan is looking at sediment movements in rivers and harbors and release of PCBs from sediments, and also at PCBs traveling in the microlayer between the atmosphere and the water of the Lakes.

In Wisconsin, researchers calculated that Great Lakes receive, per unit area, a far greater load of petroleum compounds than the oceans. They are surveying the petroleum hydrocarbons in sediments and bottom-dwelling creatures in harbors in Lake Michigan and Lake Superior.

Chemicals do not remain the same once they enter the Lakes. Do they change into more harmful compounds? How does fish digestion alter them? Wisconsin researchers are looking for these answers.

Evidence of contaminant effects on primates closely related to humans has raised great concern in the Great Lakes community about effects on humans. In direct response to a request from the county and state health departments, Wisconsin researchers are measuring PCB content of blood and breast milk of women in the Sheboygan County area, where fish in local waters are severely contaminated. Will there be differences between women who eat a lot of fish and those who don't?

But contaminant questions raise not only science and health issues, but also political and economic concerns. Addressing some political aspects is a Michigan researcher studying how the Environmental Protection Agency will implement the Toxic Substances Control Act and the implications for major interest groups including the chemical industry, the government and consumer groups.

There are 3,000 chemicals already in use in the Great Lakes Basin and hundreds of new chemicals are introduced each year. On which do we spend limited research dollars to safeguard the environment and residents of the Great Lakes? A Michigan researcher is using the chemical, physical and toxicological characteristics of chemicals to try to predict the sort of compounds which are apt to cause environmental hazards. This "dragnet" for future chemical problems will help scientists and regulatory agencies set priorities for research and action on chemicals needing immediate attention.

TRANSPORTATION

To keep the midwestern economy moving, ships transported over 213 million tons of cargo through the Great Lakes and the St. Lawrence Seaway in 1978. Grain, iron ore, coal, limestone and general goods rode the waters in larger and larger ships. How are ship transportation needs changing on the Great Lakes?

Michigan Sea Grant has put together a team to look into the technical problems of transportation on the Great Lakes. One study is evaluating a path control system for ships, a system which guides ships by computer through narrow channels. Another project examines how these systems can affect ship size in relation to channel width. Is it possible that with the development of new ship control systems we can eliminate some of need for changes to the shores and channels?

Sea Grant Programs in the Great Lakes are working on several aspects of Great Lakes transportation, from ship design to shoreline problems to routes and ports. These varied approaches and projects will help us plan the transportation uses of the Great Lakes in concert with other uses.

WATER SAFETY

The chilly waters of the Great Lakes, all 95,000 square miles of them, are not without hazards. Training people using the Lakes, and developing ways to treat accidents that occur when they do, is another area of interest at Sea Grant.

In Minnesota researchers are shivering in their boots for science in a study of the effects of alcohol and exhaustion on hypothermia—the progressive and dangerous cooling of the body's core. This information will be invaluable to those who play or work in the cold water everywhere. Minnesota will set up a center to answer questions about hypothermia. This research is partially funded by the largest water safety equipment manufacturer in Minnesota.

Michigan Sea Grant, which pioneered the work on survival of persons who appear drowned in cold water, is now pioneering a mass education effort about cold water survival. The program aims at teaching all rescue personnel, emergency room physicians and parents of young children about treatment of these victims. Michigan's research and public information about cold water drowning has already saved many lives. This new effort anticipated continuation of this success.

While many of us are content to merely speculate on what goes on under the surface of the Great Lakes, 40,000 scuba divers are making first-hand observations. Many other divers dive for research or commercial operations. Sea Grant's primary concern for all these divers is safety.

Michigan has developed an underwater diving safety instructor training program to upgrade safety training of diving instructors. Michigan also operates a hyperbaric chamber used to treat diving accidents and other crippling and life-threatening diseases.

Much of diving safety and medicine depends on a fundamental knowledge of how diving affects physiology. Physicians, nuclear medical specialists, chemical engineers and veterinary medicine specialists are all part of a Wisconsin team trying to unravel the interrelationships between diving and changes in body chemistry and functioning. What are the effects of high pressure to which divers are subjected? The goal of the project is to develop safer decompression procedures. Often there are spinoffs from diving research insights for treating pulmonary diseases from this work.

EDUCATION

Nearly everyone in Sea Grant is an educator since everything, from highly technical research to the advisory agent's town meetings, are intended to apply research findings to Great Lakes problems. However, Sea Grant programs have several projects under the traditional definition of education. A team of curriculum developers in Michigan is creating five major teaching units about the Great Lakes for middle school students. Last year, 800 students in the state tested the materials under a rigorous pre-publication evaluating program. The first unit, a month-long interdisciplinary course, the Sea Lamprey in the Great Lakes, is an in-depth study of biological, economic, political and environmental problems that accompanied the invasion of the Lakes by the lamprey. This unit will be published in the Spring of 1980, with units on Great Lakes shipping, cities, water quality and fisheries coming up.

In Ohio, teaching materials oriented to Lake Erie problems have already been published. Teacher training courses were taught this summer and curriculum development has moved from a science to a social studies focus.

4-H youth and leaders are getting in on Great Lakes education too. Children in coastal communities are learning about the Great Lakes; examples are: Minnesota's lakeshore day camp experiences and Great Lakes heritage Days in downtown Detroit.

At the college level, significant numbers of graduate students aid researchers in projects, thus gaining firsthand experience in their professional fields. Such assistance provides support for graduate education in New York, Wisconsin, Ohio, Michigan and Minnesota.

ADVISORY SERVICE

The advisory service is the part of the Sea Grant and other Great Lakes organizations to the various users of the Great Lakes—from the marina owner, to a 4-H member, to a solitary beach walker.

Modeled on the Cooperative Extension Service/Land Grant system, some Great Lakes Sea Grant Programs have formal relationships that tie them into Extension Networks already established in the state. Some states even call it Sea Grant Extension. But whatever the name, the job is always to link people who have Great Lakes problems and interests with Sea Grant expertise on the campuses and throughout the state.

Whether they are working on fisheries, marine education, shoreline erosion, marine business problems, recreation opportunities or just creating awareness and appreciation of Lakes, the men and women of the Sea Grant Advisory Service in each state are responding to the Great Lakes residents and their concerns.

Sometimes advisory service means working on a one-to-one basis, like the Michigan agent who donned his Sea Grant T-shirt, plunged into the chill waters of the Lake and helped a marina operator install a floating tire breakwater (FTB). The FTB is an engineering device perfected for the Great Lakes by New York Sea Grant. It is affordable by even a small marina, and widely known in trade through the efforts of advisory service agents in the region.

Other fishery work in Great Lakes states includes gear improvements for fishers in New York, Wisconsin, and Michigan, and basic courses on fish biology to help fishers in Wisconsin, Michigan and Minnesota understand the basis for fishery regulations better.

Sometimes agents find they can work with a network of agents in other states to stretch their program dollars. For example, agents in Minnesota, Wisconsin and

Michigan got together to assemble a comprehensive guide to boat launching sites all along the Lake Superior shore. The Michigan and Wisconsin agents in the Green Bay region do much cooperative programming.

Sea Grant Programs have been very important for assisting many people with diverse interests in wise use of our marine resources. The Programs have been very effective. Unfortunately, the Sea Grant program has not been permitted to realize its full scope and potential since there have been small increments in funding and the appropriations have been substantially lower than the amount authorized under Public Law 94-461. For example, the FY 82 budget does not include a request for an increase in funding for the National Sea Grant Program. In the face of inflation this means a cut in Program funds. My recommendation is that the authorization for appropriations should be increased to \$75,000,000. This would enable establishment of Sea Grant Programs in states that do not have them and the much needed strengthening of existing Programs, especially those that have been started recently.

I also recommend that members of the Sea Grant Review Panel should be eligible for reappointment to the Panel as voting members. This is not possible under the present legislation and means that some especially effective Panel members can only serve one full term.

SEA GRANT PROGRAM FUNDING ¹

[Public Law 93-688, as amended]

State, university, college or other	Grant period	Federal aid	State matching	1978	State matching	1979	State matching
Illinois.....		0	0	0	0	0	0
Indiana.....		0	0	0	0	0	0
Michigan—University of Michigan, Michigan State University, Eastern Michigan University, Northern Michigan University, Wayne State University.....	1968-78 1975-78	6,022,300 207,300	3,787,224 111,550	864,700 321,800	438,000 222,990	953,278 354,998	487,240 296,194
Minnesota—University of Minnesota.....	1968-78	9,882,758	8,711,070	1,436,670	754,251	1,658,700	1,060,494
New York—Columbia University, New York University, State University of N.Y., Cornell, others (3).....	1971-76 1977-78	202,980 349,742	251,980 193,404	0 121,842	0 67,816	0 180,000	0 101,400
Ohio—Kent State, Ohio State University.....	1970-76 1968-78	598,400 9,729,300	298,789 5,192,818	0 1,540,000	0 825,000	0 1,700,000	0 950,000
Pennsylvania—Lehigh.....							
Wisconsin—University of Wisconsin.....							
Total.....		26,992,780	18,551,023	4,285,012	2,308,057	4,846,976	2,895,328

¹ Grant-In-Aid System—Grants can be made up to two-thirds of project (closes to 50/50.)

Note.—Compiled by Michigan Sea Grant, Feb. 2, 1980.

Mr. STUDDS. Thank you very much, sir.

I believe I last saw you when the subcommittee was in St. Clair Shores in a blizzard, leaving for the Northwest and another blizzard. We have aged a lot since that time. I think we left you to have an emergency landing in Portland, Oreg. It was downhill from thereon.

I have the unhappy pleasure of now confining one of my constituents to 5 minutes, Dr. David Ross, from the Woods Hole Oceanographic Institution.

Dr. Ross. I am David A. Ross, speaking for the scientific and technical staff of the Woods Hole Oceanographic Institution (WHOI). I would like to indicate my strong support for the concept and objectives of the national sea grant program and recommend the reauthorization of the Sea Grant Act by the committee.

One of the truly important characteristics of the sea grant program is how it uses the strengths and talents of our Nation's marine institutions and universities. Today you have already heard from several sea grant colleges and it may aid you in your deliberations to be aware of other types of sea grant programs.

I would like to stress briefly here five major reasons why sea grant is important to institutions like mine, to marine scientists in general, and to our Nation in its use of the ocean.

My institution is a private, nonprofit organization employing over 900 people studying all aspects of marine science, including policy.

Although much of our research is in the deep sea, at least 25 percent of our work is in coastal waters. Our total budget is about \$30 million. Only about 2 percent comes from sea grant.

In spite of the relatively small percent of sea grant support, it has allowed us to do things of scientific value far beyond its dollar amount. I will come back to this in a moment. I should add that the private source for our matching funds gives us the flexibility to look at a wide range of problems in many geographic areas. At Woods Hole we have what is called a coherent area project, which basically means that our focus is principally in one of the three major objectives defined by sea grant, that is, research, education and advisory services. In our case, marine research. I should add as an aside that we have recently initiated some marine advisory services and have, through our own private funding, been very active in educational activities.

As you might imagine from the description of my institution and its source of funding, much of our research is what may be called basic research.

However, those of you that know the ocean realize that almost anything that relates to the marine environment can have considerable applied aspects and potential. This brings me to the first reason why sea grant is so valuable to us. It allows our marine researchers who may have worked for years on a specific program concerning basic science to now consider the applied aspects or consequences of their endeavor—often at a very modest cost since much of the groundwork and outfitting may already have been accomplished.

Let me give you an example. Most of you are probably aware of the studies made, using the diving submersible Alvin, of the ocean-

ic ridge systems and their discharges of hot water from vents (hydrothermal vents). Recently some highlights were presented on public television. This basic research, well supported by NSF and ONR, strongly emphasizes the origin and evolution of the ocean basins. In the course of these studies, scientists from WHOI and elsewhere came upon literally cases of life along active portions of some of the ridges—including large mussels and clams and unique forms of worms and crabs never before seen. These discoveries have stimulated new thought and discussion regarding basic marine biological questions—such as why are these animals there, why are so many of them large, and what are they eating?

Despite the fact that much of this pertains to very fundamental questions, the discoveries can actually have very practical consequences—and this is where sea grant becomes so important. With sea grant funding, Drs. Taylor and Jannasch of my institution have initiated a project that will ultimately simulate the ecosystem associated with these vents for the purpose of shellfish aquaculture operations on land. In the vent areas, hydrogen sulfide substitutes for light as the energy source for the food chain, and bacteria substitutes for algae as the primary producer of food. Using available sulfide byproducts on land, which are an industrial waste and a pollutant, it may be possible to model the hypothermal vent system, grow shellfish and get rid of a pollutant in the process.

We are now building a biological reactor that uses hydrogen sulfide to grow the bacteria. If this is successful, we will conduct feeding experiments with edible shellfish species. The final step will be an economic analysis of a full-scale plant. It would have been very difficult, if not almost impossible, to pursue this complex type of research without the support of sea grant and its objective to increase the understanding, assessment, development, utilization and conservation of the Nation's ocean and coastal resources.

The above example, and I could have used others, leads me to the second major reason why sea grant is so important to marine scientists and to our Nation's use of the sea. This is the ability of sea grant to make rapid responses to immediate problems and opportunities. In the case I just described, we were able, using new initiative and supplementary funding, to make a quick start on the project and take advantage of the opportunity to collect water from the vents when the submarine was in the area.

Perhaps a more pertinent example is a quick survey we were able to implement, literally within days, of the lobster catch and breeding on Georges Bank relative to areas being leased. It is hoped that this data will be influential in establishing special discharge restrictions in these regions.

This point leads me to the third important aspect of sea grant. The sea grant program permits researchers from many institutions to focus on various aspects of a subject or a geographically oriented problem area. Past examples include the nearshore sediment transport study which is one of the so-called national programs of sea grant. For the purpose of that program, a select research team was assembled from several institutions to solve a broad coastal question. In my opinion, this approach has, by no means, been as fully exploited by scientists, administrators, and the Government as it could be.

For example, in the Northeastern part of the United States, the pending drilling on Georges Bank, an undisputed endeavor of national concern, presents some clear chances of ecological and environmental damage, but there is also potential in some areas, and with certain conditions, for relatively safe drilling activity. We have made studies of the region, such as water circulation, structural geology and fishing activity. Other agencies—USGS for example—and institutions, such as the University of Rhode Island, MIT, have also studied some aspects. What is lacking is a focused national research program in this area, one that could have applications for much of U.S. offshore drilling. Areas of focus could be the actual effects of certain drilling activities, such as drilling muds, and produced fluids and dispersants on lobsters or other forms of life; or relative advantages and disadvantages of different hydrocarbon transportation methods. These questions of immediate importance to Georges Bank are also relevant to other areas.

There are two other unique aspects of sea grant that should be mentioned here. One is that sea grant encourages research into problems of interest to local communities. It has been very satisfying to see competent marine scientists who are used to working halfway across the world in multimillion dollar projects find interesting scientific challenges virtually in their own backyard. The main beneficiary of this activity is actually the community, and I could list a number of such community projects we have going at the moment.

The other unique aspect is that sea grant projects have continuity and longevity. It is possible, with sea grant support, to have a research program carried out continuously to its necessary conclusion where often the applied aspect is best discovered.

One can only imagine what would have been accomplished if sea grant funding had kept pace with the marine needs.

[The following was received for the record:]

STATEMENT OF DR. DAVID A. ROSS, SEA GRANT COORDINATOR AND SENIOR SCIENTIST, WOODS HOLE OCEANOGRAPHIC INSTITUTION, WOODS HOLE, MASS.

Mr. Chairman and members of the subcommittee, speaking for the Scientific and Technical Staff of the Woods Hole Oceanographic Institution, I would like to indicate my strong support for the concept and objectives of the National Sea Grant Program and recommend the reauthorization of the Sea Grant Act by the Committee.

One of the truly important characteristics of the Sea Grant Program is how it uses the strengths and talents of our nation's marine institutions and universities. Today you have already heard from several Sea Grant Colleges and it may aid you in your deliberations to be aware of other types of Sea Grant Programs.

I would like to stress briefly here five major reasons why Sea Grant is important to institutions like mine, to marine scientists in general and to our nation in its use of the ocean. First, a little background.

My institution, the Woods Hole Oceanographic Institution, is a private, non-profit organization employing over 900 people studying all aspects of marine science, including policy. We have three major oceanographic vessels and maintain the deep diving submersible ALVIN. Although much of our research is in the deep sea, at least 25 percent of our work is in coastal waters. Our total budget is about \$30 million of which about 45 percent comes from NSF, 23 percent comes from ONR, 20 percent from private funds, and 12 percent from other sources. Sea Grant, which is one of those other sources, contributes about \$700,000, or a little more than 2 percent of our research budget. In spite of the relatively small percent of Sea Grant support, it has allowed us to do things of scientific value far beyond its dollar amount. I will come back to this in a moment. I should add that the private source

for our matching funds gives us the flexibility to look at a wide range of problems in many geographic areas.

At Woods Hole we have what is called a "coherent area project" which basically means that our focus is principally in one of the three major objectives defined by Sea Grant (research, education and advisory services)—in our case, marine research. I should add, as an aside, that we have recently initiated some marine advisory services and have, through our own private funding, been very active in educational activities. As you might imagine from the description of my institution and its source of funding, much of our research is what might be called basic research. However, those of you that know the ocean realize that almost anything that relates to the marine environment can have considerable applied aspects and potential. This brings me to the first reason why Sea Grant is so valuable to us. It allows our marine researchers who may have worked for years on a specific program concerning basic science to now consider the applied aspects or consequences of their endeavor—often at a very modest cost since much of the groundwork and outfitting may already have been accomplished.

Let me give you an example. Most of you are probably aware of the studies made, using the diving submersible ALVIN, of the oceanic ridge systems and their discharges of hot water from vents (hydrothermal vents). Recently some highlights were presented on public television. This basic research, well supported by NSF and ONR, strongly emphasizes the origin and evolution of the ocean basins. In the course of these studies scientists from WHOI and elsewhere came upon literally oases of life along active portions of some of the ridges—including large mussels and clams and unique forms of worms and crabs never before seen. These discoveries have stipulated new thought and discussion regarding basic marine biological questions—such as why are these animals there, why are so many of them large, and what are they eating? Despite the fact that much of this pertains to very fundamental questions, the discoveries can actually have very practical consequences—and this is where Sea Grant becomes so important. With Sea Grant funding, Drs. Taylor and Jannasch of my institution have initiated a project that will ultimately simulate the ecosystem associated with these vents for the purpose of shellfish aquaculture operations on land. In the vent areas, hydrogen sulfide substitutes for light as the energy source for the food chain and, bacteria substitutes for algae as the primary producer of food. Using available sulfide byproducts on land, which are an industrial waste and a pollutant, it may be possible to model the hydrothermal vent system, grow shellfish and get rid of a pollutant in the process. We are now building a biological reactor that uses hydrogen sulfide to grow the bacteria. If this is successful, we will conduct feeding experiments with edible shellfish species. The final step will be an economic analysis of a full-scale plant. It would have been very difficult, if not almost impossible, to pursue this complex type of research without the support of Sea Grant and its objective "to increase the understanding, assessment, development, utilization and conservation of the Nation's ocean and coastal resources".

The above example, and I could have used others, leads me to the second major reason why Sea Grant is so important to marine scientists and to our nation's use of the sea. This is the ability of Sea Grant to make rapid responses to immediate problems and opportunities. In the case I just described, we were able, using new initiative and supplementary funding, to make a quick start on the project and take advantage of the opportunity to collect water from the vents when the submarine was in the area.

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This point leads me to the third important aspect of Sea Grant. The Sea Grant Program permits researchers from many institutions to focus on various aspects of a subject or a geographically-oriented problem area. Past examples include the Near-shore Sediment Transport Study which is one of the so-called National Programs of Sea Grant. For the purpose of that program a select research team was assembled from several institutions to solve a broad coastal question. In my opinion, this approach has, by no means, been as fully exploited by scientists, administrators and the government as it could be. For example, in the northeastern part of the United States the pending drilling on Georges Bank, an undisputed endeavor of national concern, presents some clear chances of ecological and environmental damage, but there is also potential in some areas, and with certain conditions, for relatively safe drilling activity. We have made some studies of the region, such as water circulation, structural geology and fishing activity. Other agencies (USGS, for example)

and institutions, such as the University of Rhode Island, MIT, have also studied some aspects. What is lacking is a "focused" national research program in this area, one that could have applications for much of U.S. offshore drilling. Areas of focus could be the actual effects of certain drilling activities, such as drilling muds and produced fluids and dispersants on lobsters or other forms of life; or relative advantages and disadvantages of different hydrocarbons transportation methods. These questions of immediate importance to Georges Bank are also relevant to other regions.

There are two other unique aspects of Sea Grant that should be mentioned here. One is that Sea Grant encourages research into problems of interest to local communities. It has been very satisfying to see competent marine scientists who are used to working half-way across the world on multi-million dollar projects find interesting scientific challenges virtually in their own backyard. The main beneficiary of this activity is actually the community and I could list a number of such community projects we have going at the moment.

The other unique aspect is that Sea Grant projects have continuity and longevity. It is possible, with Sea Grant support, to have a research program carried out continuously to its necessary conclusion where often the applied aspect is best discovered. This may involve a changing cast of scientists and even goals. In some instances the project can also involve industrial participation.

What I have tried to briefly show today is the uniqueness of Sea Grant in its funding of marine scientific activities. Through its support marine scientists are often able to take the results of basic, and even sometimes esoteric research, and translate it into practical use.

One can only imagine what we might have accomplished if the funding levels had kept pace with the nation's marine needs.

Thank you.

Mr. STUDDS. Thank you, and I apologize for rushing you.

Let me ask all of you this: Putting aside the question of the level of funding, are there any specific changes that any of you would recommend in the statute?

Mr. HORN. I have put three in my written statement, Mr. Chairman.

Mr. STUDDS. Do you want to take the mike for a second?

Do you wish to summarize them briefly now? I have not yet had a chance to read all the statements, but the staff already has.

Mr. HORN. The three changes that I recommended, some of the others have mentioned, one I have not heard previously, is to make a provision for the assignment of patents automatically under this act, so that we do not have to wait for the delay of the processing through the Department of Commerce, to know at the start of a project, that if a patent developed, it would come to the university, with the stipulation that, of course as at present, all Federal Government use is royalty free. But add the stipulation which came to your mind, that any commercial royalties would be reapplied specifically to support sea grant activities. So they would not just go into the general university pot.

The other thing was to extend the one additional appointment cycle for the members of the national review panel; and the other was an editorial change that I think accidentally crept into the Improvement Act of 1976, that I think administratively would be useful to change.

Mr. STUDDS. Thank you.

Are there any of you with recommendations for changes in the statute itself?

Dr. SULLIVAN. Mr. Chairman, I would like to second what Dean said about the national review panel, especially as sea grant moves to the longer review cycle, on the major programs, it would almost

be useless for somebody to come once, and then they are never back to our programs again, to evaluate it.

Mr. STUDDS. Very good.

We have a panel from the review panel testifying later, down to one person, I think.

Dr. Beeton, when we were in Michigan, you suggested a closer tie between the coastal zone management program and the sea grant program. Were you meaning that as an unofficial interacting, or statutory changes to bring that about?

Dr. BEETON. When I testified before that hearing, my remarks were addressed to the fact that we already have a mechanism in place, through the sea grant programs, sea grant network across the country, and in the Great Lakes, to carry out much of the work that is needed through the coastal zone management agencies, and so I think that that can be certainly strengthened. Whether it would require legislation, I am not certain, but I am certain it can be a very effective way to carry out that work.

Mr. STUDDS. Let me say to all of you, I know the caliber of work that is done, and it is with great reluctance that I abbreviated your statements, because we do not get a chance very often to hear how very small amounts of Federal funds are wisely expended.

The question of adequacy of funding levels is primarily one for the Appropriations Committee, because in the past this committee has authorized significantly more than has been appropriated.

I think every one of you represents States with one or more members on the Appropriations Committee. Let me plead with you to make that case to them. We will do our part here. The chairman of that committee, however, is not from a coastal State.

If some of you can think of ways in which the sea grant program can effect West Virginia, it would be helpful. But I would urge you all to use whatever contacts you have in your own constituencies to approach those members of your own States that serve on that committee, because I will assure you that we will do whatever we can, within reason.

I thank you all for your patience and good work, and I apologize again for the irrationality of our own schedule.

I think what we will do at this point is to pause for what is euphemistically called lunch in this institution, and we will return at 2 o'clock. And let me alert those of you who remain to testify that we will continue with the same rules. We will ask you to confine your oral statements to 5 minutes. Your written statements will appear in the record in their entirety. That will give those of you who remain time to practice your 5-minute presentations.

We will resume at 2 o'clock.

Thank you very much.

[Whereupon, at 12:45 p.m., the subcommittee recessed, to reconvene at 2 p.m., the same day.]

AFTERNOON SESSION

Mr. STUDDS. The subcommittee, with unprecedented minority representation, will come to order.

Our first panel is a one-person panel, Ms. Marjorie Vesley of New York.

Although you are a panel, you are still under the 5-minute rule. I apologize for that.

Welcome.

I am sorry your copanel person is not here.

[The prepared statement follows:]

PREPARED STATEMENT OF MARJORIE L. VESLEY, MEMBER OF THE SEA GRANT
REVIEW PANEL, 1977-80

Mr. Chairman, members of the committee, I am very pleased to be invited to present testimony concerning the National Sea Grant Program. During the past three years I have been a member of the Review Panel and have had an opportunity to observe several positive trends in the development of the programs. It has been a rewarding experience and I expect to see continued refinement of the program so that it will make an even greater contribution to the national welfare.

During my term as a panel member I have served with site visit teams at thirteen of the Sea Grant institutions. I have also attended panel meetings at three additional Sea Grant institutions and the Marine Advisory Service Leaders Conferences in 1977 and 1978.¹ These experiences have convinced me that the institutions benefit from exchange of ideas within the system but the individual character of each program influenced by the geographical location of the program the political climate in which it functions, and the academic strengths to be found within the institution, should reflect the needs of the region. That individual character is a real strength and resource in the community.

The variety of issues and problems which have been addressed by Sea Grant programs in different parts of the country is very broad in scope. The important response to local need is made possible by the attention of individual Sea Grant program directors to marine problems and the resources available to meet them. It is a difficult task to meld the research, educational and advisory service components of Sea Grant into a functioning, on-going program which identifies problems, develops some information and gets the information out to people who will benefit from it. This is an exciting challenge and the enthusiasm and dedication that is shown by those responsible for programs in all parts of the country is pleasant to see.

Communication of research results brings about a closeness to the community that is very important to Sea Grant programs and those they serve. Visibility is achieved through use of newspapers, radio, television, publication of newsletters and fact sheets. In some communities Sea Grant specialists work through local institutions, such as museums, to offer adult education courses. In my own community such a course is being offered this spring on the topic of "Lake Erie." Through their own initiatives and their alertness to local resources marine extension specialists and advisory agents are finding new ways to communicate research findings.

The last three years have seen changes in the Sea Grant Review Panel in accordance with the "Sea Grant Improvement Act of 1976." As a member of the first group of three year appointees I had the pleasure of becoming acquainted with those members appointed for one and two years terms who had been closely associated with the Sea Grant program for somewhat longer periods of time. The changes which they had seen in the early years of the program were perhaps more striking than those which have taken place in the last three years. However, I feel that I have witnessed a refinement and maturing of the Sea Grant idea. It is an exciting one and the potential is being realized. Attention has been given, by the Office of Sea Grant, to the problem of making the Review Panel acquainted with broad aspects of the entire program during the term of the panel member. In addition to presentations at panel meetings, the distribution of a regular newsletter concerning activities of the Sea Grant office is now contributing to awareness of the program by panel members. The recent distribution of copies of Subject-Area Assessment reports of Sea Grant activities, prepared by Sea Grant staff for their annual retreat, to panel members was another good step in the process of building a more complete understanding of the program as a whole. This is very necessary if the Review Panel is to fulfill its role of providing advice to the director as it is directed to do by the legislation.

In the near future I hope to see this program achieve more visibility while continuing the high standards of responsiveness and scholarly achievement which have been evident.

It has been a pleasure to serve as a member of the Review Panel and I thank you for the opportunity to present my views on the Sea Grant Program.

¹ List of institutions visited attached.

SITE VISITS MADE DURING 1977-80 TERM ON SEA GRANT REVIEW PANEL

1977: University of Minnesota; Louisiana State University; University of Wisconsin; Maine-New Hampshire; and University of Maryland.

1978: University of Rhode Island; University of Miami; Louisiana State University; Maine-New Hampshire; and University of Washington.

1979: Michigan State University-University of Michigan; Oregon State University; Woods Hole Oceanographic Institution; University of Alaska; and University of Maryland.

Panel meetings held at Sea Grant Institutions: 1977, Scripps Institute of Oceanography; 1978, University of North Carolina; and 1979, University of Georgia.

Marine Advisory Service Leaders Conferences Attended: 1977, Airlie House, Airlie Va.; and 1978, Mountain Haus, Vail, Colo.

STATEMENT OF MARJORIE L. VESLEY, MEMBER, SEA GRANT REVIEW PANEL, 1977-80

Ms. VESLEY. Thank you for inviting me. I am very pleased to testify.

I submitted some testimony to the committee and I don't believe that I will read that today; but I thought that in view of my experience with the panel for the past 3 years, it might be useful to review some of the trends I have been seeing during that time and some of the things that I think have been occurring in the sea grant program.

I have been very pleased to see that there is trend toward what I would call a mutual respect between the various components, the marine research, education, and advisory arms. I feel they are in much better communication than they were a few years ago; and we are finding them calling upon each other for help and information and working together in a more teamlike way than we saw at one time.

There has been, I think, a decided change for the better in the kinds of proposals that are presented as the programs mature. There has been quite a bit of refinement in them and I think we will see this trend continue.

I would like to speak a bit to the question you raised this morning on the GAO report and the fact that much research was not relevant to the community; because my experience has been, as a representative of community groups—I have worked primarily with the League of Women Voters and we have had a great interest in seeing that work that is done is relevant to the community; and I feel that it is important to recognize within the context of sea grant that if you are to do innovative work you are not going to bat 1,000 all the time, and in some cases there will be long-range projects that will not get back to the community for a long time.

In other cases, you may have some failures if you are going to do anything that is different from what would be done commercially.

So I feel that the intent has been to do work that will be significant in the best judgment of the people who are managing the programs; that the work they have chosen is in that category. But in some cases we will, of course, find that it will not be possible to carry everything through.

If you would like to ask some questions concerning my experience with the panel, I would be glad to try to answer them.

I have been able to participate in a number of site visits during the time I have been a member of the panel and have observed a

number of other meetings. I think that the functioning of the panel has changed over the past 3 years because under the old legislation, the panel members were better acquainted with the various institutions than it is possible to become in a 3-year span of time. So there have been changes initiated from the Office of Sea Grant which I think have been very good in helping panel members to quickly become acquainted with the kinds of programs that are going on.

Mr. STUDDS. Thank you very much.

What is your own background which you bring to this role?

Ms. VESLEY. My background is, as I say—has been with community groups, I was an environmental quality chairman for the League of Women Voters for New York State, most recently serving on a number of other boards; was chairman of the Lake Erie Basin for New York for the League, and things of that kind.

I also serve on a conservation council in my own community.

Mr. STUDDS. And I assume you concur in the recommendation that we allow consecutive terms?

Ms. VESLEY. Yes; I heard the recommendation.

Mr. STUDDS. You concur in that?

Ms. VESLEY. I concur that it would perhaps be helpful in that the amount of time and effort that has gone into informing panel members that sea grant is such that I think they would probably be more useful to the office.

Mr. STUDDS. Does the panel have a substantive role in the awarding of grants under the program?

Ms. VESLEY. In determining the amounts?

Mr. STUDDS. Recipients and decisions as to whether or not—

Ms. VESLEY. No; I would not call it a substantive role there.

Mr. STUDDS. More of an advisory committee?

Ms. VESLEY. You mean the allocations between different institutions—the panel would have no role in that.

Mr. STUDDS. Are you an advisory committee with a better name?

Ms. VESLEY. I don't understand the question.

Mr. STUDDS. Are you essentially what would be called a consultant, under the heading of an advisory committee?

Ms. VESLEY. I think it was called the advisory committee at one time.

Mr. STUDDS. You are probably well disguised as a review panel.

Ms. VESLEY. I think there may have been some reason for the change in the name. You already have a marine advisory service and it becomes confusing if you use the word "advisory" in too many ways.

Mr. STUDDS. Thank you for your testimony.

Mr. Pritchard?

Mr. PRITCHARD. Would you run through, if you can, rather briefly, how you would review a school?

You undoubtedly make an onsite visitation.

Ms. VESLEY. Well, the Office of Sea Grant has a program monitor who is assigned to each of the institutions and that person in conjunction with the sea grant director at the institution plans—well, the sea grant director essentially plans the site visits which will be held and the program monitor assembles the site team which will evaluate the program. The proposal is prepared well in

advance of the site visit dates and distributed to the members of the team.

It has been traditional that a member of the review panel will serve on that team and the distribution of assignments is made in accordance with the convenience of their schedules. The members of the team are then assigned particular proposals which they should look at in detail and look at the whole proposal also to be ready to question the research people who present their plans at the site visit.

Then an evaluation of the proposal is made by the team, letters written by the program monitor go to the director, and final decisions for funding and so on take place in the office of sea grant.

Mr. PRITCHARD. We are at a time where we are cutting a lot of things and we look at these things and wonder just how important they are, these activities we are conducting in sea grant, and we who come from areas who have sea grant colleges kind of go along and are likely to be supportive and we see it from that view.

I just wonder in an overall look—these things get a certain momentum in themselves and I wonder how closely we are looking at them.

Ms. VESLEY. At the programs themselves?

Mr. PRITCHARD. Yes.

Ms. VESLEY. I would say you are looking at them very closely; and I think that the people in the programs, from what they have said to me, seem to be looking at that in that view because beneficial suggestions are made and it is a way in which they can make much better comparisons than if they relied entirely on written comments.

Mr. STUDDS. Mr. Forsythe?

Mr. FORSYTHE. Thank you, Mr. Chairman.

Thank you, Ms. Vesley.

Do I understand that you do not feel that the review panel really has a significant role in the determination of the choice of grant awards?

Ms. VESLEY. I think that the panel's direction is rather clearly laid out in the legislation and that is that its members are to give advice only to the director of the program with regard to policy or whatever kind of advice he does request. But I think that their advice is more in terms of the overall direction that the program takes instead of advice with regard to the distribution of a particular yearly appropriation.

Mr. FORSYTHE. Does the panel meet as a body? I think that you said that the teams include a member of the panel.

Ms. VESLEY. Right; the panel has two meetings each year. That again is designated in the legislation.

Mr. FORSYTHE. And what really is accomplished in these meetings as a body?

Ms. VESLEY. In the meetings as a body, it is possible to review the overall program and the progress that has been made in particular areas.

In some cases, they have pulled out something like the Marine Advisory Service or an aquaculture program, for example, and told the panel what is going on in that particular area.

It is possible for the panel members to become better acquainted with the thinking of the several panel members of the direction in which the sea grant program should proceed, which is something we would not get if we didn't—

Mr. FORSYTHE. Would I be nasty if I said it was a show and tell?

Ms. VESLEY. I think you would be rather nasty if you said that, as a matter of fact. I feel that it has to be considerably more than that.

Mr. FORSYTHE. I hope so.

Ms. VESLEY. However, it takes considerable planning, I might say, on the part of the office of sea grant to make it more than that when they have a great many new panel members with whom to work. I think it was much easier for them in the days when they had people who had been panel members over a long period of time so they were acquainted with what is going on in a number of institutions. I think it is the role of the panel to bring to the attention of other members and the director the deficiencies that they have observed in particular programs or in the program as a whole. If they feel there is a communications gap, they should say so. I think there has been quite a bit of change.

This morning, Ned Ostenso did refer to the report done on the overall program. That has not been distributed to us, and I think perhaps it was not done in that detail before; but it was distributed to us recently and I think that should go a long way toward going beyond a show and tell in the next meeting.

Mr. FORSYTHE. Your two annual meetings, how long do they last?

Ms. VESLEY. They are 2-day sessions.

Mr. FORSYTHE. Thank you.

Mr. STUDDS. Thank you very much.

Ms. VESLEY. Thank you very much. It has been a great pleasure to serve on this panel, and I thank you for inviting me today.

Mr. STUDDS. Let me say again that in the unlikely event that witnesses were not here this morning to hear this, we are limiting witnesses to 5 minutes and all written statements will appear in the record as if read in full. We will also limit members to questions of 5 minutes.

Our next panel is a panel of Marine Advisory Service directors, Dr. Carolyn Thoroughgood of the University of Delaware, Dr. Walter Gray of the University of Rhode Island, and Dr. Bruce Wilkins of the State University of New York and Cornell University.

[The prepared statements follow:]

PREPARED STATEMENT OF CAROLYN A. THOROUGHGOOD, COLLEGE OF MARINE STUDIES, UNIVERSITY OF DELAWARE, NEWARK AND LEWES, DEL.

Mr. Chairman and committee members, my name is Carolyn Thoroughgood and I am Executive Director of the Delaward Sea Grant College Program as well as Director of Marine Advisory Service. In these capacities, I have responsibility for overall Sea Grant program operations as well as management of our Advisory Service effort. Because of this dual administrative role, I have developed an appreciation for those factors which promote the intertwining of research and advisory service. Therefore, today I want to focus my remarks on the information and technology transfer function of Sea Grant, specifically:

1. Strategies for insuring research utilization.
2. The requirements for demonstration projects.
3. Adequate financial support.

1. Strategies for insuring research utilization

Much of the contact between Sea Grant and its clients comes through the Marine Advisory Service. The intermediary function that the marine advisory program serves in melding a university-agency-industry partnership is well-established. In its purest form, the advisory-research continuum begins with the marine resource user identifying a problem. The problem is then packaged and articulated by the marine advisor to the Sea Grant investigator. The researcher uses his professional talents and facilities to generate an answer to the problem. Finally, the advisor takes the product back to the client who uses the new knowledge to solve the problem. In practice, our experience has shown us that there are three key factors critical to the success of this scenario; they are: (1) joint planning, (2) joint appraisal, and (3) joint funding.

To exemplify the importance of these factors, I offer the following success story. In 1967, when the University of Delaware turned to marine resource users for identification of critical problem areas to be addressed by Sea Grant, the problem selected as highest priority was the need to revitalize the oyster industry. The value of oyster landings in Delaware had declined 99 percent during the period 1960-1967. This loss was due largely to the significant reduction of oyster stocks in the Delaware Bay region. Therefore, we launched a research program with the long-term goal to develop a commercially viable controlled environment mariculture process for producing the Eastern oyster. The accomplishments to date have been significant, including the identification of suitable algal diets for the oysters, the mass culturing of algae at concentrations never before achieved, and the production of oysters to market size in 36 weeks compared to the 36 months required in nature.

Even though the project has yet to reach its ultimate goal, there have been numerous spin-offs that have already reached users. MAS has functioned over this 12-year period as the link between the researchers and those who identified the problem. As a result, our techniques for the mass culturing of algae and the spawning of both oysters and clams have been adopted by several commercial hatcheries both in this country and abroad. The planting of natural shellfish beds has been undertaken in cooperation with Delaware's Department of Natural Resources and Environmental Control. Recognizing the need to distinguish planted animals from the natural inhabitants, we developed and patented a "branding" technique. Controlled-environment produced oysters have also been used by a private consulting firm for marine toxicological experiments; these oysters are particularly suited to serve as test animals for assessment of environmental quality because of their known genetic background and environmental history.

In addition to facilitating the direct application of research result, MAS has continued to sponsor sessions to promote dialogue between researchers and users. Further planning and project appraisal has occurred in semi-annual industry partner briefings for the past four years.

One measure of research significance is the level of user investment. This particular project has attracted the annual matching support of three industry partners and one foundation, plus a \$1.2 million grant from the Economics Development Administration to construct a new mariculture laboratory. With this level of involvement and commitment to date, the likelihood of utilization of final output has been increased.

2. The requirement for demonstration projects

Based on our experience with the mariculture project and several others, we have learned that one final step must be taken before research results can be fully adopted by the user; i.e., the operation of a demonstration project. Our industry partners have informed us that their decision to undertake the technical and financial responsibility for scale-up process or product evaluation invariably requires the estimation of capital investment and operational costs. Also important in their decision is the protection against encroachment by competition that is available through patents.

Currently, Sea Grant program funds are inadequate to support the transition from laboratory to pilot scale projects which are necessary to conduct economic and marketing studies. Yet, if the real supporter of the research, the taxpayer, is to benefit, the research must be launched into the commercial arena. It seems that Sea Grant might once again benefit from the example of Land Grant. In the Land Grant system, demonstration projects are handled at substations which are part of the state agriculture experiment stations.

Mariculture research is only one of several Sea Grant examples that I could cite that have matured to the point of demonstration. This step falls within the purview of advisory service, but will require a major increase in both human and financial

resources to be carried out effectively. To date, we at Delaware have progressed as far as we can afford in the establishment of such a field station component for mariculture. However, this prototype will require one more scale-up to be considered a pilot operation. There are other projects related to wave energy and chitin research which will require the same treatment to be fully exploitable by the user. The MAS already has committed a marine advisor to working with users of high technology research. He also has assisted numerous principal investigators in the preparation of patent applications. The fact remains however, that the "D" side of the R & D couplet represents significant costs and at present the funding of Sea Grant is not adequate to fully exploit the return-on-investment potential.

3. Adequate financial support

Because Sea Grant funding has barely kept pace with inflation and, at the same time, the expectations for Sea Grant have continued to expand, a competition for resources has developed among the three missions of Sea Grant—research, education, and advisory services. At Delaware, we turned to our Sea Grant Advisory Council, a 28-member group of marine resource users, to assist us in defining the optimal mix of projects. After much deliberation, they concluded that 60% of the funds should be programmed for research, 10% should be allocated to education, 20% should be earmarked for Marine Advisory Service, and 10% should be available for program management and quick response capability.

To date, we have been able to abide by their recommendation; however, it is proving to be quite a challenge. That area most likely not to be able to live within its budget is MAS. This, of course, is primarily due to the fact that there are full-time employees whose salaries are typically adjusted upward annually. With this economic reality, MAS personnel actively seek ways to pyramid the impact of their outreach efforts to accommodate the increased demands of our constituencies. When additional expertise is required, the most cost effective approach involves faculty on a part-time basis or uses any of several specialists retired from local industries. In addition MAS personnel have been successful in acquiring supplemental funds from a variety of matching sources to augment the dollars originally allocated for the MAS effort.

Entrepreneurship is exhibited not only by MAS personnel, but also Sea Grant researchers. The level of matching funds for Delaware Sea Grant has grown substantially and today our non-federal partners contribute almost as much to our Sea Grant effort as the federal government. The applied problems that we are being asked to address are not necessarily short-term or low cost. A capable talent pool has been assembled at Delaware and it is representative of the Sea Grant network at-large. Because of the meager funding history for Sea Grant, the network capabilities have never been fully accessed. The federal partner should not continue to expect disproportionate increases from other Sea Grant shareholders and it is time for the federal government to keep pace with other investors in the Sea Grant College Program.

This, Mr. Chairman, concludes my prepared statement. I will be pleased to answer any questions you may have.

PREPARED STATEMENT OF WALTER J. GRAY, DIRECTOR, MARINE ADVISORY SERVICE, UNIVERSITY OF RHODE ISLAND

Mr. Chairman and members of the subcommittee, my name is Walter Gray, and I am Director of the Marine Advisory Service at the University of Rhode Island. I also have the additional university titles of Assistant Provost for Marine Affairs, and Director of the Division of Marine Resources.

I am a newspaperman by training and a marine administrator by happenstance. I have been affiliated with the Sea Grant Program in Rhode Island almost since its inception; that is since 1968 when the first funds were distributed.

What I would like to accomplish, with your indulgence, in the time allotted to me is to talk a little bit about what we do in the Rhode Island advisory program and why we do it.

The State of Rhode Island is not a modest one, except in size. We are a microcosm of several coastal states in that we count among our resources Narragansett Bay, a vibrant commercial fishery, recreational boating and fishing, coastal hazard zones, tourism, shoreside industry, commercial shipping, and other water-related uses. A major boat builder who recently located in Rhode Island has commented that there probably is no more ideal a spot left in the world to attempt to secure a responsible marriage between industry and the environment.

In this setting, our Rhode Island marine advisory program has worked most closely with government agencies, commercial fishing interests, marina and boat-

yard owners and operators, recreational boaters, seafood processors and dealers, and elementary and secondary level schoolteachers. Our staff expertise is in resource economics, commercial fisheries training, seafood technology, environmental education, marine recreation, public information, and publications distribution. Each of our specialists is in daily contact with members of their user groups so that we obtain constant feedback, not only on projects we have conducted but on problems and opportunities of concern to people in the marine community. We are very conscious of the fact that our client's concerns come first, ahead of any perceived research interests of our faculty.

By way of background, about 27 percent of the total National Sea Grant budget is devoted to advisory services—just over \$9 million. There are currently 30 Sea Grant marine advisory programs with approximately 250 full-time equivalents in the network. There is an advisory program in every coastal and Great Lakes state except Indiana, Illinois and Pennsylvania. In addition, there are three regional Sea Grant advisory programs, one covering the Pacific coast, one for the Great Lakes network, and a third covering the New England states and New York.

The latter, called the New England Marine Advisory Service, is administered by a full-time individual who reports to a Board of Directors representing Sea Grant programs, the National Marine Fisheries Service, the New England Aquarium, and other agencies with an "extension" mission. The regional programs don't duplicate the local ones; rather, they assure that talent sharing and the transport of worthwhile projects across state lines takes place. As a founding member of the New England regional program, I am happy that it has worked so well.

It was my pleasure to appear before this committee during the last reauthorization hearings five years ago. It is illuminating to contemplate just how much happens during such intervals. For example, the 1970-75 period was start-up for most advisory programs. There were some false starts; some of us tripped a couple of times along the way; some institutions didn't really want to get involved in waterfront dialogues and others didn't know how; and fighting for turf within universities and with public agencies was a seemingly insurmountable barrier to progress.

Sensitivity and experience have guided advisory programs around these kinds of problems in the most recent five years, and the early hopes have become realities for the great majority of advisory programs. We have users who will testify to economic, environmental, and social benefits derived from advisory projects; we have scientists who find merit in conducting research that is applicable to everyday marine problems; and we have public and private agencies who welcome the broadened research base in colleges and universities which is helping them cope with management issues.

Essentially, advisory programs exist to educate people, teaching them how to make more money, how to do things more efficiently, how to use a resource wisely, and how to understand and appreciate the marine environment.

In Rhode Island, which I suggest to you is not at all atypical of advisory programs, we have made progress in the past five years in many areas. Our educational work with the commercial fishing industry in the introduction of new trawls and other gear has been well received and documented. Two-boat midwater trawling, the technique imported by us from the United Kingdom, has been widely used on the east coast, as has Scottish seining.

In addition to on-board commercial fisheries education work, we recently completed a partnership effort with a major Rhode Island seafood processor in the development of a multi-purpose processing plant which now allows the firm to process different fish species as supply and demand warrant. The processor's investment in this project was well over \$1 million, while ours was the time of the seafood technologist. Currently, we are working on the engineering of refrigerated seawater systems for installation on existing vessels at Point Judith.

In the area of marine recreation, we recently conducted at the University an international conference on hypothermia in cooperation with the Coast Guard, the Red Cross, and the Undersea Medical Society. Researchers, physicians and practitioners in the field of cold water survival attended the five-day conference, which was planned as the forerunner of further conferences and workshops in the various states. The subject has special applicability and interest to commercial and sports fishermen and offshore oil rig workers.

We initiated floating tire breakwater research in Rhode Island in cooperation with the Goodyear Tire and Rubber Co., with the objective of providing a low-cost method of dampening 2-3 foot waves around docks. There are now nearly one hundred of these breakwaters in use around the country, doing the job we envisioned. Currently, we are consulting with engineers at the U.S. Coast Guard Acade-

my on the feasibility of their establishing a floating tire breakwater at the Coast Guard station in Portsmouth, N.H.

We are involved in a lot of other projects. We conduct marina business courses for managers in various states; we offer diesel engine repair workshops; we run in-service and quality control workshops for NMFS; we attract funding from the National Science Foundation and the Office of Coastal Zone Management for our school and public education programs; we distribute about 40,000 copies of publications a year and we make as much use as possible of radio, TV, newspapers and trade publications to intensify our efforts in reaching our diverse clientele with information about our projects.

That's a thumbnail of who we are and what we do in Rhode Island. We do what we do because of our close ties to our user groups. This relationship fosters a climate which helps both sides understand what is necessary and what is possible.

Does what we do make a difference? Without reservation, I would say the answer is yes. We have better fishermen, better marina managers, better school teachers, better processors and a better informed citizenry as a result of our advisory efforts.

Finally, Mr. Chairman, in response to your letter of invitation to this hearing, the negative I would like to inject is that continuing Sea Grant projects such as advisory services require continuing funding.

Sea Grant budgets simply have not increased sufficiently to assure vigorous advisory work. Individual state Sea Grant directors have had two choices—either reduce advisory work as costs escalated or reduce research which provides the base for advisory work in order to keep the advisory services alive. Neither course can guarantee the retention of Sea Grant quality.

In my own state, we have followed the latter course. My advisory budget this year is 46 percent higher than in 1977 for a level effort program, but our total University Sea Grant has increased by only half of that, or 23 percent. This situation gives me great concern for the future, for to accomplish effective advisory work, we must continue and increase our cooperation with our University researchers. That isn't easy when the research base is eroding.

I know it isn't necessary to tell this committee that marine resource use is increasing in intensity, as are conflicts among users and the degree of citizen participation in decision-making. These are all conditions which increase the need and the payoff for quality advisory services based on first-rate research.

While industry and our state have increased their support for our advisory service from \$50,000 in 1977 to about \$168,000 in 1980, they cannot solve our problems alone, nor should they be expected to, for most of the work we do has had, and will continue to have, national and regional implications.

I realize, Mr. Chairman and members of the committee, that this is not a hearing on appropriations, but I ask that you use your influence with other members of the Congress to impress upon them the need to help the states and marine business and industry to protect the cooperative Sea Grant program from the sort of erosion it has had to endure in the last few years.

Thank you for allowing me to share these observations with you.

PREPARED STATEMENT OF DR. BRUCE T. WILKINS, PROGRAM LEADER, NEW YORK
SEA GRANT ADVISORY SERVICE

Mr. Chairman, members of the committee, my name is Bruce Wilkins and I am a member of Cornell University's faculty, as well as Associate Director and Program Leader for the Advisory Service of the New York Sea Grant Institute.

The National Sea Grant College Program has had major impact aiding people in New York resolve marine and Great Lakes coastal problems. I am pleased to speak in behalf of its reauthorization.

Earlier today Dr. Donald Squires, Director of the New York Sea Grant Institute, mentioned New York's Sea Grant College is a consortium of the State University of New York and Cornell University. Let me note Sea Grant programs have stimulated Colleges in New York, and in virtually every other state it has touched, to generate cooperative efforts and thus reducing duplication while using strengths of many colleges in a state.

Advisory Service activities in New York exemplify that use of existing strengths. Cornell University, as New York's Land Grant Institution, possesses in Cooperative Extension a long standing commitment and structure for implementing problem-solving, informal educational efforts similar to those of the Advisory Service. The vast geographic distances involved in New York's Great Lakes and marine coast required just such a broad flung network and Sea Grant's Advisory Service function was grafted to the existing Cooperative Extension network.

Sea Grant funds, together with those of the State and local government, support a field staff of 15 persons spread along New York's 2400-mile coastline. It is those field staff who serve as the main Sea Grant contact for the 15 million New Yorkers living in coastal counties. The field staff in New York are backstopped by persons on College campuses who have specific Advisory Service responsibility in each of five marine topics. Those topical areas are: Applied Shellfish Biology, Food Science, Nutritional Science, Marine Business Management, and Coastal Recreation.

In the few minutes I have it is not possible to detail all the impacts these Sea Grant staff have had in New York so I'll touch on just a few that emphasize the Advisory Service function.

Coastal erosion is a serious problem in New York and many other states. Nearly \$60 million was spent by New York residents between 1972 and 1976 in an attempt to avoid such damage, yet few individuals understand these hazards, or plausible means of avoiding some of the damage. The Advisory Service in New York has approached this problem in several ways including working with researchers identifying erosion-prone areas, as well as more effective protective devices. Demonstrations of modest control measures have been found helpful in some instances. Working with local Soil Conservation Service staff and state agencies, experimental slope stabilization plantings are being tested. Publications have been produced on how to control ground water seepage that contributes to bluff erosion.

Individuals must at times hire professionals to build protective devices, or to move structures from eroding bluffs. Such work along our Atlantic Coast is typically handled by contractors specializing in such work. Contractors with this expertise are less common on the Great Lakes and therefore less available to the landowner. Advisory Service staff using the experience of a Long Island contractors association stimulated formation of a Coastal Contractors Association among interested Lake Ontario firms. Interested contractors joined together for self-learning, and self-help. Homeowners can now get a list of contractors increasingly experienced in specific problems of shoreline erosion. This contractors group has also aided state coastal agencies and the Corps of Engineers, being a ready source of local coastal contractor experience and knowledge.

Management of the coastal zone is a critical and complex issue in New York. While the State's formal Coastal Zone Management Plan is still under review, Sea Grant has assisted in resolving problems related to appropriate allocation of space at the unique land and water interface. In one such case, local fishermen were being charged transient rates for season-long use of a town's docks. Their contact with local Advisory service field staff led to their requesting the Town Board to establish seasonal rates for permanent moorings, as is done elsewhere in the county. In preparation for the meeting with the Town Board, fishermen gained letters from nearby businesses attesting to the importance of this rather small number of boats to those businesses. The Town Board listened to their request and agreed to establish a seasonal rate. The fishermen will save \$15,000 each year, but in my eyes of even greater significance, they learned how a problem they faced could be effectively addressed and saw they could influence local government to act to resolve an undesirable situation. They now possess that knowledge and skill and can use them to resolve other problems they encounter.

Commercial fishermen in New York are faced with technical problems brought about by changing conditions. The Fishery Conservation and Management Act, and higher energy prices, have drastically affected fishing in our State. Sea Grant and its Advisory Service has responded. The New York dragger fleet has expanded and modernized. Between 1976 and 1979 there was a 50 percent increase in the number of documented fishing vessels, to over 200. Larger vessels and newer gear mean new problems. Meetings sponsored by Sea Grant, in cooperation with others, on trawl door design and energy-saving approaches have been of high interest to fishermen. As one told me "I lost the income from a day's fishing to attend this meeting, it was worth 10 days fishing."

Capital is needed to finance this rapid increase and changes in vessels. The National Marine Fishery Service's Capital Construction Fund, Farm Credit loans, a host of financing opportunities can be involved. Advisory Service staff in New York have aided local banks and investment groups identify opportunities, and hazards, associated with such financing. Several of those private groups now view loans to fishermen as an important area for their business, aiding the fishing industry and themselves.

With larger, more modern vessels, fishermen can now capture fish previously of prime interest to foreign fleets, whiting and squid for example. The increased availability means new markets must be found and Sea Grant research on new products from fish flesh is beginning to come to fruition. A supermarket chain in

upstate New York is now marketing products developed and tested by Sea Grant researchers. Those products use fresh water sucker. Similar activities are underway to develop alternative uses for salt water species and hopefully provide new markets for the increased supply of this protein previously little used in this country.

Exporting offers another new opportunity for markets for some non-traditional fish. Sea Grant together with the National Marine Fisheries Service has brought fishermen into contact with American exporters as well as Japanese and Polish representatives. Last year for the first time New York fishermen were exporting to Japan, the amounts were modest but reflect growing awareness of expansion to foreign markets.

Growth of New York's commercial fishing fleet has brought increased pressure on shoreside facilities. New docks and expanded services are needed by this growing fleet. New York's Coastal Management Program and the Economic Development Administration are involved with Sea Grant and local communities in facing up to these needs. Sea Grant Advisory Service's regional networks, specifically the New England Marine Advisory Service, has facilitated bringing together regional expertise and attention to this problem, again demonstrating the value of Sea Grant as a national, integrated network.

I have few suggestions for changes in the Sea Grant College Program Act. The tie of Advisory Service and research in this program must be maintained to insure research addresses current problems and that the results of that research get to those who need the findings.

One change I would urge is some means to insure the federal budget commitment to Sea Grant recognizes the need for some permanent staff. Most program managers, Advisory Service, and communication staff commit all of their professional energies to this work. Funds for salary increases are therefore necessary, or fewer dollars will remain for other Sea Grant functions. It was nearly a decade after its establishment that Sea Grant's Advisory Service function first attained 30 percent of the total program funds, a roughly appropriate proportion of funding in my view. There has been some slippage since then and that must be avoided. But of equal concern, salary increases can eat up portions needed in other program efforts. Maintenance of salaries is critical for an effective Advisory Service and I view an effective Advisory Service as essential to an effective Sea Grant Program in this country. Some provision is needed then to insure regular increases in the Sea Grant budget consonant with some increases in salaries. How such adjustment to base can best be assured is an area in which this Committee's guidance could be helpful.

The Department of Commerce has in recent years not requested funding needed to maintain the Sea Grant Program at current levels, much less permit its growth. I urge this Committee carefully review that problem and perhaps as a Committee request the Committee on Appropriations to recognize and respond to the need for an increase in appropriations for Sea Grant. The Appropriations Committee has been generally supportive of such requests.

Sea Grant has been successful in New York in increasing University research, education and Advisory Service directed toward aiding individuals and communities, resolve problems of the marine and Great Lakes coast. This progress has come in large part because of the interest, commitment, and support of the Congress to this program. It has been a pleasure to have this opportunity to bring you abreast of some of that progress.

STATEMENTS OF A PANEL CONSISTING OF DR. CAROLYN THOROUGHGOOD, UNIVERSITY OF DELAWARE; DR. WALTER GRAY, UNIVERSITY OF RHODE ISLAND; AND DR. BRUCE WILKINS, STATE UNIVERSITY OF NEW YORK AND CORNELL UNIVERSITY

Dr. THOROUGHGOOD. Mr. Chairman and committee members, my name is Carolyn Thoroughgood, and I am executive director of the Delaware sea grant college program as well as director of marine advisory service.

In these capacities, I have responsibility for overall sea grant program operations as well as management of our advisory service effort.

Because of this dual administrative role, I have developed an appreciation for those factors which promote the intertwining of

research and advisory service. Therefore, today, I want to focus my remarks on the information and technology transfer function of sea grant; specifically (1) strategies for insuring research utilization; (2) the requirement for demonstration projects; (3) adequate financial support.

STRATEGIES FOR INSURING RESEARCH UTILIZATION

Much of the contact between sea grant and its clients comes through the marine advisory service. The intermediary function that the marine advisory program serves in melding a university-agency-industry partnership is well established. In its purest form, the advisory-research continuum begins with the marine resource user identifying a problem.

The problem is then packaged and articulated by the marine advisor to the sea grant investigator. The researcher uses his professional talents and facilities to generate an answer to the problem. Finally, the advisor takes the product back to the client who uses the new knowledge to solve the problem. In practice, our experience has shown us that there are three key factors critical to the success of this scenario. They are: one, joint planning; two, joint appraisal, and three, joint funding.

I have described one of our success stories in the written document to substantiate these factors. There is one factor also and that is a requirement for demonstration projects.

THE REQUIREMENT FOR DEMONSTRATION PROJECTS

Based on our experience with the mariculture project and several others, we have learned that one final step must be taken before research results can be fully adopted by the user, that is, the operation of a demonstration project.

Our industry partners have informed us that their decision to undertake the technical and financial responsibility for scale-up process or product evaluation invariably requires the estimation of capital investment and operational costs. Also important in their decision is the protection against encroachment by competition that is available through patents.

Currently, sea grant program funds are inadequate to support the transition from laboratory to pilot scale projects which are necessary to conduct economic and marketing studies.

Yet, if the real supporter of the research, the taxpayer, is to benefit, the research must be launched into the commercial arena. It seems that sea grant might once again benefit from the example of land grant. In the land grant system, demonstration projects are handled at substations which are part of the State agriculture experiment stations.

Mariculture research is only one of several sea grant examples that I could cite that have matured to the point of demonstration. This step falls within the purview of advisory service, but will require a major increase in both human and financial resources to be carried out effectively.

To date, we at Delaware have progressed as far as we can afford in the establishment of such a field station component for mariculture.

However, this prototype will require one more scale-up to be considered a pilot operation. There are other projects related to wave energy and chitin research which will require the same treatment to be fully exploitable by the user. The MAS already has committed a marine advisor to working with users of high technology research. He also has assisted numerous principal investigators in the preparation of patent applications. The fact remains, however, that the development side of the research and development couplet represents significant costs and at present the funding of sea grant is not adequate to fully exploit the return-on-investment potential.

ADEQUATE FINANCIAL SUPPORT

Because sea grant funding has barely kept pace with inflation and, at the same time, the expectation for sea grant has continued to expand, a competition for resources has developed among the three missions of sea grant: research, education, and advisory services.

At Delaware, we turned to our sea grant advisory council, a 28-member group of marine resource users, to assist us in defining the optimal mix of projects. After much deliberation, they concluded that 60 percent of the funds should be programed for research, 10 percent should be allocated to education, 20 percent should be earmarked for marine advisory service, and 10 percent should be available for program management and quick response capability.

To date, we have been able to abide by their recommendation; however, it is proving to be quite a challenge. That area most likely to be able to live within its budget is MAS.

This, of course, is primarily due to the fact that there are full-time employees whose salaries are typically adjusted upward annually. With this economic reality, MAS personnel actively seek ways to pyramid the impact of their activities.

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Entrepreneurship is exhibited not only by MAS personnel, but also sea grant researchers. The level of matching funds for Delaware sea grant has grown substantially and today our non-Federal partners contribute almost as much to our sea grant effort as the Federal Government.

The applied problems that we are being asked to address are not necessarily short-term or low cost. A capable talent pool has been assembled at Delaware and it is representative of the sea grant network at large.

Because of the meager funding history for sea grant, the network capabilities have never been fully assessed. The Federal partner should not continue to expect disproportionate increases from other sea grant shareholders and it is time for the Federal Government to keep pace with other investors in the sea grant college program.

This, Mr. Chairman, concludes my prepared statement. I will be pleased to answer any questions you may have.

Mr. STUDDS. Thank you very much.

Dr. Gray?

Dr. GRAY. It was my pleasure to appear before this committee during the last reauthorization hearings 5 years ago. It is illuminating to contemplate just how much happens during such intervals.

For example, the 1970-75 period was startup for most advisory programs. There were some false starts; some of us tripped a couple of times along the way; some institutions didn't really want to get involved in waterfront dialogs and others didn't know how; and fighting for turf within universities and with public agencies was a seemingly insurmountable barrier to progress.

Sensitivity and experience have guided advisory programs around these kinds of problems in the most recent 5 years, and the early hopes have become realities for the great majority of advisory programs. We have users who will testify to economic, environmental, and social benefits derived from advisory projects; we have scientists who find merit in conducting research that is applicable to everyday marine problems; and we have public and private agencies who welcome the broadened research base in colleges and universities which is helping them cope with management issues.

Essentially, advisory programs exist to educate people, teaching them how to make more money, how to do things more efficiently, how to use a resource wisely, and how to understand and appreciate the marine environment.

In Rhode Island, which I suggest to you is not at all atypical of advisory programs, we have made progress in the past 5 years in many areas.

Our educational work with the commercial fishing industry in the introduction of new trawls and other gear has been well received and documented.

Two-boat midwater trawling, the technique imported by us from the United Kingdom, has been widely used on the east coast, as has Scottish seining.

In addition to on-board commercial fisheries education work, we recently completed a partnership effort with a major Rhode Island seafood processor in the development of a multipurpose processing plant which now allows the firm to process different fish species as supply and demand warrant. The processor's investment in this project was well over \$1 million, while ours was the time of the seafood technologist. Currently, we are working on the engineering of refrigerated seawater systems for installation on existing vessels at Point Judith.

We initiated floating tire breakwater research in Rhode Island in cooperation with the Goodyear Tire & Rubber Company, with the objective of providing a low-cost method of dampening 2- to 3-foot waves around docks. There are now nearly 100 of these breakwaters in use around the country, doing the job we envisioned.

We are involved in a lot of other projects.

We conduct marine business courses for managers in various States; we offer diesel engine repair workshops; we run in-service and quality-control workshops for the National Marine Fisheries Service personnel; we attract funding from the National Science Foundation and the Office of Coastal Zone Management for our

school and public education programs; we distribute about 40,000 copies of publications a year and we make as much use as possible of radio, TV, newspapers and trade publications to intensify our efforts in reaching our diverse clientele with information about our projects.

Sea grant budgets simply have not increased sufficiently to assure vigorous advisory work. Individual State sea grant directors have had two choices—either reduce advisory work as costs escalated or reduce research which provides the base for advisory work in order to keep the advisory services alive. Neither course can guarantee the retention of sea grant quality.

In my own State, we have followed the latter course. My advisory budget this year is 46-percent higher than in 1977 for a level effort program, but our total university sea grant has increased by only half of that, or 23 percent.

This situation gives me great concern for the future, for to accomplish effective advisory work, we must continue and increase our cooperation with our university researchers. That is not easy when the research base is eroding.

Thank you.

Dr. Wilkins?

Dr. WILKINS. Mr. Chairman and members of the committee, my name is Bruce Wilkins and I am a member of Cornell University's faculty as well as associate director and program leader for the advisory service of the New York Sea Grant Institute.

The national sea grant college program has had a major impact aiding people in New York to resolve marine and Great Lakes coastal problems.

I am pleased to speak in behalf of its reauthorization.

Others have pointed out that sea grant programs have stimulated colleges in New York, and in virtually every other State it has touched, to generate cooperative efforts and thus reduce duplication while using strengths of many colleges in a State.

Advisory service activities in New York exemplify that use of existing strengths. Cornell University, as New York's land grant institution, possesses in cooperative extension a long-standing commitment and structure for implementing problem-solving, informal educational efforts similar to those of the advisory service.

The vast geographic distances involved in New York's Great Lakes and marine coast required just such a broad-flung network and sea grant advisory service function was grafted to the existing cooperative extension work—coopting them as you suggested this morning. We have been able to do that effectively.

Sea grant funds, together with those of the State and local government, support a field staff of 15 persons spread along New York's 2,400-mile coastline. It is those field staff who serve as the main sea grant contact for the 15 million New Yorkers living in coastal counties.

The field staff in New York are back-stopped by persons on college campuses who have specific advisory service responsibilities in each of five marine topics. Those topical areas are: applied shellfish biology, food science, nutritional science, marine business management, and coastal recreation.

In the few minutes I have, it is not possible to detail all the impacts these sea grant staff have had in New York so I will touch on just a few that emphasize the advisory service function.

Coastal erosion is a serious problem in New York and many other States. Nearly \$60 million was spent by New York residents between 1972 and 1976 in an attempt to avoid such damages, yet few individuals understand these hazards, or plausible means of avoiding some of the damages.

The advisory service in New York has approached this problem in several ways, including working with researchers identifying erosion-prone areas, as well as more effective protective devices, as Walter just mentioned.

Individuals must at times hire professionals to build protective devices, or to move structures from eroding bluffs. Such work along our Atlantic coast is typically handled by contractors specializing in such work. Contractors with this expertise are less common on the Great Lakes and therefore less available to the landowner.

Advisory service staff using the experience of a Long Island contractor's association stimulated formation of a coastal contractor's association among interested Lake Ontario firms. Interested contractors joined together for self-learning, and self-help. Homeowners can now get a list of contractors increasingly experienced in specific problems of shoreline erosion. This contractor's group has also aided State coastal agencies and the Corps of Engineers, being a ready source of local coastal contractor experience and knowledge.

I would like to share just one of those with you:

A small number of vessels, six or seven in a community, are being charged mooring fees on a daily basis. I happened to be with them that day when they met with the advisory service specialist in their area. He said, "You have to talk to the town board." They said, "We will do that." Also, they were helped in recognizing it would be valuable if they could speak to the rest of the community that also realized the need for their services. They did that. They went to the town board, with the support of other individuals and were able to get their request granted to establish a seasonal rate as occurs in most other communities. Those people will save \$12,000 a year; that small group of individuals. But in my eyes, of greater significance is that the small group of local citizens found they could effectively affect local government. In my mind, the money saved was less important than the fact that those individuals now have the knowledge, now have the skill, now have the experience, that if a similar problem arises, they know how to address that problem in getting a resolution. I could go on.

I think in trying to save some time, I will not go over other areas that have been gone over, but point out some new areas in product development.

We have seen in New York State developed by sea grant and picked up by the private sector this idea but I think others have commented on most of the matters in my testimony so I will close now.

Mr. STUDDS. Let me ask each of you, do you have anything analogous to the county extension in the agricultural program?

Dr. WILKINS. We do in New York, I think the most analogous, because of the great geographic distances in our coastlines.

Mr. STUDDS. So you explicitly have personnel assigned to coastal counties?

Dr. WILKINS. They actually cover more than one county, two counties, or three.

Mr. STUDDS. How about in other instances?

Dr. GRAY. Well, Rhode Island has a limited number of counties. We have five counties. We follow the policy of hiring specialists and in the agricultural context they would be located within the college of agriculture serving the needs of the extension agent who would be in the field. We only have specialists, and find it works effectively.

Dr. THOROUGHGOOD. We have three counties in Delaware. Our advisory agents are called agent specialists and perform both functions. They have statewide responsibility.

Mr. STUDDS. Generally speaking, if I were to walk into any coastal community and walk up to the captain of a fishing vessel and say, "sea grant," would he know what I was talking about, assuming I put it into a sentence?

Dr. WILKINS. A substantial portion of them would, not all of them. But I know a significant portion of them would.

Dr. THOROUGHGOOD. The same is the case in Delaware.

Mr. STUDDS. Rhode Island?

They would know at Point Judith?

Dr. GRAY. They would know at Point Judith, and they would be satisfied or dissatisfied with the services. It is a very vocal community.

In many cases where they could not identify sea grant, they probably would identify closely with the University of Rhode Island or the person who is on the scene daily.

Mr. STUDDS. I notice we have some new unavoidable jargon such as the "user community." I am against phrases like that. But these words come up.

Dr. GRAY. We use a lot of different terms.

Dr. WILKINS. Just the point that I think the significant element related to that is, we do try to identify particular audiences than with whom we are going to focus efforts. Sometimes people say, are you working with the public? My answer is, "No." We are working with segments of that public. So we can have impact on the community.

You identified specifically fishermen on the waterfront. That is an audience, in my mind.

If you said, do you talk to people on Long Island, I would say, no.

Mr. STUDDS. You said all of that without that awful phrase.

Mr. PRITCHARD. I have no questions.

Mr. STUDDS. Mr. Forsythe?

Mr. FORSYTHE. Because Delaware is across the river from New Jersey, I have had an interest in the oyster program there—how long has it been going on?

Dr. THOROUGHGOOD. It was the very first project we had in 1968. That was the first sea grant proposal we had. This is a success story that is included in the written documents, because the major problem that we were asked to address is revitalization of the

oyster industry in Delaware. That program has taken a number of different turns, but the program is still under way.

Mr. FORSYTHE. You made a very significant point of the necessity of moving to demonstration projects from the pilot program, which is the case with the sea grant program in Delaware. There really has not been sufficient—interest is not the word—but enthusiasm among the commercial community to move in and take this research through that next step.

Dr. THOROUGHGOOD. The problems we have are a controlled-environment process. It is a high-technology process. We do have support for the demonstration projects that we are currently building right now.

The system, however, is a small system and our industry partners tell us before they are convinced that it is economically viable, we have to scale up one more time so there is investment. But there is this gray area of who has responsibility for this demonstration, larger-scale facilities that need to be resolved. That is not just with the oyster project.

Mr. FORSYTHE. A few years ago, I was very enthusiastic about what we had to do at the Federal level in moving these programs into the commercial area. But with the fiscal restraints we are all working under, I am kind of distressed that there is no way we can get these to the point where the private sector gets going. I know there are some that have moved into commercial use directly from the sea grant type operation. But these bigger things are more complicated. I guess we still have a major problem.

Dr. THOROUGHGOOD. That is true. We have industry partners currently involved. It may get to the point where we have to encourage one single company to make a major investment. This is something that we are certainly exploring. But I think that we need not underestimate the amount of costs that are associated with running a facility 7 days a week, 24 hours a day, and this is critical to the overall assessment. That is the cost I am talking about. It is the human cost as well as the additional straight bucks for capital costs.

Mr. FORSYTHE. I fully agree.

Thank you.

Mr. STUDDS. Thank you very much.

Our next panel will be a panel of marine advisory service agents, Mr. William DuPaul of the Virginia Institute of Marine Sciences and Mr. Donald Webster of Cambridge, Md.

Welcome to the subcommittee and to the 5-minute constraint. [The prepared statement follows:]

PREPARED STATEMENT OF WILLIAM DUPAUL, VIRGINIA INSTITUTE OF MARINE SCIENCE

My name is William DuPaul. I have a Ph.D. in Marine Science and currently serve as the Director of the Sea Grant Marine Advisory Program at the College of William and Mary and the Virginia Institute of Marine Science. I have substantial experience in education as an Associate Professor at the Massachusetts Maritime Academy from 1973-1977. I also have experience as a commercial fisherman, working on fishing vessels from New Bedford and Gloucester, Massachusetts.

My Marine Advisory Program has activities in several areas of concern for present and future users of marine resources. Our main activities center around areas such as—commercial fisheries where we are involved in introducing new harvesting technology for our growing offshore fisheries. We have a substantial

program commitment to provide technical assistance to property owners, cities and counties in need of low cost shoreline erosion protective devices. We have a Marine Advisory Specialist working with the marine trades and recreational fisheries sector. Our largest commitment is in the areas of marine education (K-12) where we are working with school systems, science centers and other educational institutions to introduce marine related curricula and materials into the daily mainstream of activities.

From my present position and past experience I have had the opportunity to view the Marine Advisory Services from different perspectives. But in the last analysis, I perceive the Advisory Services as a mechanism by which users of marine resources at all levels have access to research capabilities, specialized talents and information pools that were previously difficult to reach. As an access mechanism, Advisory Services have established working relationships with user groups and have channeled their needs to appropriate research and educational institutions. Basically this process results in one or all of the following: (1) research projects directed to meet the needs of the constituency, (2) advisory services reacting in an educational mode with workshops, seminars or demonstration projects or (3) the publication of useable information designed to educate and inform user groups.

This mechanism works with differing degrees of success. Factors such as the difficulty of the problem, how well the problem is perceived, and the availability of technical know how are only a few of the variables that are of concern and can be identified. Factors that constantly beleaguer Marine Advisory Programs are budgetary constraints, the sheer number of problems that exist, the complexity of identifying user groups and their appropriate spokesman, different user groups competing for the same resource—and all wanting a bigger piece of the pie.

In this context, the appropriate use of industry advisory panels that reflect the legitimate marine interest in a state can be invaluable in identifying real problems, assigning priorities and helping us to realize that we can't satisfy every demand. To this end I feel that Sea Grant has made extraordinary advances to work with the many diverse marine industry associations, work groups, and regulatory agencies in order to ascertain where we are going in the future.

The establishment and use of an industry advisory panel is a criteria set for evaluating my program and others around the country by the Office of Sea Grant. I feel it has worked well for us in Virginia and we will continue to utilize an industry advisory panel in helping us to better develop our Sea Grant Program.

STATEMENTS OF A PANEL CONSISTING OF WILLIAM DUPAUL, VIRGINIA INSTITUTE OF MARINE SCIENCE AND DONALD W. WEBSTER, CAMBRIDGE, MD.

Mr. DuPAUL. My name is William DuPaul. I have a Ph. D. in marine science and currently serve as the director of the Sea Grant marine advisory program at the College of William and Mary and the Virginia Institute of Marine Science. I have substantial experience in education as an associate professor at the Massachusetts Marine Academy from 1973 to 1977. I also have experience as a commercial fisherman, working on fishing vessels from New Bedford and Gloucester, Mass.

My maritime advisory program has activities in several areas of concern for present and future users of marine resources.

Our main activities center around areas such as commercial fisheries, where we are involved in introducing new harvesting technology for our growing offshore fisheries.

We have a substantial program commitment to provide technical assistance to property owners, cities, and counties in need of low-cost shoreline erosion protective devices.

We have a marine advisory specialist working with the marine trades and recreational fisheries sector. Our largest commitment is in the areas of marine education, K-12, where we are working with school systems, science centers and other educational institutions to introduce marine related curricula and materials into the daily mainstream of activities.

I have been asked to give my opinion as to what marine advisory services are and how I perceive its function. This is very difficult to do in a few minutes. However, from my present position and past experience I have had the opportunity to view the marine advisory services from different perspectives.

In the last analysis, I perceive the advisory services as a mechanism by which users of marine resources at all levels have access to research capabilities, specialized talents and information pools that were previously difficult to reach. I think that is an important point to make.

As an access mechanism, advisory services have established working relationships with user groups and have channeled their needs to appropriate research and educational institutions.

Basically, this process results in one or all of the following:

One, research projects directed to meet the needs of the constituency; two, advisory services reacting in an educational mode with workshops, seminars or demonstration projects; or three: the publication of usable information designed to educate and inform user groups.

This mechanism works with differing degrees of success. Factors such as the difficulty of the problem, how well the problem is perceived, and the availability of technical know-how are only a few of the variables that are of concern and can be identified. Factors that constantly beleaguer marine advisory programs are budgetary constraints, the sheer number of problems that exist, the complexity of identifying user groups and their appropriate spokesman, different user groups competing for the same resource—and all wanting a bigger piece of the pie.

In this context, the appropriate use of industry advisory panels that reflect the legitimate marine interest in a State can be invaluable in identifying real problems, assigning priorities and helping us to realize that we can't satisfy every demand. To this end, I feel that sea grant has made extraordinary advances to work with the many diverse marine industry associations, work groups, and regulatory agencies in order to ascertain where we are going in the future.

The establishment and use of an industry advisory panel is a criteria set for evaluating my program and others around the country by the Office of Sea Grant.

I feel it has worked well for us in Virginia and we will continue to utilize an industry advisory panel in helping us to better develop our sea grant program.

I have brought along with me today a member of our advisory panel who will be speaking to you later.

Mr. STUDDS. Thank you very much.

Mr. Webster?

Mr. WEBSTER. I appreciate the opportunity to be here today.

I am Donald Webster, the marine advisory service agent for the University of Maryland's sea grant program, which position I have occupied now for more than 5½ years. I was the first Maryland advisory agent and I took the position because it was a ground-floor position and I desired to develop and offer some new programs for the watermen of our State.

We started our program back in the early part of 1970. I am sure, Mr. Studds, that you are well aware of some of the problems which the fishermen have had with the Internal Revenue Service.

We put together a program of tax related recordkeeping materials for watermen. We are now in the second revision and the fourth printing of these publications are in use in all of the coastal States, two provinces of Canada, and four other foreign nations.

We expanded our program to business management information and jumped into quite a few different areas. We have done a great deal of work on financial assistance programs and have specific fact sheets on different programs available to watermen.

One fact sheet we have is on how to put together a loan package and is distributed by the Small Business Administration to watermen. Through industry involvement, we expanded our program into marine engineering systems such as hydraulics for small boat fishermen. This program, which we have had for several years has been given in other parts of the country such as Massachusetts where we were invited 2 years ago by Doug Coughenhougher to participate in an MIT sponsored workshop. We have other ones now on D.C. boat wiring systems and will be adding more overtime as needs are identified by industry. We have programs in seafood waste treatment and disposal where we are trying to help seafood processors to meet the EPA requirements on overboard discharge. We have recently gotten into aquaculture, specifically oyster culture in the State of Maryland to help our faltering oyster fishery.

I should like to take a few minutes and talk about the recent GAO report on sea grant.

I was a part of that. I spent about 4 hours on the phone with GAO investigators and had them down at one point to my office for a morning discussion.

What came out of that, I believe, was a rather myopic look at sea grant. It was my impression from talking with the investigators who came down to Horn Point that they were looking only for one thing and that was a dollar's worth of industrial plant somewhere for a dollar's worth of sea grant research money in programs transferred to industry through the marine advisory program. They seemed to think that the marine advisory service was only the link connecting the chains of industry and sea grant research. In fact, we in the marine advisory service connect many more chains than that.

We are frequently used by watermen, processors, and packers for contact with Federal and State agencies and other groups basically because they trust us. We are readily accessible and out there on the docks and in the plants just about every day of the week.

As far as I am concerned, as a marine advisory agent I work 24 hours a day 7 days a week. I do the bulk of my business out of my home in the evening. We are one of industry's few contacts who are not regulatory and not enforcement. We deal in trust and service and are trying to help people solve their problems.

I take issue also with some of the definitions regarding perceptions of basic versus applied research that the General Accounting Office investigators were looking at. They seemed to be interested only in the relationship between watermen and research and how that functioned. Many of the research programs of the University

of Maryland deal with different clientele groups—not just commercial watermen. Several of the research areas in Maryland's program have dealt with the discipline of microbiology. Some of these were, for example, to come up with a quicker, more accurate test for the classification of shellfish-growing waters. That, to me, is an applied research program.

The clientele group in this instance would have been the State health department. If you can come up with a better test, you can open and close public grounds a lot faster. Watermen would have been a secondary clientele group benefitting by having more bottom opened for commercial harvest.

A great deal of oyster research has gone on at the University of Maryland. Several of these projects deal with the problems we are having with reproductive failures in Bay oysters—our most important resource. One possible reason considered was that since oysters are hermaphroditic—maybe the ratio of males to females was not in balance. Researchers investigated this and found that it was not a problem. That, to me, is something that amounts to addressing a possible answer to a severe problem.

But as a marine advisory agent, it is hard for me to go out to the docks and shout out to a departing captain, "Don't worry; your oysters are in the proper sex ratio."

Many of the aquaculture projects that have been funded I believe will in very short order help the declining oyster industry. We are also looking at problems of crab waste disposal. We believe that we may be able to tie in the Departments of Resource Economics, Microbiology, Agricultural Engineering, Poultry Science, with the marine advisory program as a delivery system, extracting protein from crab waste, putting it into a matrix and using it as bait to catch more crabs and getting rid of some of the solid waste disposal problems we have in the crab industry which may soon put some of the smaller plants out of business.

We have also over the years involved the fishermen in sea grant research actually getting them out on the boats to go on research cruises with us. This has been very successful. We ran one last year and had 106 people come out with us over 2 weeks. It is a way for them to meet resource managers and scientists while on neutral territory and discuss industry problems and, hopefully, find out more about each other's concerns.

Thank you, sir.

Mr. STUBBS. I guess the overall question both of you addressed in the course of your remarks is: Is it working and is it getting to the communities that are involved? I take it from what both of you have said that in your judgment, it is working. Of course, you are prejudiced, because if it were not working, you would be indicting yourselves, so I should not ask you that.

Mr. DUPAUL. I have had an opportunity to look at it from various perspectives. Now I am on this side of the fence and I believe the idea is dynamite and I think it can work and it is working.

But to say that everything is going on real smooth—I don't think we can say that yet. But I think we have the mechanism by which we can work with the people working in the marine environment, whether they be commercial fishermen or recreational people or

what have you. I think sea grant and marine advisory service is a very appropriate mode to reach those means.

Mr. STUDDS. Mr. Webster, can you testify to the fact that the Federal Government is relating to some of Mr. Bauman's constituents on Chesapeake Bay?

Mr. WEBSTER. Yes. I, like Mr. DuPaul, went to the University of Rhode Island and fished commercially in Boston, Point Judith, and the Chesapeake before joining sea grant. I am seeing things from both sides of the fence. Quite frankly, if I didn't believe I wasn't doing any good, I would have gotten out of this job long ago.

Mr. STUDDS. You have been a fisherman yourself?

Mr. WEBSTER. Yes.

Mr. STUDDS. In the Boston area?

Mr. WEBSTER. Yes, on the Old Colony.

Mr. STUDDS. Thank you.

Mr. FORSYTHE. Mr. DuPaul, one thing struck me.

You say your largest commitment is in the area of marine education, K-through 12.

Mr. DUPAUL. That is my particular marine advisory program in which we work with children from kindergarten through high school in helping the students and the teachers—by way of the teachers—introduce marine-related materials on the environment and what is happening can be incorporated into their day-to-day activities.

Many of the teachers in school sometimes do not have that technical background or the capabilities for access of the material and that is part of my program in Virginia, to make sure that these teachers have the capability to work with the marine environment in their day-to-day environment.

Mr. FORSYTHE. Basically, a broad marine environment?

Mr. DUPAUL. We are not teaching them how to do anything. We are showing them and saying that the marine environment is an important part of your life and the teachers and the students realize that now. I think we have been very successful.

Mr. FORSYTHE. Down the road it can be very useful.

Mr. DUPAUL. These are the people we have to deal with in the future when it comes to the marine environment.

Mr. FORSYTHE. I am very impressed with your presentations. I think you are getting through. Thank you.

Mr. STUDDS. Next we have a panel of marine advisory service users, Mr. Travers Mayhew and Mr. Sparky Woodland.

[Prepared statement follows:]

PREPARED STATEMENT OF TRAVERS O. MAYHEW, NEWPORT NEWS, VA.

Mr. Chairman, my name is Travers O. Mayhew, I am the owner of Davis Boat Works in Newport News, Virginia. I would like to tell you a little about my association with the Sea Grant Program and particularly the Advisory Services.

Davis Boat Works is in the boat repair business and we work on government boats, commercial vessels, and pleasure boats. It is through the recreational end of it that I became involved in helping to organize what we called a marine trades association. It was composed of dealerships, marinas, and repair firms which serve the recreational boating field. One of the group's original purposes, in addition to the lofty aims you normally find in bylaws, was to try and survive through the gas crisis of 1973. Most of us did survive, and most realized that we needed a continuing association to share ideas and goals with fellow businessmen.

We notices at these early meetings, and at many since then, there was a young man off in the corner who listened intently and harbored a wealth of information and experience. This was the Sea Grant man. And, as we came to know him, we found he could speak as well.

The man's knowledge came from his contacts at Sea Grant and the Virginia Institute of Marine Science, from reading everything he could find on recreational boating, and from attending endless numbers of meetings, hearings, seminars and interviews in the field. We grew to depend on him as a catalyst and as a source of information—who do we contact in the State Government regarding this problem?—what is that group's position on this issue?—why do they think that way?—is there really a boat sewage problem? The Advisory Services man always had, or quickly found, the information we needed. I think this is due to his unique position of being close to the research organization, in touch with the vast amount of information that Sea Grant generates, and informed about the ways of education and the state government.

I can illustrate the function that Advisory Services played by reviewing the controversy in Virginia regarding Marine Sanitation Devices and pump-out facilities at marinas. The Congress, as you know, passed the Clean Water Act of 1977, which resulted in the EPA and Coast Guard regulations regarding MSDs. The regulations said that no raw sewage could be discharged. If a boat had a head it must be of a type that effectively treats the sewage or it must store the sewage in a holding tank for discharge later at a shore side facility. The State Health Department in Virginia felt that the state's oyster beds needed greater protection so they issued regulations outlawing any discharge—thus requiring the use of a holding tank. The result of this difference of approach was mass confusion and animosity.

The Virginia boater didn't like either approach but at the least wanted the Federal option. The marine operators refused to install pump out facilities because they thought the whole approach was ineffective and they didn't want to get in the sewage handling business. The oystermen stood behind the Health Department because they didn't want anymore oyster beds closed. The Health Department was adamant against any discharge at all.

The Advisory Service's first role in this confrontation was in the dissemination of information. In the early days of the controversy, and even now, there was a lot of misinformation and untruths being circulated. Sea Grant sent out literature, attended meetings to explain the various laws and positions, publicized notices of hearings on the matter, and even sponsored a workshop on marina pollution problems which provided a direct exchange between the operators and state officials.

Later, it appeared that one group was being played against the other. The Advisory Services representatives for Commercial Fishing and for Recreational Boating arranged a meeting between the Marine Trades Association (representing marinas), Seafood Council, Oyster Packers, and Watermen. Here their function was one of catalyst—not guiding the discussion but of providing information and interpretation when appropriate. The result of the meeting was a better understanding between the groups and agreements on some portions of the problem.

The Health Department, as part of its pollution control effort, had set up shellfish bed closings around marinas of one-eighth, one-fourth, or one-half mile radius depending on the number of boats at the marina. We in the industry felt this was totally arbitrary and not supported by any facts. We found the Health Department had done no research to establish these condemned zones but had merely taken a few random samples. Advisory Services told us of other studies in the field, but they were unspecific on this question and really didn't define the problem. Because of our urgings and their own recognition of the need, Advisory Services prevailed on Sea Grant to propose research in this area. Three projects have now been funded which will look into the problem of marina pollution. We look on this as a good start in the direction of replacing supposition with fact.

I can certainly recommend the continuation of Advisory Services as an effective arm of Sea Grant.

The matter of choosing which projects should be studied is vital to Sea Grant's effectiveness. The Unit at Virginia Institute of Marine Science has formed an Advisory Panel of water users to advise on the selection of projects. I have served on this panel since it was formed about two years ago. While the effectiveness of our panel has yet to be refined, I think the idea is sound. You can expect such a panel to recommend projects of a short term practical nature. This will be balanced by the theoretical influences in the system so you should come up with a mixed program. It seems to me that the program has been slanted in the past too much toward pure research with minimal practical results.

Thank you for this opportunity to share experiences with Sea Grant with you.

STATEMENTS OF A PANEL OF MARINE ADVISORY SERVICE
USERS, CONSISTING OF TRAVERS MAYHEW, DAVIS
BOATWORKS, NEWPORT NEWS, VA.; AND SPARKY WOOD-
LAND, DORCHESTER CRAB CO., WINGATE, MD.

Mr. MAYHEW. My name is Travers Mayhew. I am the owner of Davis Boatworks in Newport News, Va. My work is in the boat-repair business and we work on Government boats, commercial boats, pleasure boats, and vehicles. It was through the recreational end of it that I became involved in what we call a marine trades association. It was composed of dealerships, marinas, and repair firms which serve the recreational boating field. One of the group's original purposes, in addition to the lofty aims you normally find in bylaws, was to try and survive through the gas crisis of 1973. Most of us did survive, and most realized that we needed a continuing association to share ideas and goals with fellow businessmen.

We noticed at these early meetings, and at many since then, there was a young man off in the corner who listened intently and harbored a wealth of information and experience. This was the sea grant man. And, as we came to know him, we found he could speak as well as he could listen.

The man's knowledge came from his contacts at sea grant and the Virginia Institute of Marine Science, from reading everything he could find on recreational boating, and from attending endless numbers of meetings, hearings, seminars and interviews in the field. We grew to depend on him as a catalyst and as a source of information—who do we contact in the State government regarding this problem? What is that group's position on this issue? Why do they think that way? Is there really a boat sewage problem?

The advisory services man always had, or quickly found, the information we needed. I think this is due to his unique position of being close to the research organization, in touch with the vast amount of information that sea grant generates, and informed about the ways of education and the State government.

I can illustrate the function that advisory services played by reviewing the controversy in Virginia regarding marine sanitation devices and pump-out facilities at marinas. The Congress, as you know, passed the Clean Water Act of 1977, which resulted in the EPA and Coast Guard regulations regarding MSD's. The regulations said that no raw sewage could be discharged overboard. If a boat had a head it must be of a type that effectively treats the sewage or it must store the sewage in a holding tank for discharge later at a shoreside facility. The State health department in Virginia felt that the State's oyster beds needed greater protection so they issued regulations outlawing any discharge—thus requiring the use of a holding tank. The result of this difference of approach was mass confusion and animosity.

The Virginia boater didn't like either approach but at the least wanted the Federal option. The marina operators refused to install pump-out facilities because they thought the whole approach was ineffective and they didn't want to get in the sewage-handling business. The oystermen stood behind the health department because they didn't want any more oyster beds closed. The health department was adamant against any discharge at all.

The advisory service's first role in this confrontation was in the dissemination of information. In the early days of the controversy, and even now, there were a lot of misinformation and untruths being circulated. Sea grant sent out literature, attended meetings to explain the various laws and positions, publicized notices of hearings on the matter, and even sponsored a workshop on marina pollution problems which provided a direct exchange between the operators and State officials.

Later, it appeared that one group was being played against the other by the health department. The advisory services representatives for commercial fishing and for recreational boating arranged a meeting between the Marine Trades Association—representing marinas—seafood council, oyster packers, and watermen. Here the advisory services' function was one of catalyst—not of guiding the discussion but of providing information and interpretation when appropriate. The result of the meeting was a better understanding between the groups and agreement on some portions of the problem.

The health department, as part of its pollution control effort, had set up shellfish bed closings around marinas of $\frac{1}{8}$ -, $\frac{1}{4}$ -, or $\frac{1}{2}$ -mile radius depending on the number of boats at the marina. We in the industry felt this was totally arbitrary and not supported by any facts. We found the health department had done no research to establish these condemned zones but had merely taken a few random samples. Advisory services told us of other studies in the field, but they were unspecific on this question and really didn't shed any light on the problem. Because of our urgings and their own recognition of the need, advisory services prevailed on sea grant to propose research in this area. Three projects have now been funded which will look into the problem of marina pollution. We look on this as a good start in the direction of replacing supposition with fact.

I can certainly recommend the continuation of advisory services as an effective arm of sea grant.

The matter of choosing which projects should be studied is vital to sea grant's effectiveness. The unit at Virginia Institute of Marine Science has formed an advisory panel, as Mr. DuPaul said, of water users to advise on the selection of projects. I have served on this panel since it was formed about 2 years ago. While the effectiveness of our panel has yet to be refined, I think the idea is sound. You can expect such a panel to recommend projects of a short-term, practical nature. This will be balanced by the theoretical influences in the system so you should come up with a mixed program. It seems to me that the program has been slanted in the past too much toward pure research with minimal practical results.

Thank you for this opportunity to share experiences with sea grant with you.

Mr. STUDDS. Thank you very much.

Mr. Woodland?

Mr. WOODLAND. I am Spark Woodland of the Dorchester Crab Co. in Wingate, Md.

Along with the other problems, we started having more with the overboard discharge, EPA specifications of what we could dis-

charge. So we started looking for help. The first place we go is the University of Maryland, and say, what can you do. So they talked the thing over and came down and looked it over and finally they started, about a year and a half ago, a project, a demonstration project. They are setting up a demonstration sewer system so that the discharged water will be—will meet the 1983 EPA discharge specifications. So they want to know how much I was going to invest in it when I started. I found out the more I put in it and the more they put in it the more we worked together. So they are getting some funding from Agricultural Department and Water Resources Institute and Marine Advisory Services and also Dorchester Crab, which I didn't intend on first. Anyway, they have worked diligently on the thing for about a year and a half. I am not acquainted with the technology of what biology is. All I know is it smells better when they put it overboard than when we put it into the tank.

We are in contact with all the watermen in the area. Sophisticated equipment has come to being. He has to have hydraulics and he has to have this and that. The first one says anything to me I send them to them. If they don't learn by the circulars there is a person who advises them. Now just as soon as they get through this we have another problem for them, the waste material. We don't know what to do with the cuttings from the crab after we get the meat out of it. Nobody seems to want it so they are trying to find a way that this would be used in some sort of food or meal. So that is the next job I am going to present to them when they get through with the water.

Our association with them so far has been first class. They always come when we need them. We need something on this thing. I am speaking for a lot of small plants that cannot afford to test the sewer system. If they find a rig that will work, they could probably install it. But they are not funded to experiment so they need help on it. That is who we have been calling on.

Mr. STUDDS. Thank you.

I assume that Wingate—is that on the Eastern Shore?

Mr. WOODLAND. It is 25 miles south of Cambridge.

Mr. STUDDS. So your Congressman is Mr. Bauman?

Mr. WOODLAND. Yes.

Mr. STUDDS. I am going to tell him of one constituent of his who thinks highly of at least one Federal program. I wish he were here to hear it.

The fun thing about serving on this committee is—I also serve on the Foreign Affairs Committee and I never get a chance to hear people. But over here from time to time we have fishermen and other people. The fun thing is you still live in a real world. No matter what language you speak, you communicate.

I appreciate that very much.

Let me ask you first, Mr. Woodland, you have obviously had some very positive experiences with the sea grant program.

Mr. WOODLAND. Yes.

Mr. STUDDS. Would most of your fellow watermen be familiar with the program?

Mr. WOODLAND. They don't connect with sea grant. They say University of Maryland. I doubt if 20 percent know where the

money comes from but they know they will call on the University of Maryland. That is who they recognize as doing the work.

Mr. STUDDS. Good enough.

Mr. Mayhew, same question to your colleagues throughout the State of Virginia, would they be aware of the program?

Mr. MAYHEW. I would think so.

Mr. STUDDS. Your experience has not been unique or special—obviously it is unique.

Mr. MAYHEW. My experience is rather limited to the group that I have been functioning with. I know full well that they know who the man is, what he is and where he is from.

Mr. STUDDS. Mr. Hughes?

Mr. HUGHES. Just one question.

I notice, Mr. Mayhew, that you indicate in the concluding portion of your statement that you feel that there is too much research and too little practical application.

I wonder if you can give us some specific instances that you have become aware of that the practical application would have been more useful?

Mr. MAYHEW. I had that in the past tense because I think it is changing to some degree at VIMS—the Virginia Institute of Marine Science. I remember when I first started reading their projects I could not read them and now I am beginning to read them. I am referring to the scientific language in the projects. Again, that might be my fault and not theirs.

Mr. HUGHES. That is one aspect of the problem. I am not talking about people being able to read the jargon and the terminology.

You make a statement, that the program has been slanted in the past too much toward pure research with minimum practical results.

Do you have something in mind specifically? That echoes some of the criticisms that have been directed at the sea grant program by the General Accounting Office.

Mr. MAYHEW. If I had the last three proposal lists in front of me, I think I could demonstrate what I was talking about. I have the last one here. I can see the practical results of the one for 1980. I can recognize quite a few of them as practical applications, which when I started reading them I couldn't.

Mr. HUGHES. You do not have any specific instances you can cite from memory?

Mr. MAYHEW. No; it is kind of an overview of the thing.

Mr. HUGHES. Thank you.

Mr. STUDDS. Mr. Forsythe?

Mr. FORSYTHE. I suspect that the increasing emphasis on the advisory service of getting to the watermen, who need practical, applied research, has resulted in getting better information back to the program directors as to what is needed.

Mr. MAYHEW. I think the advisory service is the link. Without it, I think sea grant would be lost.

Mr. FORSYTHE. Therefore, the importance of the advisory service link is very significant.

Mr. MAYHEW. Absolutely.

Mr. FORSYTHE. Thank you very much.

Mr. STUDDS. Thank you, gentlemen.

Mr. HUGHES. Just one additional thing.

What is happening with regard to fisheries reminds me of what happened a number of years ago with farmers. We have a very excellent extension service in New Jersey, but our agents have had to work at it. Farmers are an independent lot. They have set ways of doing things and we found until the agent actually went out in the field to talk with farmers about their pesticides and other problems, they were not really incorporating the very practical things that we were discussing in the research laboratories.

Do you find that is an area that is lacking in this whole program? We just took on in New Jersey a field representative who is now going to the docks to talk to the oyster people about their problems, to talk to the commercial fishermen. They are a very independent lot also. They have set ways of doing things and they often are not aware of the technical improvements that are being made around the world in fisheries.

Do you feel that is one of the areas we should be looking to in trying to get this practical application of what we are discussing in the laboratories?

Mr. MAYHEW. That is my concept of what the advisory service is.

Mr. HUGHES. But is it doing it?

Mr. MAYHEW. In my opinion, it is.

Mr. HUGHES. Is that typical throughout the country?

Mr. MAYHEW. I don't know.

Mr. WOODLAND. I think it is typical, but it seems to be getting more communication. Like these fellows—instead of reading some pamphlets, they will come there. They get on the boat or come to the plant and do some work instead of just sending out a circular of some kind saying this is the way to do it.

Mr. HUGHES. That is good. It has been my experience that it is difficult to get farmers to meetings and fishermen to meetings, except when there is a major problem. But generally speaking, they do not communicate as freely as perhaps they should as a group and it is very difficult to penetrate that group.

Mr. MAYHEW. The thing I notice about the advisory service job is that it is strictly dependent on the individual that is in that job. It just will not happen unless you have quality people. The ones I have met so far are. I could also see that if they were not totally devoted to their jobs, they would sit in the office and not get out and it would be a flop.

Mr. STUDDS. That is an important point. I hope you people are representative of what is going on nationally. Obviously, you are here to encourage us. You are very encouraging. I do not think two people with backgrounds and experience such as your own could have been found 7 or 8 years ago. I think the imbalances in the past are being corrected and that the advisory services are being strengthened and I find that very encouraging.

Our final and very patient witness is Mr. Jere Chase, the University of New Hampshire's interim president.

[Prepared statement follows:]

PREPARED STATEMENT OF JERE A. CHASE, INTERIM PRESIDENT, UNIVERSITY OF
NEW HAMPSHIRE

THE VITAL IMPORTANCE OF THE NATIONAL SEA GRANT COLLEGE PROGRAM TO
AMERICAN UNIVERSITIES AND COLLEGES

Chairman Gerry E. Studds and distinguished members of the United States House of Representatives Merchant Marine and Fisheries Subcommittee on Oceanography, it is my privilege and pleasure to discuss with you the critical importance of the National Sea Grant College Program to American universities and colleges. In behalf of the Sea Grant Association and the National Association of State Universities and Land Grant Colleges, we are grateful for your invitation to present an institutional perspective on the National Sea Grant College Program during these authorization hearings.

The Sea Grant Association, representing 45 member institutions of higher education and several industrial member organizations, seeks to advance the Sea Grant concept as a uniquely successful mechanism that can contribute substantially to our nation's goals for the oceans, coastal, and Great Lakes regions, and works to promote the development of and excellence in Sea Grant and related marine research, education and advisory service programs.

The National Association of State Universities and Land Grant Colleges (NASULGC) is a partner in promoting and developing an outstanding National Sea Grant College Program. This Association is the oldest higher education Association in the United States, representing the 142 principal state universities in the nation and the land grant colleges in the 50 states, the District of Columbia, Guam, Puerto Rico and the Virgin Islands. These institutions enroll more than 3.25 million students (approximately 30% of all students enrolled in the 3000 U.S. colleges and universities) and they grant 38% of all higher education degrees and 64% of all doctoral degrees. It is from this perspective of a broadly-based interest in the National Sea Grant College Program that I appear before you to present testimony on the importance of the National Sea Grant College Program to our nation and to its institutions of higher education.

"Using the oceans and the Great Lakes intelligently is one of the great challenges of this age. Marine food, energy, minerals, transportation and recreation as well as the preservation of the marine environment are increasingly accepted as a necessary part of our future, but we need to educate ourselves if we are to derive maximum benefits of the sea.

America's universities can accept these challenges through education, research and advisory service programs. In the last half century, major centers of oceanographic excellence have emerged on all ocean coasts and the Great Lakes. Little more than a decade ago, the Sea Grant Act broadened the capabilities of the nation's colleges and universities to develop the ocean's resources by forming a partnership between them, government, industries and the people of America. But opportunities for service and requirements for new knowledge far exceed the financial resources.

The institutions are expected to provide scientific and professional assistance in the implementation of new and wide-ranging national marine legislation, such as the Coastal Zone Management Act, the Marine Sanctuaries Act, the Aquaculture Act, the Outer Continental Shelf Act, the Ocean Pollution Research Act and the Fisheries Conservation and Management Act.

Solutions for marine resource problems and exploitation of marine resource opportunities require sustained research efforts at all levels, from the most fundamental research for understanding to innovative application of existing and newly found knowledge.

Tied as they are to education and broad public service, university research programs have historically produced rich benefits for the nation. There is abundant evidence that this pattern is being and will be repeated in the area of ocean and Great Lakes resources. To achieve these goals we recommend that:

Support for stronger marine programs within the universities be given high priority.

Sea Grant programs be encouraged to take a leadership role in sustained research efforts directed toward solution of marine resource problems.

Support for university education and training in all aspects of marine resources and environment be increased.

University research vessels be supported and maintained at a level necessary to accomplish their tasks.

The promise, the mystique and the opportunities in the ocean demand our attention. The people of the United States and, indeed, the world deserve no less."¹

The National Sea Grant Program is founded on the concept and has demonstrated through its fourteen years of existence that a partnership between major American universities and the federal government is a most effective mechanism for establishing new knowledge and understanding essential to the development, sagacious use and conservation of our ocean, coastal and Great Lakes resources. This university-based program is committed to further such wise use of our nation's marine resources by addressing high priority issues of local, regional, national and international importance.

In the United States, new methods for understanding coastal and ocean processes, recovering offshore petroleum, building up America's fishing industry, and managing coastal development represent just a few of the management and economic opportunities that Sea Grant programs explore. Developing countries seek improved technologies for harvesting their own marine resources; working with industries and agencies, Sea Grant universities have begun to address these countries' needs. At the same time, each Sea Grant program retains its special responsiveness to local, state and regional opportunities.

U.S. industry looks to the sea as a source of minerals and petroleum, as a site for profitable technologies, and as a field for innovative business ventures to spur economic growth and development. Government expresses its commitment to managing wisely the uses of ocean and coastal resources. Citizens respond with new awareness to the cultural and recreational importance of the oceans and coasts. The National Sea Grant College program has been a mechanism for fostering such cooperation between these various interests. Sea Grant programs in coastal and Great Lakes states apply the resources of major universities to ocean development. Each state programs brings together industry, citizens, and state and local governments to define opportunities for using the seas and coasts, and to chart new directions for our nation's approach to the marine environment.

Now in its second decade, the Sea Grant colleges and institutions believe that Sea Grant has a unique record of accomplishments in applied marine and coastal research, in training young professionals, and in helping users to apply new knowledge.

Through Sea Grant research, university faculty and research staff apply scientific skills to practical questions in ocean and coastal engineering, aquaculture, commercial and recreational fisheries, marine mineral and chemical resources, and the many other fields represented in the ocean's challenge.

Working with faculty investigators on Sea Grant projects, students produce useful results while learning the techniques required for marine research and management and preparing themselves for professional, ocean-related careers. Sea Grant's efforts in marine education are helping to inform Americans about "the world of water."

Sea Grant Advisory and Extension staff carry the results of research to people in industries and local agencies and to citizens who put this new knowledge to work to meet national economic and social goals. These advisory and extension agents, in turn, inform the university about research needs of industry, local agencies, and the citizens of out country. This two-way communication between society and our universities is building on the proven tradition of the Land Grant universities' Extension Service.

The benefits to our nation provided by the Sea Grant College Program are outlined by other individuals appearing before you today. They represent a broad spectrum of Sea Grant's involvement in universities and colleges in our coastal states, and have provided you with examples of specific benefits resulting from Sea Grant supported activities.

With over 700 Sea Grant projects in our universities and colleges, it is difficult to provide you with a comprehensive overview of benefit. However, it is our observation that the National Sea Grant College Program is replete with examples of research contributing substantially to the economic and commercial sector. In these cases, the Sea Grant investment is a remarkably small percentage of the economic benefit derived. Some examples of these are outlined in "The First Ten Years": A

¹ This introductory quotation is taken from the Marine Resources Recommendations to the 96th Congress, published in the Agenda-Recommendations For National Action in Higher Education. This statement is addressed to the members of the Congress and to the federal agencies which administer national programs affecting higher education's programs in the oceans, coastal regions and Great Lakes, on behalf of the colleges and universities which hold membership in the Sea Grant Association (SGA), and the National Association of State Universities and Land Grant Colleges (NASULGC) and the American Association of State Colleges and Universities (AASCU).

Report on the National Sea Grant College Program by E. W. Seabrook Hill, published in August of 1979.

Sea Grant is unique in one other aspect, the congressionally created requirement for non-federal matching funds for all Sea Grant activities. For the FY80 appropriation to the National Sea Grant College Program of \$38.7 million, approximately \$25 million additional dollars are provided by the Sea Grant colleges and universities for their programs, funds derived from the institutions themselves, from industries, from special appropriations and budget allocations from state government, and from others deriving benefits from Sea Grant. We support this matching fund concept and believe it has contributed substantially to the success of the program in responding to real needs within our states and regions.

The benefits of the National Sea Grant College Program to universities and colleges are substantial and varied. Sea Grant encourages problem-oriented programs within higher education that respond to real world needs within our states and regions; it provides a framework that attracts excellent faculty and students, and a network that fosters inter-institutional transfer of knowledge, information, and services. It is built around a concept that legitimately integrates research, education and advisory programs, and provides many other benefits that we believe are in the best interests of higher education and of our nation. We seek the opportunity to continue to bring the resources of higher education to the challenges of our ocean, coastal and Great Lakes resources, with new insights and imagination yet within the Land Grant heritage. The National Sea Grant College Program, we believe, has a similar opportunity to the Land Grant system which, we believe, more than any other single development, was responsible for the excellence of our nation's agricultural industry, resulting in a productivity unmatched by any nation in the world.

The National Sea Grant College Program is capable of reaching the goals and purposes of the Act. Reauthorization is essential, along with increases in the budget to enable higher education to contribute adequately to the partnership. The Sea Grant Association, in its recommendations to the Appropriations Committees in Congress, believes President Carter's FY81 Budget for the National Sea Grant College Program must be increased in Congress so that Sea Grant colleges and institutions can continue to produce the benefits outlined here today and so that states and regions not now served by Sea Grant can also benefit through this unique program.

Sea Grant colleges and institutions have demonstrated the value of cooperation in opening up ocean opportunities. As Sea Grant colleges and institutions, we believe we must do more to meet our nation's marine resource responsibility. We are prepared to meet the challenge posed by the National Sea Grant College enabling legislation. On behalf of the Sea Grant Association and the National Association of State Universities and Land Grant Colleges, we seek your assistance in reauthorizing this important act.

Thank you.

STATEMENT OF JERE A. CHASE, INTERIM PRESIDENT, UNIVERSITY OF NEW HAMPSHIRE

Mr. CHASE. I appreciate the chance to talk with you. I will keep it as brief as I can and try to emphasize the points that have not been made previously.

I am representing several groups including my own institution, the Sea Grant Association and the National Association of State Universities and Land Grant Colleges.

I am grateful for this opportunity. I think these two associations of higher education and my own institution advance the sea grant concept as something that is uniquely successful as a mechanism and can contribute substantially to our Nation's goals for the oceans, coastal, and Great Lakes regions. I think that we have to learn how to use the oceans and the Great Lakes intelligently as we search for food, energy, minerals, and how to use the marine medium for transportation and recreation as well as to conserve it.

We have talked a great deal today about the comparison with the land grant concept. The sea grant concept is pretty much the

same. I would like to talk about one part of the total land grant relationship that I think has made us the greatest food-producing Nation in the world and has made the world a better place in which to live. The land grant institutions are dedicated to three functions of which teaching is primary. The second is research and the third function is what we call a service function or cooperative extension. It takes the result of the first two and translates them for people's use. This is a constant cycle that rotates and we dedicate the research in the beginning to the improvement of teaching and out of that teaching comes the people who have had the experience. These people come back to contribute, along with the research, to make the service function more valuable and more important.

I might digress for 1 minute. With respect to cooperative extension and the users, we need to have the kind of person who can rub shoulders with people and create confidence in the people that he or she is serving. In effect extension people represent the talents of the institution to the group being served. Through their efforts research results are made more meaningful and scientists are more approachable, almost like real people, which is very helpful to everyone.

There is another thing that sea grant does that is different from what has taken place in agriculture—if sea grant is going to be worth a grain of salt, we ought to capitalize on those things that it does well—in agriculture we have the agricultural experiment station, where the work that is done is focused pretty much through the colleges of agriculture and related institutions. But what happens in sea grant is that it reaches to the entire strength of the institution. The research that is done and the projects that take place under sea grant are not restricted to any one college. They involve the life sciences. They involve the physical sciences They involve the social sciences.

Another thing that comes out, and particularly at our institution, so I can talk about it because I know something about it, is that the results that take place in the teaching gets students involved. They become involved in making their own contribution to the service effort and to the research that takes place.

One of the things they have done at the University of New Hampshire which has had a great effect on excellence in teaching—rather than doing the problems at the end of a chapter in a textbook, they get students involved in real problems and they play a role in those real problems.

In the upper levels of undergraduate work, we are finding that students, when you give them that kind of responsibility, tremendous results take place. We think the sea grant concept and the input from sea grant has helped us tremendously. We have one course called ocean projects that has 50 to 60 students, where they work with other faculty and students. These students bring input from more than one discipline and the problems are real. The excitement that comes from that experience makes a contribution you do not get in the ordinary classroom and the ordinary work that takes place there.

We have some things that have taken place as a result of the sea grant effort. We have had to react to the fact that industry looks to

the sea as a source of minerals, petroleum, and other resources for profitable technologies and an area where innovative business ventures can react to the growth and development of the country. The Government expresses its commitment to the management of the oceans and coastal resources. The citizenry looks at the recreational importance of the oceans and coasts. I think perhaps sea grant has made some real inroads on coordinating and fostering cooperation between all of these facets and it becomes an important objective of an institution like ours, to be part of this coordinating effort. I don't think we have answered all of the questions as to whether the fishermen will talk to the scientists. I know darn well that they won't all of the time. I have made it a point to go visit with fishermen at their meetings. But I can also cite the case of a student out of resource economics, a senior, who was interested in finding out why the fishermen did not establish a cooperative. Somebody said, you cannot do it. You cannot talk to them. He was a senior. He didn't know better. He went down and spent a full summer living with the fishermen, living on the boats. He became one of them. That particular student talked 17 fishing people, fishermen who had their own boats, into a contribution of \$1,000 apiece. He went to the bank with \$17,000, established credit of \$35,000 in addition. They established a cooperative. They went to the Governor and talked to him about it and said: "We need a place." The Governor believed them and went to the department of resources and economic development at the commercial fishing pier. They provided a space for the cooperative and, as the senior walked out of the office, he said: "We don't have any furniture, Governor."

He said: "We have to have furniture." They got the furniture.

They are now in the process of cooperatively working to establish a market for their products. I think it is a good example of what can happen with students and those students are the very people who are going to wind up, as a result of the education and experience, in positions related to the oceans and all the things that go with it.

I think sea grant is working. I don't think we are there. We have only scratched the surface of what we know about the oceans. We have to take those things and get them working. I think that if I can say anything that is to be remembered it is that I believe the effect of sea grant and the enrichment it has placed on our marine programs—and incidentally, this program is slightly different in another way from cooperative extension and the land grant type of effort that includes the experiment stations. It is the fact that the matching funds that go with the sea grant projects come from the institutions themselves and from private sources. If the institutions did not believe that these things were happening, the institutions would not provide the support out of their budget.

I would be glad to answer any questions. I think the program is a sound program. I think it needs more financing but it is there playing a role. It needs more time to become more effective. The land grants have been at it for a much longer period. I think that we cannot afford not to explore and understand our marine environment.

Mr. STUDDS. Thank you very much. That is thoroughly encouraging testimony.

That senior, if he is looking for a job, let me know.

Mr. CHASE. It is incredible to see. Let me tell you the kind of thing that happens with students. This is only one example. The students in this ocean project course, working with a faculty member and one graduate student, generally from the engineering field, have developed an underwater vehicle. If you look at it, it looks like a 5-foot circle. Around the outside are sonar probes. This is a vehicle designed to track pipelines at extreme depths under the surface of the ocean and we are talking about starting at 600 meters under. The objective in the long haul is to get it down to 6,000 meters. But this vehicle can be operated from the top using minicomputers and microprocessors. The instrument can be sent below the surface. It can track pipelines, either plastic or metal, at speeds up to 2 1/2 knots. It will map the area it is in and will take care of riding over obstructions. We started this project with the help of about \$2,500 from sea grant. That project has produced support of almost a half million dollars now. What they are hoping for out of this project is a torpedo-shaped underwater vehicle that can be released and left by itself to map a tremendous area of the ocean bottom by using the same principle. It is designed to travel 1,000 miles, or about 1 week, unattended. Plans and a proposal resulting from this project are now before the Defense Mapping Agency. It is the kind of thing that generates knowledge and interest, that you cannot plan for or predict but which is expanded to things that are extremely valuable.

To hear students at the end of the project come before what we call a jury to present their works makes you pretty proud of what students can do when given the responsibility.

Mr. STUDDS. What is not working? What is the bad news?

Mr. CHASE. We need more money in sea grant and we need to cure some of the problems that still exist out there in the field so we can get people to talk to each other and respect each other.

We have not gone that distance yet. We have done some of it. We are trying. We have that great long coastline of about 15 miles. What I believe is the ocean is just as large once you get that.

Mr. STUDDS. Mr. Hughes?

Mr. HUGHES. No questions, just thank you, President Chase, for your contribution.

Mr. STUDDS. Mr. Forsythe?

Mr. FORSYTHE. I do not have to tell you what an important role land grants have played in the whole agricultural revolution. At that time, 85 percent of our population was on the farm. We are so good at land grants we ran them off of the farms. Our marine situation is almost the reverse of that—we are trying to start from very little. How can we get to where I am convinced we have to be in the future?

Sea grant has got to be a part of it, but I am a little bit afraid that it will get lost in the university. Am I overconcerned?

Mr. CHASE. I understand what you are saying. I think it is advantageous to reach across the disciplines because it is pretty hard to find a problem that is solved by one discipline in its own field.

Mr. FORSYTHE. Land grant colleges have not stayed in one discipline.

Mr. CHASE. You have the law of the sea and a great many things that have to be involved and I think the things that do have to be done can be done inside of institutions and what sea grant has is the ability to move from one college to another college and share the people. I think the marine sciences and the marine resources programs have done that. But it needs an organization like sea grant to make things happen. I think it is a great advantage to not have just one discipline involved. That is not to belittle what has happened in agriculture. I think in the marine field there are a great many problems to solve.

Mr. FORSYTHE. Thank you.

Mr. STUDDS. Thank you very much.

The subcommittee stands adjourned.

[Whereupon, at 3:40 p.m., the subcommittee was adjourned.]

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CHESAPEAKE BAY RESEARCH COORDINATION ACT

THURSDAY, SEPTEMBER 6, 1979

HOUSE OF REPRESENTATIVES, SUBCOMMITTEE ON OCEANOGRAPHY OF THE COMMITTEE ON MERCHANT MARINE AND FISHERIES, AND THE SUBCOMMITTEE ON NATURAL RESOURCES AND ENVIRONMENT OF THE COMMITTEE ON SCIENCE AND TECHNOLOGY,

Washington, D.C.

The subcommittees met in joint conference in room 1334, Longworth House Office Building, commencing at 2:15 p.m., Hon. Gerry E. Studds (chairman) presiding.

Present: Representatives Studds, Ambro, Lowry, Pritchard, Bauman, and Emery.

Staff present: For the Committee on Merchant Marine: Thomas Kitsos and Ann Land; for the Oceanography Subcommittee, Richard Norling, Don Lippincott, Curt Marshall, and Diane Hull; for the Subcommittee on Natural Resources and Environment: Ian Marceau, Paul Maxwell and David Clement.

Mr. STUDDS. The subcommittees will come to order.

The Chair apologizes to the members for the delay.

The subject of today's hearing is H.R. 4417, the Chesapeake Bay Research Coordination Act, legislation designed to coordinate the Federal research efforts in the Chesapeake Bay area.

In the 95th Congress a similar bill passed the House under suspension, but never came up for a vote in the Senate. Over a half-dozen Federal offices or agencies are currently involved in conducting research on various issues concerning the Chesapeake Bay. Each, however, deals with a specific area or problem and, to date, little if any coordination of efforts has been attempted. Because the bay is one of the world's largest estuaries, and therefore a relatively shallow body of water with restricted circulation, multiple and sometimes conflicting uses of its waters can cause extreme problems. Also, the area surrounding the bay is heavily populated and, in addition, stream or river pollution from municipalities or industries even several hundred miles away can adversely affect the bay.

The development of a coherent Federal policy in research projects concerning Chesapeake Bay would be a step toward increasing our knowledge of the conditions in the bay and would thus enable the Government to check problems before they become disasters.

The problems of water quality, sedimentation, oil spills, coastal zone and fisheries and wildlife management, though fragmented

legislatively, are very much interrelated when one examines the total picture of the bay.

It would certainly be tragic, not to mention a waste of Federal funds and research efforts, if the Government were to fail to insure the quality and stability of Chesapeake Bay because of lack of coordination between agencies. This bill attempts to bring about such coordination.

This meeting is a joint meeting between this subcommittee and the subcommittee on Natural Resources and Environment of the Committee on Science and Technology, whose chairman, Mr. Ambro, is here.

Mr. Ambro, I understand you have a statement.

Mr. AMBRO. Thank you very much.

I'm pleased to join with my colleague from Massachusetts in chairing the hearings today on H.R. 4417, the proposed Chesapeake Bay Research Coordination Act of 1979.

The major purpose of this act is "to provide for the rational and effective planning and coordination for federally supported research and support of wise management of the Chesapeake Bay system." This is an important and commendable goal. The 200-mile length of the bay provides one of the largest estuary systems in the world, bordered directly by the Commonwealth of Virginia and the State of Maryland, and indirectly related and affected by the States of Pennsylvania, Delaware, and North Carolina.

I would be remiss if I didn't point out the additional fact that the Susquehanna River, one of the major tributaries of the Chesapeake Bay, has its origin in the State of New York.

All this is to say that the Chesapeake Bay represents an important regional and national concern warranting our attention. As I have discovered in my own district regarding Federal policies related to the Long Island Sound, differing Federal goals and local needs can adversely affect these fragile environmental systems. The damage done is often environmentally and economically irreversible. It seems only reasonable that a comprehensive approach be taken in addressing these kinds of special regional problems.

I believe there is precedence for this in the Great Lakes environmental research program, within the National Oceanic and Atmospheric Administration. Perhaps the Great Lakes program would provide a useful model for establishing the necessary coordinating mechanisms for Chesapeake Bay while avoiding organizational difficulties which might be anticipated by a completely independent office within NOAA, itself independent within the Department of Commerce.

I look forward to hearing the testimony, and I wish to commend the authors of this bill.

Thank you, Mr. Chairman.

Mr. STUDDS. Thank you, Mr. Ambro.

I would ask unanimous consent that a statement by Congresswoman Mikulski in support of the bill appear in the record at this point.

[The following was received for the record:]

STATEMENT OF HON. BARBARA A. MIKULSKI, A REPRESENTATIVE IN CONGRESS
FROM THE STATE OF MARYLAND

Good afternoon. As a co-sponsor of the Chesapeake Bay Research and Coordination Act, I am happy to welcome the subcommittee's witnesses today who represent varied interests in preserving the Chesapeake Bay.

As the largest estuary on this continent, our bay provides the most abundant storehouse of seafood in the world and is endowed with indescribable beauty. Our primary goal must be to preserve this valuable resource by protecting against new threats to the bay's environment and engaging in preservation and conservation efforts. There are many who are, in fact, pursuing this goal in a variety of different ways and the purpose of this act is to facilitate these efforts by coordinating the research now being conducted by about 60 Federal, State, and local agencies.

To save time, money and valuable efforts, we must minimize duplication, exchange information and assure a solid basis for sound decisionmaking in regard to the bay. It is my hope that the necessary input from today's witnesses will provide meaningful guidance in the resolution of these tasks.

Mr. STUDDS. I again am going to have to apologize to the folks who are here. The two bells that have just rung indicate a vote on an amendment offered by the gentleman from Maryland, Mr. Bauman, at this moment on the floor. So the subcommittee will have to suspend for approximately 10 minutes, and we will resume at that time.

[Whereupon, the subcommittees were in recess.]

Mr. STUDDS. The subcommittees will resume.

The Chair will note the presence of the distinguished author of the bill, the gentleman from Maryland, returning somewhat less than triumphant from the floor.

The Chair can't resist observing that it is his wish that the gentleman from Maryland would restrict himself to the area of his expertise; namely, the environment and the Chesapeake Bay, where he does such magnificent things and has such fine ideas.

Mr. BAUMAN. I appreciate to hear the gentleman from Massachusetts judgment on my ability in this area, and it is assumed that means the unanimous reporting of this bill.

Mr. STUDDS. Well, the Chair was considering that until the Chair arrived at the floor to find out what else the gentleman had been up to. [Laughter.]

Mr. BAUMAN. One day at a time. [Laughter.]

STATEMENT OF HON. ROBERT E. BAUMAN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MARYLAND

Mr. BAUMAN. Mr. Chairmen of both subcommittees, I want to thank you sincerely for scheduling this hearing today, and I also apologize for the lateness of my arrival for the reasons indicated by the gentleman from Massachusetts. I will check the record later to see how the gentleman from New York voted, to see what my chances are on the pending legislation.

I am not going to read my entire statement, as I often hear witnesses say, but I did want to make a few points.

[The following was received for the record:]

STATEMENT OF HON. ROBERT E. BAUMAN, A REPRESENTATIVE IN CONGRESS FROM
THE STATE OF MARYLAND

Mr. Chairmen, the bill we consider today is not new to either of the Subcommittees involved in these joint hearings. Last year, this legislation, with only slight modifications from the one before us today, was considered in separate hearings by each of your two distinguished subcommittees. Following lengthy consideration and

review by each subcommittee, this legislation received the unanimous endorsement of both and was later unanimously approved by the respective full committees represented here today, and by the House. Unfortunately, our colleagues in the other body failed to act expeditiously on this legislation and the 95th Congress expired in the weeks that followed the passage of this bill by the House.

This year, I am pleased to announce, this bill has been introduced in the other body by my colleague from Maryland, Senator Charles Mathias. Following a day of hearings he held in Annapolis earlier this year, Senator Mathias came to the same conclusion so many others of us have reached concerning the state of research on the Chesapeake. Congresswoman Marjorie Holt and Congresswoman Barbara Mikulski have joined me once again as co-sponsors of this important legislation for the Bay area and its residents, and I believe the support these distinguished members have lent to this bill is a good illustration of the merits it brings to these hearings.

The problems, however, which lead to the introduction of this legislation remain. There are still over 60 Federal, State and local agencies conducting research on the Chesapeake Bay without an over-all coordinating mechanism or guiding hand. Federal dollars are still being wasted as a result of the duplication of effort that stems from this disorganization, but more importantly perhaps, taxpayer's dollars are being wasted because they are presently being poured into a system that is not leading to the solutions for the problems that confront the Chesapeake Bay. As an illustration of this system and how it is floundering in a sea of federal dollars, I would like to point out to the members of the subcommittee present that there are presently some 18 data bases containing data on the dynamic activities of the Chesapeake. In these hearings we will hear from Dr. Eugene Cronin, who is the Executive Director of the Chesapeake Research Consortium. Dr. Cronin is a well respected scientist in the Bay community and I shall look forward to hearing his statement later today. However, I would like to quote Dr. Cronin on the subject of these data bases, from a paper he presented to the International Codata Conference in Palermo, Italy in 1978. Dr. Cronin said in that paper that, "The data files and data bases in the Chesapeake Bay region are among the most completely documented in the world." However, the Doctor noted, "Because of the existing diversity and stubborn independence of management and research entities, there is no universally accepted and applied system for storage, retrieval and analysis of the data related to the Chesapeake Bay."

Many of these data bases are rapidly becoming dated because they are not being maintained. This situation results in a condition in which so many efforts to measure, record and study the activities of the Bay must begin from scratch. That is part of the reason why we have 18 data bases to record many of the same figures. I should also like to point out that the Environmental Protection Agency has recently proposed the creation of the 19th data base for the Bay to store the results of their study. EPA Administrators have shown little or no interest in improving the systems that already exist and have expressed their intention to terminate the present research efforts on the Bay as soon as the time limit runs out for that program.

If the EPA, or anyone else for that matter, were to develop an overall data management system, it might resemble the "Management Resources Bank" that was proposed in the same study that resulted in the creation of the Chesapeake Research Consortium in 1971. According to the records of the National Science Foundation, some \$1.4 million was allocated to the development of this Management Resources Bank in 1973. Furthermore, NSF reports that between 1970 and 1973, some \$4.7 million was awarded in research grants to develop, among other things, a "data bank for storage and retrieval of information on matters that would assist in the management of the Bay." Unfortunately, there does not presently exist a Management Resources Bank and there is no data base that is working to perform the functions outlined in the NSF grant description. What Dr. Cronin described as the "existing diversity and stubborn independence of management and research entities" has proven itself to be very expensive indeed.

the result of all this confusion means simply that the dangerous trends remain unabated. The once plentiful rockfish is becoming increasingly difficult to find in the Chesapeake, the oyster harvest has been in a steady decline and crab production has been notoriously unstable in the waters that previously have known only abundance. Entire communities on Smith Island and Tangier Island are threatened by an erosion that many believe is the direct result of the decline in aquatic vegetation and yet the causes of these various phenomena remain a mystery to those of us who wish to take preventive steps.

The disorder in the research effort which is allowed to exist within the present system contributes to perpetuating ignorance. Because there is presently no design or order to the research grants that are handed out by many Federal agencies, there

has been little or no progress along the line that extends from basic research in an academic discipline toward the refinement of that knowledge into information that can be of some use to management and policy decision-makers.

This progression, or sequence of research steps, never has taken place in the research involving the Chesapeake Bay and that is a large part of the reason why we still lack the answers to so many questions. But it hasn't been lacking because no one knew how to establish a sequence of research.

In 1973, the National Science Foundation funded a research project entitled, "A Method of Applying Research to Environmental Planning and Management: A case study of issues important to the Chesapeake Bay Region." This study was conducted at a cost of \$73,000 and among its conclusions was the following set of remarks: "A critical problem today is the gap between research and the use of research results for planning and management decisions. This is a communications gap between research scientists and users (planners and decision-makers.) This gap is not the fault of either the researcher or the user. It results because of the unrecognized, ill-perceived, or ill-defined series of steps required to link basic knowledge with decision-making. The research community states that projects they propose are relevant and will provide basic information for societal problems. This situation exists because there are several steps between understanding what is occurring in the environment (phenomenon and processes) and how this information will be used for decisions."

This study, which has been collecting dust since 1973, goes further to propose the establishment of a sequence of research or "research plan" that will insure the production of useful information of practical solutions. This is the plan that is incorporated in this bill and the mechanisms established by the bill are designed to formulate that "research plan" and to carry it out by making recommendations on the funding of research projects by all Federal departments or agencies.

The provisions of this legislation would establish an Office of Chesapeake Bay Research Coordination as an independent office within the Department of Commerce. As the members of this hearing are well aware, the National Oceanographic and Atmospheric Administration is also housed in the Department of Commerce and has been designated to be the lead agency for the Ocean Pollution Monitoring Act. Congressman George Brown suggested last year that the office established by this bill should become a model for other regional research efforts addressed by the Ocean Pollution and Monitoring Act and that it contain some sunset language if it should not prove satisfactory. That language is contained in the bill and it is our intention that this program should serve the purpose of a model for that nationwide effort.

The Office of Chesapeake Bay Research Coordination established by this bill will have three primary functions as contained in the language before us. It will conduct an inventory of the past research effort, to determine what has been done and accomplished by the wide variety of participants in research over the years. It will develop the "Research Plan" that will set out the sequence of research described above and it will review the on-going research activities funded by the federal government to insure that the money being spent will contribute to the solutions so desperately needed. Furthermore, the Office will have the responsibility for identifying those areas where research may be needed, but is not presently taking place. This will help to insure that the problems that confront the Bay will come to the attention of the Congress so that when additional funds are necessary to carry out vital research, the conduit of information will exist to get that message to those who can do something about it. This state of affairs has been noticeably lacking in the past and the erratic funding for certain research has lapsed because of a chronic discontinuity of federal attention. This condition has been called "impulse funding" by some students of this problem and it has resulted in a haphazard response to the serious problems and conditions confronting the Bay.

There are adequate safeguards in this legislation to insure that the legitimate rights of the states will not be usurped by the creation of this office. A "Chesapeake Bay Research Board" will be established within this office to provide the expertise necessary to make the proper decisions on these technical matters. The Governors of Maryland and Virginia are given the power to appoint two members each directly to this 15 member board. The Secretary of Commerce will appoint the other members of the board, but the Secretary is directed to "insure that the interests of State and Local Government, industry, the public, and the scientific community are represented." The primary purpose of this bill is to insure that Federal dollars are well spent; not to expand the present federal role in these areas, and I intend to work along with the other co-sponsors to insure that these safeguards are enforced.

Furthermore, there is little reason to believe that this bill is a threat to the research scientists who have devoted their lives to the study of the Bay and its nature and problems. Diversity need not be eliminated through coordination of efforts. The lack of direction and the subsequent "impulse funding" for research projects do little to enhance the atmosphere in which the research scientist performs his work. A stable continuity of direction and funding will benefit the scientific community dealing with the Bay by allowing them to devote their attention to their primary calling of research rather than forcing them to divert so much of their attention to politics.

There is no single answer to the myriad of problems that afflict the Chesapeake. Sound research policies will do little good if they are not followed by sound management. But there can be no rational management effort without the necessary tools in the form of accurate, timely information concerning the workings of the Bay.

In these hearings, I would hope that every participant would keep in mind that our first and foremost consideration must be the welfare of this vital natural and national resource. The fact of the matter has been and remains that the Bay faces problems for reasons that continue to allude our understanding. This is so despite the millions we have spent on research and the lives that have been devoted to unlocking these mysteries. Furthermore, I hope that all participants will remember that there has never been a dispute over the fact that this research presently lacks coordination or that coordination is necessary if the fruits of any research project are to be realized. I am not interested in creating another office within the Federal Government for its own sake, and I have said in the past that if anyone can demonstrate that this coordination function is being carried out by some organization already in existence, I would withdraw this legislation. However, the fact of the matter is that there is no coordination of the overall effort at present and that his legislation is needed to promote that very coordination. I have heard it said that "coordination is very much like heaven; everybody want to get there but not just yet." Well, that may be true, but I believe that as it relates to the problems of the Chesapeake Bay, Heaven Cannot Wait, and I urge my colleagues to give this bill their favorable consideration.

Mr. BAUMAN. This legislation in various forms has been around on Capitol Hill since shortly after my arrival, because as one who served in the Maryland legislature and in Congress who deals constantly with problems of the Chesapeake Bay, I have tried to reach some solutions to those problems.

You have to live on the waters of the Chesapeake Bay, as I do, on Glebe Creek, off the Miles River in Talbot County, and to have lived there all your life, to know the beauty of the area and the need to preserve it. I don't need to give you the statistics of the bay or its productivity or its beauty or its recreational qualities or the commerce that travels over it, because those are well known.

After many draftings and redraftings over the years, this legislation comes before your joint subcommittee today, and I thank you for that occasion, with the sponsorship of such diverse elements as Mrs. Holt, my colleague from Maryland, Ms. Mikulski, my colleague from Maryland, and incredibly, we find the senior Senator from the State, Charles Mathias, and the gentleman from the Eastern Shore of Maryland, agree on this legislation, and he is a cosponsor in the other body.

This legislation draws out of my intimate observation over the years of what has happened in research on matters dealing with the bay, which I am sure the subcommittee understands are greatly diverse. By actual count, there are more than 60 Federal, State and local agencies conducting this research, and there is no overall mechanism or guiding hand.

I know that you will hear testimony later today from one of our most distinguished scientists in the bay community, Dr. Eugene Cronin, whom I count as a friend and respect greatly myself. I

would like to just briefly quote to you from a paper he delivered last year, in which he said:

The data files and data bases of the Chesapeake Bay Region are among the most completely documented in the world, but, because of the existing diversity and stubborn independence of management and research entities, there is no universally accepted and applied system for storage, retrieval, and analysis of the data related to the Chesapeake Bay.

We have counted 18 different existing data bases and various agencies dealing with research on the Chesapeake Bay, and the Environmental Protection Agency is now engaged in research authorized by this Congress at the rate of close to \$5 million a year and is proposing a 19th data base to be created.

According to the records of the National Science Foundation, back in 1971, more than \$1 million was allocated, in 1973, to create such a combined resources bank of data for research on the bay, and to this day it still has not been done, although the money has been spent. So I think Dr. Cronin is correct in his talk about stubborn independence and the need at least to bring things together.

I stand before you as one who, for instance, joined with the chairman of the Subcommittee on Oceanography in his excellent amendment dealing with what he calls the striped bass— I believe the correct name is the rockfish—but nevertheless, that is only one of our problems with the declining oyster harvest and the problems with unstable supplies of crabs, erosion, and pollution. The bay isn't dying, and I don't think it's dead, but there is that possibility and it does exist.

The disorder that may exist in the research community certainly ought to be corrected to bring about answers to the problems that I have only mentioned in a glancing sort of way.

I refer in my testimony—and I need not read it to you—of an observation made in a study that was funded by NSF in 1973 about the need to translate research into an end product. Those who make decisions, governmental and otherwise, about the use of natural resources, need a line to be created directly from basic research to the kind of information they can use and which will them the ability to make those decisions. And yet, there again, another study funded by NSF indicated the way that needed to be followed.

Last year, when this bill was before the subcommittee, now chaired by the gentleman from New York, our colleague, George Brown, became rather interested in the legislation and referred to it as a possible prototype for other areas, such as the San Francisco Bay, the Great Lakes, various river areas that have a bistate or multistate problem, and at the same time the subject of Federal research. So really, we might even use this legislation as a model.

I need not explain to you in detail, because I'm sure the staff has briefed you on it, the general thrust of the legislation. It is to create in the Department of Commerce, where much of our marine research and expertise resides, a Chesapeake Bay Research Coordination Office. It would, in fact, be charged with developing a research plan, which I think is badly needed. And may I say parenthetically that this bill doesn't envisage the cutback of research unless that is warranted under the investigations made. I know

there has been some concern in the scientific community that that is the case based on my own conservative leanings in many areas. However, it may well prove, if the bill becomes law, that there will be a need for more research in certain areas, rather than the sort of impulse funding that has occurred in recent years.

It creates a board that would work in concert with this Office that brings in for the first time the Governors of Maryland and Virginia, appointing two members each, and that will give the States not necessarily a veto or even enormous clout, but at least something they don't have now, and that is a say at the Federal level of the direction that research ought to take, and at the same time it would direct, when the Secretary of Commerce names the balance of the Board, that they would represent not only the scientific community but other communities, local governments, industry.

I think that would bring together as a focal point something that we have lacked in the Chesapeake Bay region for years, and that is a mechanism to not only compromise but to bring together, all of the diverse elements that use the bay and want to preserve the bay.

I don't think there is really any one answer to the problem we face, but any of you who have ever had the chance to travel on the bay, to fish there, to enjoy it recreationally or otherwise, know the beauty of this largest estuarian body in the United States and the need for some sort of action at the Federal level.

The States of Maryland and Virginia have entered into a recent compact to do this; we have previously created a joint legislative commission, composed of members of the Virginia Legislature and the Maryland Legislature, which is headed by Dr. Cronin, to coordinate all the laws that the two States enact on their own individual powers in their areas. As I say, the two Governors, only weeks ago, signed a new compact to coordinate the executive power. I think it is left for this Congress to enact legislation to bring the Federal presence together in a coordinated manner. There are, indeed, millions of dollars involved in this.

In closing, I would only say that I recently discussed with the Governor's staff the availability of the Governor's brandnew yacht, which is called the *Aurora*, so that the subcommittee members and others interested in this matter may first-hand inspect this area. I extend to you, on behalf of the State of Maryland, an invitation to not only see but to sample the delectable aspects that the bay produces at some future point, one assumes after action is taken in an appropriate manner on this legislation.

I thank you for your indulgence.

Mr. STUDDS. I want to assure the gentleman of a thoroughly fair, open, and friendly hearing for his proposal here, and that notwithstanding his occasionally aberrant behavior in the field of foreign affairs, and notwithstanding his extraordinary inability to grasp the most elementary ichthyological nomenclature——

Mr. BAUMAN. "Striper." I'm sorry.

Mr. STUDDS. Yes. That's much better.

I want you to know that on my coffee table overlooking Cape Cod Bay are both "Beautiful Swimmers" and "The Chesapeake," and I

certainly for the umpteenth consecutive year will do my very best to get around to being there this winter.

In one of my reconnoiters of the gentleman's district, incognito, of course, several years ago, I noticed an enormous structure alongside the bay, labeled U.S. Army Corps of Engineers. I, of course, found that it was locked and bolted and I couldn't get in. I suspect I would not have been allowed in in any event because of the way I appeared.

But can the gentleman tell me, is that a model of the bay, or what do they have in that enormous building?

Mr. BAUMAN. This is an exact reproduction to scale of the Chesapeake Bay and all of its major tributaries. It was constructed after authorization of the Congress of the United States, by the Corps of Engineers, and it is now operational. It has cost many millions of dollars, and I believe the operating budget appropriated by the Congress only a few weeks ago for this year is in the neighborhood of \$2 million. It has been tested for the last 2 years to assure accuracy, and it is now being used for a whole host of investigations.

There will be coming in 1980, for the fiscal year 1981, the question of what future use of that model will be used, and certainly I would see that it would play a key role in any legislation that we might report and pass in the House such as I suggest. But it is on the order of the Vicksburg operation and one on the west coast, an exact reproduction of the bay.

Mr. STUDDS. Have they successfully modeled all the currents in the bay?

Mr. BAUMAN. They have. In an inspection tour made only in the last 3 weeks with the Governors of Virginia and Maryland, they showed some extraordinary abilities, the ability to reproduce the lower currents in the James River as represented by a red dye, as opposed to the opposite flowing currents on the surface of the James River into the bay. Obviously, in the case of the James, it would be used in measuring the impacts of future pollution such as Kepone that entered into that particular river and hence into the lower bay area.

There are other planned uses of this model.

Mr. STUDDS. We could use one right now in the Gulf of Mexico.

Mr. BAUMAN. Yes, indeed.

Mr. STUDDS. I thank the gentleman. In spite of my being somewhat taken aback at his suggesting just a teeny bit more Federal personnel here, it's a very sound idea. I understand the depth and strength of his feelings with respect to that extraordinary estuary.

Mr. BAUMAN. I would just reply on the matter of money, that I had started out with a very modest amount—I believe \$100,000—and was told by the subcommittee under the previous chairman that no respectable agency ever started out for less than \$500,000. It was their suggestion against my better judgment, but I always defer to the majority.

Mr. STUDDS. Yes. Mr. Ambro?

Mr. AMBRO. Well, I would just like to note that in my opening statement an hour ago, that I said then and will say again, that this is a most important and commendable goal.

I am most interested in this problem since it parallels a similar problem in the Long Island Sound, which concern my district. There we have the same kind of fragility, the same threat to shellfish and finfish, the same kinds of eutrophication occurring around the coastline. We have got a new horror now with respect to dumping toxic spoils from dredge material by the Corps, of Engineers, who incidentally have never provided us with an analog model as they have for the Chesapeake, and if they do one, they should do the other. I'm going to follow this legislation very carefully, because I think it could be a precursor to what we might want to do in some areas in order to protect that body of water which is defined as an estuary.

Certainly, I too love the Chesapeake Bay because I sometimes vacation on it. As I say, the parallels with the Long Island Sound are most significant. So I would like to commend you both on the legislation and your intensity, your deep-rooted interest in this kind of thing. It's uplifting to see that you care so for this body of water.

Thank you, Mr. Chairman.

Mr. BAUMAN. Thank you.

Mr. STUDDS. Mr. Emery?

Mr. EMERY. Despite the differences in ichthyological nomenclature, the rather tough nature of the gentleman's soft-shelled clams compared to mine, and the rather extraordinary nature of the oysters in the gentleman's district, I am happy to support the legislation and commend the gentleman on his forethought and support for continuing research and concern for the Chesapeake Bay region.

Mr. BAUMAN. I thank the gentleman.

Mr. STUDDS. Mr. Lowry?

Mr. LOWRY. Given that there are 60 agencies now conducting some type of research, do you see a duplication of these efforts? Do there have to be 60 agencies doing this?

Mr. BAUMAN. The number 60 is derived by taking all the Federal agencies that have made grants or are engaged in research, all State agencies or educational institutions that have received grants or are doing their own research, or some local agencies as well. We have a number of these highly skilled research groups dealing with various aspects and there have, indeed, been a number of cases of duplication.

The Corps of Engineers, for instance, in the model to which the gentleman from Massachusetts referred, conducted a study which the law that created the model also required, and it is now in a number of volumes available, and has been for 2 or 3 years, a baseline study of the bay at that point. It is unclear yet what the EPA's study, what direction they will take, whether they will, in fact, update the baseline. But they are already proposing an extensive area of activity and it is not totally clear in what direction.

At the same time grants are being made to the Virginia Institute of Marine Sciences, the Chesapeake Bay Consortium, various universities, Maryland, Delaware, Virginia, for research. It would be impossible to deny that some duplication is taking place.

Mr. LOWRY. Do you see a potential savings, through the coordination that your legislation is addressing, that might have a possibility of offsetting the \$500,000 authorized?

Mr. BAUMAN. I wish I could say that there would be, because I know every witness I have ever heard in 6 years in the Congress said that if you will pass this bill it will actually mean a net savings. I can't guarantee you that. If, in fact, in the long run we spend more money, but in fact saved the bay, it would be an investment that, indeed, would produce a great deal of not only good, but things of monetary value in terms of millions of dollars of catch, productivity, and the existence of communities and people's lives.

But certainly we would try to use it as a focal point for saving as much money as possible without being niggardly in the handing out of grants for research that needs to be done. I know that appears to be perhaps a momentary lapse into liberalism on the part of the gentleman from Maryland. But I think that's my honest assessment.

Mr. LOWRY. Thank you.

Thank you, Mr. Chairman.

Mr. STUDDS. Thank you, Mr. Bauman.

Our next witness is Dr. Ferris Webster, Assistant Administrator of the Office of Research and Development of NOAA.

Dr. Webster, I apologize again for keeping you waiting. We run the almost certain risk of being interrupted by constant roll call votes on the floor, so I would ask you and the succeeding witnesses if you would recognize the possibility at least of summarizing your statement. It will appear in its entirety in the record in any event.

STATEMENT OF DR. FERRIS WEBSTER, ASSISTANT ADMINISTRATOR, OFFICE OF RESEARCH AND DEVELOPMENT, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Dr. WEBSTER. Thank you, Mr. Chairman.

I am pleased to have the opportunity to appear before you today, and I will summarize the statement which I will submit for the record.

[The following was received for the record:]

STATEMENT BY DR. FERRIS WEBSTER, ASSISTANT ADMINISTRATOR FOR RESEARCH AND DEVELOPMENT, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Mr. Chairman and members of the subcommittee, I appreciate this opportunity to appear before you to present the views of the Department of Commerce concerning H.R. 4417, a bill to provide for the coordination of Federally supported and conducted research efforts regarding the Chesapeake Bay, and for other purposes.

The objectives of this bill are important and the Department of Commerce wishes to support the best possible procedures for achieving them. The increasing pressures of a growing population heighten the need for more effective coordination of the Federal, state, local, and academic research activities in the Chesapeake Bay area. We believe that through such coordination the interest of the citizens of the Chesapeake Bay area are best served. We firmly believe, however, that the creation of a separate office specifically for the purpose is not necessary to attain the stated objectives since mechanisms already exist to meet the purposes of the bill. We, therefore, oppose enactment of H.R. 4417.

The Environmental Protection Agency currently has a Chesapeake Bay program which has as its primary objective (1) to assess the principal factors adversely impacting the environmental quality of the Chesapeake Bay by considering the needs of the Bay users, (2) to direct and coordinate research and abatement pro-

grams, and (3) to establish a continuing capability for collecting, storing, analyzing, and disseminating environmental sampling data. We believe that these comprehensive objectives address the major concerns and goals of H.R. 4417.

The National Science Foundation also has an institutional mechanism for providing clearinghouse and research coordination on the Chesapeake. This institutional mechanism, the Chesapeake Research Consortium, Inc., incorporated in 1972 in Maryland, is comprised of the University of Maryland, Johns Hopkins University, the Virginia Institute of Marine Science, and the Smithsonian Institution. It would be duplicative to create a Federal office for Chesapeake Bay research coordination to perform the same functions of the existing consortium.

Programs of the National Oceanic and Atmospheric Administration (NOAA) support research for a variety of regulatory, scientific, and resource management needs. I would like to summarize these activities as they pertain to the Chesapeake Bay and show how they are being coordinated at the Federal, state, and local levels.

The NOAA Office of Coastal Zone Management has provided funding to Maryland and Virginia for the past five years for the development of their coastal zone management programs. In September 1978, Maryland was awarded a grant of \$1.4 million to administer a program for the protection, preservation, and orderly development of the State's coastal resources with particular emphasis on the Chesapeake Bay.

The 1976 amendments to the Coastal Zone Management Act established the Coastal Energy Impact Program. This program permits the Federal Government to assume some of the financial responsibility for effects on local communities or energy development projects undertaken to meet national needs. Grants under this program have been made to the Maryland Department of Natural Resources to study energy related impacts in Baltimore Harbor, on the St. Mary's County petroleum storage project, and the Calvert County liquified natural gas facility.

The Office of Sea Grant, which is in the Office of Research and Development of NOAA, support applied research programs in Maryland and Virginia directed at solving local problems such as shellfish mariculture, shoreline erosion, and genetic studies of Chesapeake Bay shellfish. In addition, the Sea Grant program provides a marine advisory service which delivers technical information and the results of new research to the marine user community. All Sea Grant activities are coordinated with the state Sea Grant program directors. Because of this joint Federal/state participation, we believe the Sea Grant program is very responsive to local needs.

The matching fund provisions of the Coastal Zone Management and Sea Grant Programs ensure the active participation of the states with the desired result that such activities are responsive to state and local needs.

The National Marine Fisheries Service (NMFS) maintains its only national fish disease laboratory in Oxford, Maryland. In operation since 1960, the laboratory's primary function is to study the health of marine and estuarine resources using the methods employed by researchers in the field of aquatic animal sciences. The laboratory is a focus for interactions and communications on an international as well as regional scale with many Federal and state agencies and universities regarding marine fish and shellfish disease problems, particularly as they relate to diagnosis, prevention, control, and elimination of aquatic animal diseases.

The laboratory houses and supports the National Registry of Marine Pathology, and is now in the process of developing an international network of such registries in pathology. Its library is the best in its field and is used by the public, medical community, industry, and universities in the immediate vicinity and nationally. Research began with the study of diseases and the causes of mortalities of mollusks such as oysters and clams and, more recently, with finfish such as rockfish and menhaden. Current research also involves studies of pathological effects on marine biota due to such activities as ocean dumping and industrial accidents. In the discharge of its responsibilities the laboratory works closely with the Maryland and Virginia Departments of Natural Resources in providing information needed for the management of the wetlands and open waters of Chesapeake Bay.

NOAA places great importance upon its habitat protection responsibilities. We have recently established within NMFS an Office of Habitat Protection which is designed to work with other NMFS offices and other elements of NOAA to effect habitat protection measures in Federal water project permit and license programs. NOAA is committed to maintain and enhance our habitat protection program with regard to the waters and wetlands of Chesapeake Bay. NMFS staff work out of Oxford, Maryland, to assist Federal and state regulatory and planning agencies by reviewing and commenting on proposed developments which may affect the marine aquatic advisory and technical committees for the Chesapeake Bay area. Through

these avenues NMFS expertise is supplied to state and Federal planners and decisionmakers.

NOAA's Environmental Data and Information Service (EDIS) maintains the national data repository for oceanographic and atmospheric data including that for the Chesapeake Bay. The EDIS provides Chesapeake Bay data summaries and other environmental information in response to requests for public users, institutions and Federal agencies, and has entered into contract agreement with the Virginia Institute of Marine Sciences (VIMS) in the production of an Environmental Data Index (ENDEX) for the Chesapeake Bay. This latter work has resulted in some 1200 data files set up as a computer retrievable/referral data base. VIMS is also a contractor to EDIS for an aquaculture data file. The Chesapeake Bay Institute, the University of Maryland, and VIMS are supplying data to EDIS from the Baltimore Canyon and mid-Atlantic Outer Continental Shelf study. The National Oceanographic Data Center (NODC) of EDIS has worked closely with the Corps of Engineers in establishing the first environmental data base in support of the Chesapeake Bay Model.

The National Ocean Survey of NOAA conducts an ocean dumping program with funds physical oceanography and physiological studies of the effects of disposal of dredge materials from Elizabeth River and lower Chesapeake Bay dredge locations upon the local biota at the dumpsite.

Aware of the increasing threat of pollution in the ocean environment, the Congress enacted Public Law 95-273, the National Ocean Pollution Research and Development and Monitoring Planning Act of 1978. NOAA has been designated the lead Federal agency to implement this Act and has prepared a plan as a guideline for coordinating all Federally funded marine pollution research and development and monitoring efforts. This plan will ensure a comprehensive and coordinated research effort in the important estuarine areas and in the adjacent coastal regions.

All these Federal programs share a common partner in that their implementation requires close interaction with the States of Maryland and Virginia. It is our view that this close Federal/state relationship represents the most effective way for ensuring that research being conducted in the Chesapeake Bay is coordinated and responsive to user needs.

In summary, while we agree that research projects in the Chesapeake Bay should be coordinated, we believe that the necessary coordinating mechanisms already exist. Some of the Federal activities in the Chesapeake Bay have just commenced and the full effect of their impact is yet to be ascertained. Nevertheless, the existing Federal/state relationship embodied in many of our programs indicates that an effective coordination of Chesapeake Bay research can be accomplished without the creation of a new Federal office.

Mr. Chairman, this concludes my statement. I shall be happy to answer any questions you may have.

Dr. WEBSTER. The views of the Department of Commerce concerning H.R. 4417, a bill to provide for the coordination of federally supported and conducted research efforts regarding the Chesapeake Bay, and for other purposes, is in our view important. We agree with the objectives of this bill and believe they are important and we wish to support the best possible procedures for achieving them.

We believe that coordination of research in the Chesapeake Bay area is in the interest of the citizens of Chesapeake Bay. We firmly believe, however, that the creation of a separate office specifically for this purpose is not necessary in order to attain the stated objectives, since mechanisms already exist to meet the purposes of the bill. We, therefore, oppose enactment of H.R. 4417.

I would like to note that the Environmental Protection Agency at the moment has a Chesapeake Bay program which has primary objectives of assessing the principal factors adversely affecting the environmental quality of the Chesapeake Bay, of directing and coordinating research and abatement programs, and of establishing a continuing capability for collecting, storing, analyzing, and disseminating environmental data. We believe that this comprehensive program being carried on by the Environmental Protection

Agency is one mechanism that addresses the major concerns and goals of H.R. 4417.

Additionally, the National Science Foundation also has an institutional mechanism for providing clearinghouse and research coordination on the Chesapeake. This mechanism, called the Chesapeake Research Consortium, Inc., was incorporated in 1972 in Maryland, and is comprised of the University of Maryland, Johns Hopkins University, the Virginia Institute of Marine Science, and the Smithsonian. We believe it would be duplicative to create a Federal office for Chesapeake Bay research coordination to perform the same functions of the existing consortium.

The National Oceanic and Atmospheric Administration has a number of programs related to the Chesapeake Bay. These are set forth in the testimony which I will submit for the record. I will summarize by saying these include extensive programs in the Office of Coastal Zone Management, the Office of Sea Grant, the National Marine Fisheries Service, and NOAA's Environmental Data and Information Service. Each of these offices in the National Oceanic and Atmospheric Administration maintains strong relationships with the States of Virginia and Maryland.

In addition, because of the national awareness of the increasing threat of pollution in the ocean environment, the Congress enacted Public Law 95-273, the National Ocean Pollution Research and Development and Monitoring Planning Act of 1978. NOAA has been designated the lead agency to implement this act, and has prepared a plan as a guideline for coordinating all federally funded marine pollution research and development and monitoring efforts. This plan will insure a comprehensive and coordinated research effort in the important estuarine areas and in the adjacent coastal regions.

All these Federal programs share a common feature, in that their implementation requires close interaction with the States of Maryland and Virginia. It is our view that this close Federal-State relationship represents the most effective way for insuring that research being conducted in the Chesapeake Bay is coordinated and responsive to user needs.

In summary, while we agree that research projects in the Chesapeake Bay should be coordinated, we believe that the necessary coordinating mechanisms already exist. Some of the Federal activities in the Chesapeake Bay have just commenced and the full effect of their impact is yet to be ascertained. Nevertheless, the existing Federal-State relationship embodied in many of our programs indicates that an effective coordination of Chesapeake Bay research can be accomplished without the creation of a new Federal office.

Mr. Chairman, this concludes my summary. I would be happy to answer any questions.

Mr. STUDDS. Thank you, Dr. Webster.

Mr. Bauman, as the author of the bill, would you like to have the first opportunity to question the witness?

Mr. BAUMAN. Thank you, Mr. Chairman.

I really will not detain Dr. Webster for any extensive questioning, because we did hear testimony last year—I'm not sure whether you testified before us—

Dr. WEBSTER. Yes, I did.

Mr. BAUMAN. At the time we had representatives, I believe, from a number of other agencies and we systematically asked each Federal agency which one of them was, in fact, the one coordinating all the Chesapeake Bay activity, and each of the agencies named a different agency other than themselves, so that by the time they had all testified, there was a cross-indexation of all the witnesses thinking that the others were doing the coordination.

I share your concern about another agency, but if you can tell us who is doing the 18 data bases coordination and reviewing all of the research grants, of all of the Federal agencies, I certainly would like to know who it is.

Dr. WEBSTER. Mr. Bauman, you make a good point. I would not have the temerity to suggest that I have an answer as to who is coordinating all the 18 data bases.

I must say that personally I am concerned about the interpretation of 18 different data bases. I suspect that a good number of them are so specialized that a strong justification for their separate existence might exist. However, I would not contest the point you made some time ago, that there undoubtedly is some duplication in such a broad and complex program as the total Chesapeake Bay research efforts.

Mr. BAUMAN. You did say in your statement that you felt there was effective coordination—actually you said it can be accomplished without the creation of a new Federal agency.

Are you saying that it is now being accomplished by the Federal Government?

Dr. WEBSTER. My personal view, Mr. Bauman, is that we are not doing a good enough job on it. It is a difficult job to coordinate because a good number of agencies are involved. Each agency has a different mission, or perceived mission, in the bay, and it is sometimes difficult to come to agreement. We have tried this in a number of areas, as you probably know, related to the oceans, and it is continually a difficult problem to reconcile the different points of view of a number of agencies working in the same area.

Mr. BAUMAN. Thank you, Mr. Chairman.

Mr. STUDDS. I guess Mr. Bauman asked the most obvious questions that spring from your testimony. The last time we encountered a situation like this was after the *Argo Merchant* spill off Nantucket, when we tried to find out who was in charge of the various kinds of procedures that ought to occur—the continual monitoring of the damage, the cleanup responsibilities, and so forth. It was another case of bureaucratic scrambled eggs, with EPA, NOAA, the Coast Guard, and everybody running around, each claiming that somebody else was in charge.

You said to Mr. Bauman you do not believe the coordination at this point is being effectively accomplished. You did not, unless I didn't hear you, respond to his question as to who has the responsibility of effecting that coordination at the moment.

Did you respond to that?

Dr. WEBSTER. No, sir, I didn't.

Mr. STUDDS. Would you like to?

Dr. WEBSTER. I would hesitate to name a single agency and say that agency is the lead for coordinating the work of all branches of

the Federal Government and others in the Chesapeake Bay area, Mr. Chairman.

Mr. STUDDS. So there is no such clearly assigned responsibility at this time?

Dr. WEBSTER. Not to my knowledge, no, sir.

Mr. STUDDS. I recall what has to be the most verbose piece of legislation ever to emerge from this committee, the Ocean Pollution Research and Development and Monitoring Planning Act, which I think we shared jurisdiction with the Science Committee on, aimed at precisely this kind of a problem in ocean pollution research problems. It was supported enthusiastically by the administration, and attempted to do roughly what the gentleman from Maryland proposes to do by way of coordinating Federal efforts regarding the Chesapeake Bay.

It doesn't seem to be consistent that the administration would support the one and oppose the other.

Dr. WEBSTER. Mr. Chairman, the bill you referred to with the long title does, in fact, specify that NOAA shall be the lead agency to coordinate the—

Mr. STUDDS. Well, that's why you support it?

Dr. WEBSTER. Pardon me?

Mr. STUDDS. Is that why you supported it?

Dr. WEBSTER. No, sir—

Mr. STUDDS. Not you, but the administration generally did that.

Dr. WEBSTER. I'm sorry, I wasn't with the Government at that time. My recollection is that NOAA at that time did not support the legislation.

Mr. STUDDS. As originally passed, I'm sure it wasn't. That was another administration. But in this administration, in the extension this year, we were told what a fine idea it was.

Dr. WEBSTER. Mr. Chairman, I can only reply that if we are talking about coordination of pollution, research development and monitoring in Chesapeake Bay, yes, there is a lead agency. It is the National Oceanic and Atmospheric Administration.

I think the point that I perhaps didn't make clearly enough is that the totality of activities on the Chesapeake Bay is so varied and draws upon such a variety of skills, that I'm not sure that a single lead agency or a single lead authority is wise.

If you address yourself simply to ocean pollution, yes, I think there is coordination. A first draft of a plan is nearly completed and will be submitted to Congress shortly, and I think this is a good start in doing the kind of thing that is being required. But I have to underline that that's only one component of the research program in Chesapeake Bay.

Mr. STUDDS. Thank you.

Mr. AMBRO?

Mr. Ambro. Dr. Webster, just so I can get things more clearly in mind, the Great Lakes Environmental Research Program of NOAA provides, I think, a means for managing, coordinating, NOAA's research in the Great Lakes region.

How effective has that program been in coordinating its efforts with other Federal agencies, can you tell us?

Dr. WEBSTER. Mr. Chairman, I wasn't well prepared for that question. I would prefer, if I could, to answer that for the record.

Mr. AMBRO. All right.

[The following was received for the record:]

FEDERAL AGENCIES COORDINATION BY NOAA IN GREAT LAKES

NOAA's mission related research program in the Great Lakes is conducted mainly through our Great Lakes Environmental Research Laboratory (GLERL). The GLERL program includes support activities for and participation in the work of many other agencies in both the United States and Canada. In the international area, GLERL participates in the activities of the International Joint Commission, the Great Lakes Basin Commission, the International Coordinating Committee on Great Lakes Hydraulic and Hydrologic Data, and the International Association for Great Lakes Research. In addition, GLERL has crossagency agreements in support of the Corps of Engineers, the Environmental Protection Agency (EPA), and the Great Lakes Basin Commission. GLERL also takes part in periodic joint meetings with the EPA Grosse Ile Research Station, and the Great Lakes Fisheries Laboratory of Interior's Fish and Wildlife Service to discuss ongoing and planned research programs.

NOAA's Sea Grant program also supports research in the Great Lakes through grants to universities located in Wisconsin, Ohio, Michigan, Minnesota, and New York. These universities interact very closely with each other and with state authorities in defining their respective research programs.

There is no single federal coordinating mechanism for Great Lakes research. However, the active participation by NOAA in various international, federal and state activities has provided an effective means for ensuring a research coordinated effort in the Great Lakes that is responsive to local and regional needs.

Mr. AMBRO. Do you know anything about the Marine Protection, Research and Sanctuaries Act—I think it's called the Ocean Dumping Act?

Dr. WEBSTER. Yes, sir, a little bit.

Mr. AMBRO. That act provides protection for bodies of water apart from so-called estuaries, or these bodies which are defined as estuaries. It seems to me in recent research we found that those bodies of water defined as estuaries have less protection by virtue of the umbrella of the Ocean Dumping Act than the act provides for other bodies of water.

Do you want to comment on that before I go on, or do you agree?

Dr. WEBSTER. Yes, I think you're correct in your analysis of the Marine Protection, Research and Sanctuaries Act. My interpretation would be that the other act we were mentioning, the Ocean Pollution Research and Development Monitoring Planning Act, according to the language of that Act, encompasses previous legislation and gives a broader umbrella. My interpretation would be that the aims of the Ocean Dumping Act, as you refer to it, could be applied to estuaries under the later act.

Mr. AMBRO. Well, I won't get into that because I'll be going off somewhere that I don't want to go.

I think they're separate pieces of legislation, but I really don't understand the resistance to this kind of a plan except to ask you whether or not you know of other estuaries—hate that word; that's why I seem to alight on it—but other bodies of water such as Chesapeake Bay and Long Island Sound, which could be brought under the protection of some kind of coordinating agency in order to assure the kind of planning and coordination that we look for here.

Do you resist this because it's too specific and doesn't cover those other bodies of water, or do you resist this because it's kind of a "hole in the do-nut", one independent agency insulated by another independent agency, in another? Is it an administrative problem that you have?

Dr. WEBSTER. I would say the principal concern with what the bill is designed to do is the creation of another Federal agency to coordinate, where our interpretation would be that we ought to do a better job with existing mechanisms. I do not argue with the point that the objectives of this bill are worth while.

Mr. AMBRO. Well, I think we're all making the same point, then. The existing mechanisms have been in place for a while and the same perils and same threats and the same difficulties with respect to protection and preservation exist. So why not look in another direction?

We have precedent for that in a number of other programs.

Just one last question. You note that both the Environmental Protection Agency and the National Science Foundation have institutional mechanisms for providing clearinghouse and research coordination on the Chesapeake. That's what you said, I think.

Does the National Science Foundation's Chesapeake Research Consortium, Inc. have formal links in coordinating its research activities with those of EPA's Chesapeake program?

Dr. WEBSTER. I'm sorry, I can't answer that question. I could get an answer and submit it for the record.

Mr. AMBRO. But those are the kinds of questions the answers to which would help us determine whether or not the existing mechanisms work. How could you not answer the question?

Dr. WEBSTER. I'm sorry, but I hesitate to respond at this time to a question related to two other agencies.

Mr. AMBRO. All right. I didn't mean to press you to that extent. I just think that if you make the flat-out statement that the existing mechanisms are there and they will be able to work, then one would counter with the thought that they haven't worked thus far, why not try something else. One should be prepared to answer the questions as to the efficacy of the existing mechanisms.

Having said that, Mr. Chairman, I have no further questions.

Mr. STUDDS. Mr. Lowry?

Mr. LOWRY. Mr. Chairman, I think the previous three questions have brought up the major issues and I don't need to repeat them.

Mr. STUDDS. Thank you very much, Dr. Webster.

Dr. WEBSTER. Thank you, Mr. Chairman.

Mr. STUDDS. We appreciate it.

The next witness is Mr. Lee Zeni, director of Tidewater Administration for the State of Maryland. I welcome you, sir, and would say as I did to Dr. Webster, that you are free, if you so choose, to summarize your statement. It will appear in its entirety in the record.

STATEMENT OF LEE E. ZENI, DIRECTOR, TIDEWATER ADMINISTRATION, STATE OF MARYLAND

Mr. ZENI. Thank you, Mr. Chairman, Members of Congress. I think, having read the other statements of the other witnesses here, that except for the sponsor and author of this bill, I'm the only one here in support. Therefore, I would let my statement in its entirety go into the record and make perhaps several other points, Mr. Chairman, that might be important for you to consider in support of this bill.

[The following was received for the record:]

STATEMENT BY L. E. ZENI, DIRECTOR, TIDEWATER ADMINISTRATION, STATE OF MARYLAND, REPRESENTING SECRETARY JAMES B. COULTER, MARYLAND DEPARTMENT OF NATURAL RESOURCES

Mr. Chairman and members of the committee, I am Lee Zeni, Director of the Tidewater Administration of Maryland's Department of Natural Resources. That Department includes agencies of the state closely concerned with Chesapeake Bay. I am here representing Secretary James B. Coulter, who is by law charged with the responsibility for carrying out Maryland's laws dealing with natural resources. Secretary Coulter had the privilege of testifying before the Sub-Committee on Oceanography on March 3, 1978 regarding the special need and value of federal legislation mandating coordination of research in Chesapeake Bay. He then supported the concept and essential features of H.R. 10064, later offered as H.R. 12631, and now embodied in H.R. 4417. He continues to support strongly a Congressional mandate which forces federal agencies to coordinate their Chesapeake Bay related research and investigation activities. The inefficiencies and difficulties resulting from independently conducted research by federal agencies in Chesapeake Bay continue to this day, and will not be corrected without federal legislation. It is imperative that these resources be used effectively and efficiently.

Therefore, I welcome this opportunity to testify in support of a principal purpose of H.R. 4417, Chesapeake Bay Research Coordination Act of 1979. The major purpose of the bill, as Maryland understands it, is to force independently operating federal agencies to coordinate their Chesapeake Bay research efforts to provide for more efficient and effective use of federal monies.

We are in wholehearted agreement with the findings set forth in Section 2 of H.R. 4417. Chesapeake Bay is one of this nation's greatest resources: it is a factor in worldwide shipping; it helps to provide for national defense in times of war and peace; it is an assembly point for migratory waterfowl as well as a cradle for migratory fish; it is an estuary unparalleled for its beauty and productivity among industrialized nations, but its beauty and productivity are under constant pressure from all kinds of human activity. It is of vital importance to Maryland and Virginia. Federal agencies independently are conducting research and investigations. Federal agencies are not coordinated in Chesapeake Bay efforts and at times appear to be in competition with each other; and, much good would come from compulsory coordination of federal agency research projects on Chesapeake Bay.

Because Chesapeake Bay lies entirely within the boundaries of the Commonwealth of Virginia and the State of Maryland, it would seem that interstate coordination of Chesapeake Bay affairs could be handled through simple and direct bi-state relationships between the Commonwealth and the State. The legislative and executive branches of both the State and the Commonwealth have recently taken steps in this direction through the establishment of a Bi-State Legislative Advisory Commission on Chesapeake Bay and a Bi-State working committee of state agency administrators.

However, government of Chesapeake Bay is made difficult by two factors that lie beyond the direct control of Virginia and Maryland. The first of these factors is the influence of actions in other states on the major river tributaries to the bay. Maryland's response to this problem is to foster and participate in Federal-Interstate Compacts. One such compact gives us a voice in the water and land-related activities of the Susquehanna River. The Susquehanna flows through New York and Pennsylvania and contributes approximately 40 percent of the fresh water flow into the headwaters of Chesapeake Bay. In a similar effort, Maryland participates in the Federal-State Compact for the Potomac River.

The second factor that lies beyond the direct control of Maryland and Virginia, and yet has a profound effect on the government of Chesapeake Bay affairs in both of our states, is the federal presence. Here the problem is further complicated because the federal presence is not represented by a unified federal government. Rather, the federal presence exists in the form of several major independent federal agencies. Each agency separately performs in its own field according to the mandates of budget and law.

Thus, in the world of state government, the federal presence is there in the form of a number of single purpose units of federal government. In numerous instances, Congress has given these single purpose units of federal government authorities that preempt or are equal to but hardly ever subservient to authority of the State. Perhaps that is as it should be, but in this one instance, the intent of Congress would seem to be best served if the separable federal agencies were required to coordinate Chesapeake Bay research efforts.

The federal government should participate in the control of Chesapeake Bay to fulfill constitutional responsibilities to protect the national interest. Some of these

interests have long been recognized. They include national defense, navigation, commerce, and international treaties including protection of migratory waterfowl. The federal presence in those matters has long been accepted and thus it is not surprising that in the main, problems connected with coordination of research and investigations responding to these national interests were resolved long ago.

It is the crop of recent legislation in such areas as water quality control, maritime development, control of hazardous substances, prevention of point and non-point sources of pollution, and coastal zone management that creates an urgent demand for coordination. In the main, Congress recognized that this type of legislation invaded areas previously left to state and local government and I believe in every instance mandated Federal-State coordination.

Surprisingly, a congressional mandate for federal agencies to coordinate with each other is either lacking or ignored. To improve government of Chesapeake Bay affairs at this time, high priority should go to finding a way of requiring federal agencies to coordinate. H. R. 4417 is one such way.

We believe it is essential that this bill work to coordinate federal research, and avoid interference with federally-funded state responsibilities in the areas of water pollution control, wetlands management, coastal zone management, and so on. While the office and Board created by this bill surely will have to be cognizant of research being carried out by state, local, and private entities, the review evaluation responsibilities of a federal research coordination office should be confined to federally conducted research.

In this regard we question the role and responsibility of the office which would be formed under Section 4 of the bill. Naming the Office, the "Office for Chesapeake Bay Research, Planning and Coordination", erroneously implies that the Office will be conducting research and planning. We recommend calling the Office the "Office of Chesapeake Bay Research Coordination."

In Section 4(b)(2) page 6 lines 4-6, the reference to "scientific peer review" is confusing and should be deleted. The purpose of review is to determine how well federal research is coordinated and to what extent it meets needs expressed in the plan. The purpose of review by the Office is not to determine the scientific validity of individual research projects.

Section 4(b)(2)(A) on lines 7-10, page 6, appears to put the Office in the business of reviewing all "research projects". We believe this is unrealistic and the emphasis should be changed to review of federal research programs. Section 4(b)(2) should be deleted.

Section 4(c) of the Act on page 8, lines 4-17, expands the scope of the Office beyond research coordination into management. We recommend deleting lines 4-17 entirely.

The "Research Plan" in Section 5 is a very positive addition to the bill.

In developing these comments and suggested modifications, the Department has worked closely with two important groups which have also interests in coordination of Bay research efforts. These are the Chesapeake Research Consortium and the Coastal Resources Advisory Committee. The Research Consortium is also presenting testimony here today. The Coastal Resources Advisory Committee is advisory to the Maryland Coastal Zone Management Program. It is a diverse and active group made up of representatives of local, state, federal, and regional agencies, academic institutions, business representatives, environmentalists and citizens groups. The comments of the Committee are attached.

We believe that our comments are consistent with the comments of the Coastal Resources Advisory Committee (CRAC). We have no objection to the amendments of CRAC, which are in some cases more specific than our own.

As of today, it is our understanding that the Chesapeake Research Consortium has not had the time to obtain a formal vote of its Board of Trustees supporting H.R. 4417, but that a sub-group established by the Consortium to review H.R. 4417 and to prepare recommendations for the Board of Trustees is not making a clear-cut recommendation of support. It is difficult for me to understand the sub-group's position and reluctance. After all, the Consortium was born from the need that these major educational institutions coordinate their efforts to obtain financial support for research while insuring maximum benefits to the public by avoiding unnecessary duplication and by allocating research resources according to expertise and availability. A most laudable effort strongly supported by Maryland's State government. H.R. 4417 is a logical extension of the Consortium's objectives. Hopefully the Board of Trustees will at its next meeting vote to support H. R. 4417 and transmit its views to this Committee at that time.

The sponsors of H.R. 4417 have indicated their willingness to consider amendments and revisions to the bill. We would be happy to work with the subcommittee staff,

sponsors of the bill and the other interested parties from Maryland and Virginia to assist in any way possible.

Because H.R. 4417 could be so helpful to Maryland as well as the national interest in Chesapeake Bay, Maryland urges that the bill with the modifications described above be given a favorable report by the subcommittee.

COASTAL RESOURCES ADVISORY COMMITTEE,
Annapolis, Md., August 27, 1979.

Mr. JAMES B. COULTER,
Secretary, Department of Natural Resources,
Tawes Building, Annapolis, Md.

DEAR SECRETARY COULTER: It has come to my attention that you will need comment on the Bauman/Mathias Bill on Chesapeake Bay Research Coordination in sufficient time to prepare your position for the forthcoming September 6, 1979, Congressional hearing. As CRAC will not be meeting until September 14, at which time they will act on the recommendations drafted by the Legislative Task Force, I thought you would want to consider the "content" of the Task Force's response on S. 1316 and H.R. 4417.

The Legislative Task Force recommends that CRAC support the bill with certain inclusions and modifications, and reserve the right to pass judgment on the final draft.

The Task Force's specific comments on the bill:

1. Section 2(a)(2). We recommend that the findings of the bill in this sub-section include wording which refers to the use of the Chesapeake Bay for the development of commerce and industry, and for recreational boating.

2. Section 3. We find that the specific term "research plan" needs to be defined and added to this section.

3. Section 4(a)(1). The intent of the bill as supported by CRAC is to provide for planning and coordination of Federally supported research. The implication of the title, Office for Chesapeake Bay Research, Planning and Coordination implies that the Office will be doing research and planning and coordination. The Committee believes that this goes beyond the scope of the legislation as we understand it. We therefore recommend that it be renamed the Office of Chesapeake Bay Research Coordination.

4. Section 4(b)(1). It is unclear what time frame is intended for establishing the Chesapeake Research Exchange. We recommend the word "ensure" be substituted for more specific language.

5. Section 4(b)(1). In the phrase "... and the use of information concerning all research which is ongoing, ...", after the word "research" add, including state, local and privately funded research efforts.

6. Section 4(b)(2). It is unclear what a "scientific peer review process" involves. We recommend this term be given definition and clarification.

7. Section 4(b)(3). CRAC is pleased to see the bill establish a board responsible for the development of a Research Plan. Clarification is needed, however, as to whether it is a function of the board to set annual priorities for the Office. It is also unclear who is responsible to establish priorities for research; reference in this section is only to "additional" priorities as a function of the Director of the Office.

8. Section 4(b)(8). It is unclear whether the word "affairs" mean research. We recommend that a conference to be held on Chesapeake Bay research annually, rather than once every two years.

9. Section 4(b)(9). We recommend the annual report also be sent to the Governors of both States, to State libraries and be made widely available in some form to the Bay public.

10. Section 4(c). We find this section ambiguous in the same context with our position in point 3. We recommend that possible contention over the role of the Office be explicitly addressed or consideration given to dropping this section.

If you would like any additional response from CRAC in the interim, we would be most happy to meet with you in a way which would be of assistance in drafting your position.

Sincerely,

LAWRENCE WHITLOCK,
Chairman.

Mr. ZENI. I did deliver the statement yesterday, and today I was forced to make some changes in it, because one of the statements later on, on page 6, in which I had thought the Chesapeake Re-

search Consortium was also in support of the bill, I found later that that might not be the case, so we were forced to change our testimony as I have done on the top of page 7 of the copy I have given to the reporter.

The Research Consortium was not able to get a formal vote of its board of trustees in support of the bill, and the subgroup established by the consortium to review and to prepare recommendations on this bill is not making a clear-cut recommendation of support.

Now, it's kind of difficult for me and for the State of Maryland to understand this, since the consortium itself was set up because they discovered a need to coordinate the research on the bay, to coordinate their efforts to obtain Federal funds in particular for research, so therefore their position is not quite understandable from Maryland's point of view.

I would like to point up my testimony on page 3 which lists a second factor, which lies beyond the direct control of Maryland and Virginia in our inability to do a good job of managing or controlling the Chesapeake Bay. It is the Federal presence. This is the point I would like to make.

I think all of us have said that we believe this bill is necessary for the most efficient and effective use of the research dollars. Well, I think there's another reason—and I just thought of it as we were sitting here—and that reason is, I'm naive enough to think that if everybody comes from the same facts, evidence, and scientific basis, they will come to the same conclusions, hopefully, even in a complex environment such as the Chesapeake Bay.

Well, I have examples, sir, of where that has not worked to the advantage of the bay. For example, the inability of some of the Federal agencies to understand what the difference is in terms of fish and wildlife values or National Marine Fisheries Service values, or EPA values, has led to a stalemate in terms of a decision on the Hart Miller Island project. That has led to a cost change from \$13 million to over \$50 million for the construction of that particular facility.

To give you an example of a small man's problem—the inability of Fish and Wildlife and the National Marine Fisheries Service to agree on the effect of spoil disposal in terms of wetlands, in terms of marsh creation and the rest. One man, who runs a fishing industry on the Eastern Shore, couldn't dredge his channel, to get his boats in. For 5 years that application sat in the Fish and Wildlife files, until we finally found that application, got it out and able to get Fish and Wildlife and the National Marine Fisheries Service to come compromise to allow dredging of that little channel.

Now, what I'm suggesting by those two examples, and I'm going to quit, is that I believe at least if this Office of Research Coordination was started, initially we would get more effective and efficient research value for our dollars. But I also think that when they begin to put together the statements of work, agree on how the research should be done, begin to get the same findings and therefore draw the same conclusions from the same evidence, that we won't get these kinds of stalemates based on gut feelings, ignorance

in the bay, and I think we can move forward in the protection of the bay.

Thank you very much, sir.

Mr. STUDDS. Thank you very much.

Mr. Bauman?

Mr. BAUMAN. Mr. Zeni, you speak for the Secretary of Natural Resources, Mr. Coulter, and for the State of Maryland in endorsing this bill, do you not?

Mr. ZENI. I do, Mr. Congressman.

Mr. BAUMAN. I want to thank you and, through you, the Secretary and Governor Hughes for the support of the legislation. Maryland and Virginia both have a joint interest in this problem, as we well know, and I think your statement, although you didn't deliver it all, gives a rather detailed description of why the State of Maryland feels strongly that the Federal presence needs to be in some way brought together on a coherent basis for the future.

I assume that in endorsing this Federal coordination you don't see this as a duplication of the bi-State legislative commission or the compact between the two executive branches of Virginia and Maryland?

Mr. ZENI. I do not see that as a duplication. It's a very necessary element in terms of trying to do on the Federal side what we're trying to do on the stateside by the bi-State working group.

Mr. BAUMAN. Do you know of any instances where any Federal agency has sought to bring together all other Federal agencies and the State of Maryland for a coordinated approach to any problem, whether it's Baltimore Harbor dredging or—

Mr. ZENI. Yes, sir. I would have to say that I think the Corps of Engineers, in terms of the study that actually was the forerunner of the bay model, was an attempt to bring all of the Federal agencies together, including the State of Maryland and the Commonwealth of Virginia. I believe that's probably a pretty good example in terms of an effort on the part of a Federal agency to coordinate the efforts of all agencies of the Federal Government, plus the two States.

Mr. BAUMAN. And that was for this expressed purpose of a baseline study of the then existing problems with the bay?

Mr. ZENI. Yes, sir, and a future condition study, too.

Mr. BAUMAN. Has there been any such sustained coordination by any given agency, and what agency might that be over a period of time, in your experience?

Mr. ZENI. Would you mind repeating that?

Mr. BAUMAN. Any specific Federal agency, over a prolonged period of time, that has acted as a lead agency in coordinating research—

Mr. ZENI. I would not say it was a continuing thing, Mr. Congressman. It would sort of be an ad hoc thing.

For example, it is my belief that the EPA study at the moment is a coordinated effort. It took several years to get there. I don't know how much money was spent in terms of getting there. They'll have to tell you that.

But I believe eventually they did, and it's my opinion that if this office you're suggesting had been created, that we wouldn't have taken 3 years to get there; that the money that was spent in

getting there could have been spent in doing good research and finding the data that would have been important to decisions.

Mr. BAUMAN. Thank you.

Mr. STUDDS. Mr. Zeni, I have one question for you.

I was skimming your testimony, and on page 5 you say, and I quote:

We believe it is essential that this bill work to coordinate Federal research—

And you underline "Federal research"—

And avoid interference with federally-funded State responsibilities in the areas of water pollution control, wetlands management, coastal zone management and so on. While the office and board created by this bill surely will have to be cognizant of research being carried out by state, local, and private entities, the review evaluation responsibilities of a federal research coordination office should be confined to federally conducted research.

And those last three words you underline.

Mr. Bauman, in his statement, said there are still over 60 Federal, State, and local agencies conducting research in the Chesapeake Bay without an overall coordinating mechanism or guiding hand, and he refers to the duplication of effort that stems from this disorganization.

I am somewhat puzzled as to how you would propose to genuinely coordinate national policy in the bay area if you were to exclude State and local and private and federally funded State and local programs from this coordination effort.

Mr. ZENI. Perhaps I can give you an example of that, Mr. Chairman. Let's take the research that the State of Maryland conducts under the Coastal Zone Management Act. We present to the Office of Coastal Zone Management each year a proposed program of research. I think once that program has been proposed, it's incumbent upon the Office of Coastal Zone Management and this office, were it created, to determine whether or not there would be any duplication. Once having made that determination, granted to the State of Maryland the funds necessary to do the research, I do not believe this office should any longer be involved in coordinating or in any kind of a peer review or any kind of a monitoring function of that research. This is what we mean.

Mr. STUDDS. OK. I just wanted to hear on the record your response to that. I'm still not entirely clear on the distinction you're drawing between the review evaluation responsibilities——

Mr. ZENI. Could I perhaps emphasize a little bit further?

Mr. STUDDS. Yes, I wish you would, because I think that's unclear. Not only Mr. Bauman's, but other statements in support of the bill all cite the conflicting overlapping programs at all levels as a justification for the need for coordination.

Mr. ZENI. One of the fears we have in Maryland, Mr. Chairman, is that the Congressman's bill as presently written would provide a measure of authority in the Federal Government over research, first over the statement of work and how it should be done, the selection of the scientists, the determination of what data is best collected and all that. We are concerned, as to the way the bill is now written, that that measure of authority over State conducted research could take place. Therefore, we are suggesting, in a sense, some amendments to the bill which would narrow down the level at which coordination would be done.

We don't mind having the Federal Government tell us "no" in terms of some particular research program in advance of having it approved. But we have just gone through an experience which is, I think, inexcusable, where we have gotten permission with a grant to conduct a program of research over on the Eastern Shore for determining the effects on water quality and water availability in terms of ground water, and suddenly we're told by the Federal agency that that's no longer a research program that qualifies as far as they're concerned under the grant and we should withdraw support of it.

We can't very well withdraw support of it, and we are forced now to find other State funds in order to keep that program going.

I don't believe that the Congressman wants his bill to lead to that, but the way it's written right now, it could. Because it has been our observation that once Congress has enacted it and it has gone to the Federal agencies for implementation, that the degree of unilateral authority expressed by those Federal agencies goes far beyond the ability of Congress to control or of the States to fight. We're trying to limit exactly at what point in time they're going to coordinate research.

Mr. STUDDS. I think I understand what you are saying, but I must say that your capacity to worry far exceeds mine, if you are really worried about the gentleman from Maryland granting new Federal Government programs.

Mr. ZENI. We are just saying that we read the bill that way, sir.

Mr. BAUMAN. I would make an observation on that point.

This bill has been so drafted and redrafted to meet the various suggestions of various committees that I am not surprised at the State of Maryland having offered a number of amendments a year ago, most of the body of the bill, and are redrafting it, objections to the scientific community in great detail might cause some confusion. But the bill says that the office would seek to coordinate any research in part funded, or wholly funded, and I have no objection to clarifying that review will come at the point where these research grants are being considered for handing out by the Federal Government, but I think it would be a mistake to allow any Federal research by the office where it has no purpose.

As far as peer review, we put it in the suggestions of the scientific community, and they waded in with amendments in the last subcommittee, and we are always flexible.

Mr. ZENI. Could I end with a final sentence?

I just feel that perhaps my statement might weaken our support, and I would put it this way, that if I had to take the bill as presently written, or no bill, we will take the bill.

Mr. STUDDS. I appreciate that. Thank you very much, sir.

I notice Doctor Webster is still here. May I interject at this point?

I understand that NOAA has some kind of a fairly recent compilation of ongoing activities at this point, is that correct?

Dr. WEBSTER. Thank you, Mr. Chairman.

Yes, a few months ago the Environmental Data Service prepared a literature summary of work that is going on in the Chesapeake Bay. This is available, and I will hand it to the committee.

Mr. STUDDS. I appreciate that.

Without objection, we will put it in the subcommittee files and make it available for examination on request.

Mr. STUDDS. Before you escape—Mr. Ambro, do you have questions for Mr. Zeni?

Mr. AMBRO. Did I understand you to say that the EPA project is a coordinated program? Do you believe that?

Mr. ZENI. I believe that, Mr. Ambro. I believe the present program is running very well.

Mr. AMBRO. Maybe we could obviate a number of objections by what do you think of this, having EPA, rather than someone else as the lead agency here?

Mr. ZENI. I would rather not comment on that.

Mr. AMBRO. Well, I was not asking you, I was asking Mr. Bauman through you.

But that is all right, I appreciate it.

Thank you, Mr. Chairman.

Mr. STUDDS. Mr. Lowry?

Mr. LOWRY. No questions.

Mr. STUDDS. Thank you very much.

Mr. ZENI. Thank you.

Mr. STUDDS. Let me just inform the members we now have a bill on, believe it or not, final passage of the foreign operations appropriations.

The next witness is Mr. Don Budlong. Why don't we get started as best we can? We will have about 5 minutes before we have to suspend temporarily. Mr. Budlong is Assistant to the Secretary of Commerce and Resources, Commonwealth of Virginia.

We would appreciate your submitting your statement in full for the record, and giving us whatever statement you care to.

STATEMENT OF DONALD W. BUDLONG, ASSISTANT TO THE SECRETARY OF COMMERCE AND RESOURCES, COMMONWEALTH OF VIRGINIA

Mr. BUDLONG. Thank you, Chairman Studds, Chairman Ambro, Congressman Bauman and members of the subcommittees.

I want to take this opportunity to commend Congressman Bauman for his very great interest in the Chesapeake Bay, and for the spirit of cooperation that he has helped to foster between Virginia and Maryland.

I think this is a special time for the two States, as they strengthen their working relationship on the bay. As other speakers have indicated, Virginia and Maryland have established a bi-State working committee to help the managers of operational agencies of the two States address common problems on the bay.

We think that the goal of coordinating federally funded research on the bay is one that we can strongly approve, but we do think that it is important to future interests of our two States, and to the Federal Government as well, that we express our reservations about H.R. 4417 now. But rather than concentrate on these reservations, we prefer to offer some alternatives to what seem to be three major parts of the bill: the establishment of a research exchange; the preparation of a research plan; and, the underlying theme, the need for ensuring that federally funded bay research is coordinated.

With respect to the research exchange provision, we suggest that the requirement of such a research exchange be built into the data system now under consideration by the Environmental Protection Agency as part of their Chesapeake Bay program. This would require that the potential users of the data help EPA determine the design of the system.

The EPA is right now contracting with consultants to determine what that design should be. We further suggest that the bi-State working committee, which will be organized very shortly, is capable of assisting the principal parties in addressing this issue. We feel this is a minimal step that ought to be made before we establish another data system.

While we believe very strongly in planning for bay research, we have reservations about the proposal for preparation of the research plan. We think that the research needs should be defined by the managers of the operational agencies in Virginia and Maryland, as well as by Federal agencies and the scientific community. This is probably one of the most important points that we want to make.

Even the process by which the bi-State working committee will be establishing priorities for joint State activities cannot by itself define all the priorities for research. Therefore, we suggest that this bistate committee call together annually those Federal agencies which fund the bay research projects and the interested scientific communities to outline the research needs.

Federal and State officials and scientists working together at a 1- or 2-day meeting can surely define the bay's major research requirements. The resulting set of research priorities could be used by agencies as a guideline as they weigh research proposals. It could also be used by the Congress as it judges the manner in which the research funds have been expended. No new appropriations would be required to get this done.

For the Congress to be assured that Federal research expenditures meet the real research needs and do not duplicate each other, we suggest that those Federal agencies which fund research designed to contribute to solving bay problems be required to report directly to the Congress annually, through the Secretary of Commerce. The Secretary of Commerce should be responsible for preparing an annual report, which should define the areas of research which have been funded by each grantor agency, the cost, the intended use of the research, and the expected result.

The Congress need not establish a new Federal office to oversee other agencies. The legislature's direct interest will bring a much better response from agency representatives.

I assure you, Mr. Chairman, that we have long deliberated over the proposal which you have before you. A number of concerns continually have been raised. In the interest of time, I will simply say that among our reservations is the timing of the proposal with respect to the progress of the EPA bay program, and the recent developments between the executive and legislative branches in Virginia and Maryland. Another of our more serious reservations is the prospect for Federal predominance in the proposal.

We are looking for a genuine State-Federal partnership, whereby the States have an equal voice in determining the direction of any joint State-Federal activity on the bay.

I want to reiterate on behalf of the Secretary of Commerce and Resources, Maurice Rowe, our intentions to help Congressman Bauman and the many other people who are interested in working on this proposal.

[The following was received for the record:]

STATEMENT BY DONALD W. BUDLONG, ASSISTANT TO THE SECRETARY OF COMMERCE
AND RESOURCES, COMMONWEALTH OF VIRGINIA

Mr. Chairman, Congressman Bauman, and Members of the Subcommittee: we are pleased to offer testimony on the Chesapeake Bay Research Coordination Act of 1979. Those of us in Virginia who have worked with this Bill want to commend Congressman Bauman for his very great interest in the Chesapeake Bay and for the spirit of cooperation he has helped foster between Virginia and Maryland. Congressman Bauman has been most straight forward in keeping us informed about the progress of this Bill and in soliciting our ideas.

This is a propitious time for Virginian and Maryland to strengthen their working relationships on the Chesapeake Bay. As you may know, Governor Dalton and Governor Hughes recently signed an Agreement to improve the coordination between our two states on Chesapeake Bay matters. This Agreement establishes a Bi-State Working Committee to address our mutual concerns on the Bay. There is also a Joint Legislative Advisory Commission representing the two states. This Commission will be reviewing long range management alternatives for the Bay.

The goal of coordinating federally funded research on Bay problems is one which we strongly approve. We do think, however, that it is important to the future interests of Virginia, Maryland, and the federal government for us to express our reservations now about the means proposed in H.R. 4417 to achieve that goal.

First and foremost, we would like to offer some alternatives for your consideration. Our suggestions are directed to three major elements of the Bill: the establishment of a Research Exchange, preparation of a Research Plan, and the need for ensuring that federally funded Bay research is coordinated.

We suggest that the requirements of a Research Exchange be built into the data system now under consideration by the Environmental Protection Agency as part of their Chesapeake Bay Program. This would require that the potential users of the data help EPA determine the design of the system. We suggest a meeting among the users and the providers as early as possible to discuss this whole question of a data exchange. We further suggest that the Bi-State Working Committee is capable of assisting the principal parties in addressing this issue. This is a minimal step which should be taken before a decision is made to establish another data system.

While we believe strongly in planning for Bay research, we have reservations about the proposal for preparation of a Research Plan. We believe that research needs should be defined by the managers of the operational agencies in Virginia and Maryland as well as by federal agencies and the scientific community. It is our intent that the Bi-State Working Committee, by establishing priorities for joint state activities, will identify areas of research needs. However, this process by itself could not define all the priorities for research. Therefore, we suggest that the Bi-State Committee call together annually those federal agencies which fund Bay research projects and the interested scientific community to outline the research needs. Federal and State officials and scientists working together at a one or two day meeting, can surely define the Bay's major research requirements. The resulting set of research priorities could be used by agencies as a guideline as they weigh research proposals. It could also be used by the Congress as it judges the manner in which the research funds have been expended. No new appropriations would be required to get this done.

For the Congress to be assured that federal research expenditures meet the real research needs and do not duplicate each other, we suggest that those federal agencies which fund research designed to contribute to solving Bay problems be required to report directly to the Congress annually through the Secretary of Commerce. I would be more appropriate and less expensive for federal agencies to be subject to direct Congressional oversight. The Secretary of Commerce should be responsible for preparing an annual report which should define the areas of research which have been funded by each grantor agency, the cost, the intended use of the research, and the expected result. The Congress need not establish a new

federal office to oversee other agencies. The legislature's direct interest will bring a much better response from the agencies.

I assure you, Mr. Chairman, that we have long deliberated over the proposal before you. In all our deliberations a number of concerns have consistently been raised which I would like to highlight.

In all likelihood, the membership of the Research Board would be predominantly federal. The states need a voice at least equal to that of federal agencies. The driving force behind development of research priorities should be state management problems, not the discretion of federal agencies.

The Board's review of research projects would overlap other, more extensive and well-refined processes, such as Sea Grant, which now exist for evaluating research proposals. It is unlikely that still another review by the Research Board would add much that is new to these thorough, technical reviews.

Important data exchanges now exist, such as the Smithsonian Science Information Exchange and the Department of Commerce's Environmental Data Base Directory. These need to be used, but we must be very careful not to duplicate them. We acknowledge the merit of enabling an inquirer to go to one place to obtain the information he or she needs. But we reiterate our suggestion that we first consider using the EPA data system now under study to provide this service.

While on the surface it appears the costs of the Research Board would be incurred only at the federal level, there will be added expenses to the states in responding to the Board. We cannot predict what these will be, but we can foresee expenditures which duplicate work previously done in existing technical reviews of research proposals.

Enactment of such a measure in light of the EPA program's studies on data systems and the executive and legislative initiatives to increase the coordination of Virginia and Maryland Bay activities would be premature. We think that the alternatives we have offered to established of another federal agency are very much preferable at time.

Mr. Chairman, let me reiterate that we want to achieve the same goal as the proponents of the Bill. We commend this goal and we recognize that the strongest possibilities ties between the states and the federal government are desirable and essential for dealing with Chesapeake Bay problems. We do have serious reservations about the timing of this legislation in light of EPA Bay Program and other recent developments between Virginia and Maryland. We also have serious reservations about the prospects for federal predominance in this proposal. I wish to emphasize that we should strive for a genuine state-federal partnership, whereby the states will have an equal voice in determining the direction of any joint state-federal activity on the Bay.

Let me assure you and Congressman Bauman that we are willing to work diligently to determine the best form of action.

Mr. STUDDS. Thank you very much, Mr. Budlong.

The subcommittees will stand in recess for this vote, for approximately 10 minutes.

[Short recess.]

Mr. STUDDS. The subcommittees will resume.

Mr. Budlong, I wanted to ask you one thing. You stated in page 2 of your written testimony, your concern that the Research Board's membership would be predominantly Federal. Is that just an innate Virginia concern, or do you have specific reasons?

Mr. BUDLONG. I do not think that is a concern peculiar to Virginia.

Mr. STUDDS. I assume your proximity to the Federal Government gives you a reason to be concerned about it, to say nothing of your historical concern.

Mr. BUDLONG. Perhaps that is so, Mr. Chairman. I have known some fine people from Massachusetts who share that very concern.

We do count the fact that in all probability there would be 11 members from Federal agencies and four State members on the Chesapeake Bay Research Board. We are interested in the two States, Maryland and Virginia, having an equal voice in what any

such agency would decide. We do not think the current proposal would give us an equal voice.

Mr. STUDDS. I hear you.

Mr. AMBRO?

Mr. Ambro. I would like to thank you for coming. I have no questions at this time.

Mr. STUDDS. Thank you, sir. We apologize for keeping you waiting, and interrupting you, and all the other tricks of the Congress.

Thank you very much.

Mr. BUDLONG. Thank you.

Mr. STUDDS. Our final witness is Dr. Eugene Cronin, executive director, Chesapeake Research Consortium, Inc.

You are accompanied by Dr. Peter Wagner, board of trustees of the consortium.

Please feel free to summarize your statement, if you wish.

STATEMENT OF DR. L. EUGENE CRONIN, EXECUTIVE DIRECTOR, CHESAPEAKE RESEARCH CONSORTIUM, INC., ACCOMPANIED BY DR. PETER WAGNER, CHAIRMAN, BOARD OF TRUSTEES, CHESAPEAKE RESEARCH CONSORTIUM, INC.

Dr. CRONIN. Thank you, Mr. Chairman and members of the joint committees.

I am L. Eugene Cronin, and I am director of the Chesapeake Research Consortium, Inc. I am accompanied by Dr. Peter E. Wagner, chairman of the board of trustees of the consortium.

The consortium was created as a nonprofit corporation in 1972 by the Johns Hopkins University, the University of Maryland, the Smithsonian Institution, and the Virginia Institute of Marine Science, now part of the College of William and Mary. The consortium exists to undertake multi-institutional research related to Chesapeake Bay and perform other services of regional value. Our testimony presents the view of the executive committee of the trustees of the consortium, not of the four institutions which are consorts.

We appreciate this opportunity to testify on an important matter—effective coordination of research related to the Chesapeake Bay, the Nation's largest and most valuable estuary. Research of high quality is essential for the future welfare of the bay and its valuable uses, and adequate coordination of that research will preclude wastage of public funds in undesirable duplication, and also preclude the accidental, and all too frequent, omission of essential areas of study. The consortium fully supports the objective of coordination of federally supported and conducted research and agrees with the findings and purposes specified in section 2 of H.R. 4417.

As you know, this matter has been of high and continuing interest to the sponsors—Congressman Bauman, Congresswoman Holt, and Congresswoman Mikulski. We wish to record our appreciation of their interest in this matter. They and their staffs have discussed exhaustively with the scientific community the need for improved coordination, possible means of achieving it, and the possible contents of a series of drafts which have led to H.R. 4417. They have been patient and understanding, and they have incorporated many suggestions from the consortium into H.R. 4417 in a

vigorous effort to meet the need they sense without causing destructive effects on research.

The consortium has given exceptional attention to H.R. 4417. We have carefully considered that bill and previous testimony on similar proposals in H.R. 10064 and H.R. 12631 in the 95th Congress, and drawn upon our own extensive experience with Chesapeake-related research. The institutions in the consortium include nearly two-thirds of the nongovernmental scientists of the region and reach back over 50 years in investigation of the bay. We have considered and debated various alternatives to the language and sought to develop constructive suggestions toward the shared objective—improved coordination among Federal research efforts.

The trustees conclude, and testify to you, that:

One, improved coordination in federally supported research related to the bay is possible and desirable. We have seen a series of major Federal programs related to the Chesapeake—recently by the National Science Foundation, the U.S. Army Corps of Engineers, the U.S. Geological Survey, and the U.S. Environmental Protection Agency. There have also been projects or programs by the National Marine Fisheries Service, the Sea Grant Office, and the Office of Coastal Zone Management of the Department of Commerce; Fish and Wildlife Service of the Department of the Interior; Smithsonian Institution; Office of Naval Research and Naval Ordnance Laboratory; National Aeronautics and Space Administration; Department of Energy; Department of Transportation, and others. Some of these are in-house programs, and some involve external contracts and grants. We have observed cases of excellent cooperation and coordination, moderate or minimal coordination and poor coordination among these agencies. In our opinion, coordination is usually fairly good—but there is room and need for significant improvement. We urge that it be achieved.

Two, the consortium opposes creation of an Office for Chesapeake Bay Research, Planning and Coordination as proposed in H.R. 4417. Such an office would or could:

One, duplicate the review and evaluation process now required of Federal agencies and governmental bodies.

Two, exert a degree of control over science, and thereby inhibit the freedom to explore unanticipated ideas and opportunities, which so often leads to the best and most valuable achievements.

Three, create, by establishing an additional layer of bureaucratic review, a bottleneck in the approval of programs, since project review on the wide range of probable subjects cannot be accomplished quickly and competently by a small staff, even with assistance from peers.

Four, effectively preclude responsive research related to problems which suddenly arise and rapidly change—as with Kepone.

Five, create an additional layer of bureaucracy in research approval, which is already often clumsy.

Six, divert research efforts by Federal agencies from the Chesapeake to other areas of the Nation where this layer of delay and review is not required. We hope that adequate research is conducted in another area, but we do not wish to have potential for good research deflected from the Chesapeake simply because it would have to go through an additional delay and analysis.

Seven, expend \$1.5 million with no direct product in the form of new knowledge.

Eight, find it impossible to carry out the specific provisions of the bill within the required 3 years because of the time required to create and staff an office, establish a board, develop a plan and have an impact on Federal programs.

Nine, exert substantial control by one Federal agency over programs in others. We are not knowledgeable in all of the ramifications of this possibility.

The consortium recommends that the problem of research coordination be referred to the executive department of the Government.

Many constructive ideas are expressed in H.R. 4417. These include development of a Chesapeake Bay research plan; establishment of a group drawn from the Government, industry, the public, and the scientific and environmental communities to develop the plan and support coordination; assurance of a Chesapeake Research Exchange; linkage of Federal research efforts with those of State and local government agencies; effective dissemination of results and findings; periodic meetings on research among Federal agents, State, regional and local agents and the scientific community; conduct of a conference on Chesapeake Bay affairs at least once every 2 years; and review of proposed programs to preclude destructive duplication. Each of these is desirable in the public interest.

All of these functions could, and should, in our opinion, be performed by action of the executive department without additional legislation. They are matters of efficiency and effectiveness in carrying out the directives of the Congress. We recognize that interagency committees and councils or other executive mechanisms have both potential weaknesses and strengths, but we urge that the task to improve interagency coordination and planning be placed upon such agencies. Control agencies already exist to prevent wasteful duplication, but there is no present mechanism for coordination of planning for the Chesapeake Bay.

The consortium offers continuing cooperation with the sponsors, these subcommittees, and Federal agencies in obtaining unified and coherent planning and coordination of research on Chesapeake Bay, and the completion and application of useful research to meet the needs of one of the fastest growing regions of the Nation.

These hearings have been very valuable. Perhaps their greatest contribution will be to increase the awareness and sensitivity of the Federal agencies of the needs emphasized in H.R. 4417.

Mr. Chairman, Dr. Wagner or I would be glad to respond to any questions of any members of the committee.

Mr. STUDDS. Thank you very much, Dr. Cronin.

I have a feeling Mr. Bauman will have a number of questions. I will yield to him first.

Mr. BAUMAN. I find your statement surprising, if not shocking. Dr. Wagner is with you, and you will recall last year where the subcommittee of the Science and Technology Committee held hearings, and at the last minute you came in with a list, a shopping list of changes that you wanted in the bill. Consequently, as a result of that suggestion, my staff has worked with Dr. Wagner and people from your shop for almost a year changing this bill to meet every

requirement, and every suggestion that you advanced, many of which were to meet the 9 or 10 points that you now say the bill that we redrafted to meet your specification raises.

Now, do you just not want any Federal coordinating agency; is that what I conclude, and did I in any way misportray the history of this?

Dr. CRONIN. No, your portrayal is quite accurate. If you will recall, we, as late as 2 weeks ago, discussed some possible ideas. Some very useful ideas.

The executive committee of the trustees, if I quote them correctly, and I hope I do, took the point of view when they took their position on this bill that I have reported here, that is, that Congressman Bauman has worked very hard with us, He has listened to us, he has incorporated a great many ideas, but we still fear excessive control, excessive bureaucratic process over research done on the bay. They do not believe that this is constructive in getting the best quality of research, diversity of research, and achievement of research. They do believe that coordination can and should be effective.

I would interpret this, Mr. Bauman, as saying that the consortium trustees are entirely in favor of the objective but they feel that the mechanism may not be effective through creation of an office for this purpose in one agency of the executive part of the Government.

Mr. BAUMAN. Well, I have been aware that there has been more than one question raised about the need of this office, particularly on the part of the scientific community, and I think that is why we labored so hard to meet your objections, and to change the bill substantially in specific detail, to meet the various problems that you saw in this, and now you come before us with a statement that having made those changes, almost all of those objections still exist.

I do not quite understand that logic, except that your trustees concluded no matter how much you change it, you did not want a Federal office to coordinate on a formal and continuing basis research funded by the Federal Government. I mean that is a legitimate viewpoint, and I understand that viewpoint.

Mr. BAUMAN. Coming on the history of our trying to compromise, it surprises me a great deal.

Dr. CRONIN. I am sorry to disappoint you Congressman, because I know you have been quite sincere in your efforts to respond. The bill as it was, even with modifications, still was unacceptable to the group, and perhaps could not be modified to a degree of acceptability.

Mr. BAUMAN. Have you changed your view from the 1978 statement in which I quoted earlier, and I will just remind the subcommittees of it, that the diversity and stubbornness of management, because of that, there is no universally accepted program for achievement in the bay.

Do you in any way think that statement is diminished?

Dr. CRONIN. That statement is not diminished, but substantial progress has been made.

Mr. BAUMAN. Where is the data base?

Dr. CRONIN. The data base is being developed under the EPA program.

Mr. BAUMAN. How much of your funding—how much of the EPA funding has gone into the consortium, would you say?

Dr. CRONIN. A very small amount has gone to the consortium as such. A large portion has gone to the independent CBC institutions, in proportion to the number that they represent of the scientists of the region.

Mr. BAUMAN. My information is that approximately 75 percent has gone to either consortium or to member institutions, with the EPA studies running about \$5 million a year.

Dr. CRONIN. That is approximately correct, Mr. Bauman. We represent about two-thirds of the non-Government scientists receiving about 72 or 74 percent of the EPA funding program. I would like to add that not only do we have that number of people but we have the large laboratories, the research vessels, the specialized equipment that can do the type of work they need.

Mr. BAUMAN. Would your track record and your present position in the research community dealing with the bay not serve to cause you to welcome such an agency which you could probably serve and perhaps be the central mechanism in carrying out this perhaps even under contract rather than to oppose it?

Do you fear that you are going to lose research money?

You say you worry about intrusion into scientific matters by the Federal Government. Is all this talk about coordination, so much baloney that everybody repeats at every hearing and every speech, but nobody does anything about it?

Dr. CRONIN. I disagree that nobody has done anything about it because we have. We have called together every agency in the Chesapeake Bay and provided an opportunity for them to stand and tell the others what is going on and meet the other people who are active. We have brought together 2 years ago a baywide conference on Chesapeake matters, arriving at excellent statements, in my opinion, of the problems and of solutions—both governmental and research and technical—to those problems.

We have begun to develop a Chesapeake Research Information Exchange idea to see how it can best be done. We have developed a directory of the institutions working on the bay.

I do not mean to overemphasize consortium activities because there are others as well. The two States have created a Chesapeake Bay Legislative Advisory Commission to improve coordination and they have established a bi-State working committee at the agency level. I think there is much activity toward coordination, and I give you full credit for stimulating it.

Mr. BAUMAN. The Chesapeake Bay Legislative Advisory Commission is a joint body of the two legislatures dealing with State matters; is it not?

How does that touch Federal research?

Dr. CRONIN. It deals with improvement of coordination between the States in matters related to the Chesapeake Bay. One of the subcommittees that we have established deals with research and information. That subcommittee will recommend on approved coordination dealing with research at any level, I hope. Of course, the report is not completed yet.

Mr. BAUMAN. Of course we both know that you will have no jurisdiction or powers over Federal research grants whatsoever except other than advice that you might wish to give gratuitously.

Dr. CRONIN. That is right.

Mr. BAUMAN. Neither does the bi-State agreement just signed by the Governors.

Dr. CRONIN. We agree.

Mr. BAUMAN. I would like to hear you answer the previous thrust that the State of Maryland, having activities in the bay for a year, finds it is impossible to get any coordination; that there is overlapping and duplication, and it works at cross purposes arriving at solutions. He was speaking for a government of one of the two States involved.

Dr. CRONIN. I appreciate your point and his point, Mr. Bauman. The cases that were cited, though, do not seem to be to lend themselves to improvement by establishing a Federal research office. In some way and at some point, which I have always found difficult to visualize, the office is going to review programs and projects either as they begin the budgetary process or as they get to an OMB review or as they come from OMB or as they get into administration. I am not clear when the Office would review and determine whether they do or do not fit within a plan. I have been unable to see how that is going to preclude the kinds of things that I think are duplication of research.

Many of the things that Mr. Zeni cited are complexities of permits.

Mr. BAUMAN. You have concern about whether or not the bill's requirement for a research plan would some way stultify research.

Dr. CRONIN. I have that concern.

Mr. BAUMAN. Let me refer you to your statement on page 6, the last line, you say, "Control agencies already exist to prevent wasteful duplication, but there is no present mechanism for coordination of planning for the Chesapeake Bay."

Dr. CRONIN. That is correct.

Mr. BAUMAN. You want a mechanism but yet you do not want it?

Dr. CRONIN. We want a mechanism but have a concern about the office, the bureaucratic center for it. Perhaps it would be appropriate if I depart from my role as spokesman for the trustees of the consortium and give you some personal comments on ways I think the same thing might be accomplished if that would be welcomed, Mr. Chairman, or Mr. Bauman.

Mr. BAUMAN. After a year of suggestions, I am willing to listen to another year of suggestions if we can finally get to the point where we give more than lip service to coordinating this activity. Sure.

Dr. CRONIN. I, as an individual, with experience in the field, Mr. Chairman, suggest that with effective executive instruction a Federal Interagency Council on Chesapeake Research, with appropriate representatives from involved agencies, could be created which might do the following tasks:

It might establish associate members from the States and other sources to parallel the proposed research board.

It might develop, perhaps every 3 years, a refreshed and updated Federal Chesapeake research plan.

It might coordinate and stimulate the prompt and efficient dissemination of results and findings to the public and to management agencies.

It might arrange periodic working meetings on bay research among Federal, regional, State, and local agents and the scientific community.

Second, any of several agencies—Office of Coastal Zone Management Office of Sea Grant or other NOAA agencies, for instance—could contract on an extended basis with an appropriate entity to design and operate a Chesapeake Research Exchange, continuously identifying all existing research and all published research products and making this information easily available for users.

As a third function, public conferences on the many aspects of Chesapeake Bay affairs can be conducted by any of several sources. The necessary elements are identification of a competent organizing group and provision of sufficient, and relatively modest, funds from appropriate sources. We can suggest several possible approaches, and other ideas are available from existing Federal agencies, the Commonwealth of Virginia and the State of Maryland, and the regional scientific and citizen-related groups.

Fourth, the Office of Management and Budget would appear to have responsibility to assure that Federal funds are not spent in any wasteful duplication of efforts—in research as in other fields. The Office of Technology Assessment is also available to provide reviews and identify any areas of such duplication. The Government Accounting Office is available to determine whether or not expenditures have been wastefully duplicative. All of these control and monitoring offices are already available.

Mr. BAUMAN. Are these various existing Federal mechanisms working? The evidence seems to be of all of our witnesses that they are doing the job but no one wants to take the bull by the horns and require them to do the jobs in a formal mechanism.

Dr. CRONIN. I agree with you entirely.

Mr. BAUMAN. They are not doing the job but yet you do not want to change them.

Dr. CRONIN. I do not want to change them, Mr. Congressman. I would like to almost quote an individual, a very important individual who is very knowledgeable in the field, who said what we need to do is to kick the Federal agencies in the spots that will do the most good by an executive directive because that is where their directions come from. With that action, a great deal of what you have worked for can be accomplished without creating bureaucratic centers.

Mr. BAUMAN. Mr. Chairman, I thank the subcommittee for their indulgence. I just observed that Dr. Cronin is a widely respected scientist and has had some experience with politics as a result of his activities over the many years of dealing with this problem. I take his personal statement as an endorsement to most of the elements in my bill, but rejection of the bill, but I guess the subcommittees will have to decide eventually what is done.

But I am thoroughly disappointed and I am sure you will have to explain to Senator Mathias why the bill we both drafted—I might just add for the record, the consortium suggested that the com-

bined plan be included in this bill, the one that Dr. Cronin thought was a threat. That is neither here nor there.

Mr. STUDDS. I do not know if you have had enough experience in politics to accept gracefully the endorsement from the gentleman from Maryland, of his endorsement. It might elude the scientific mind.

Mr. Ambro?

Mr. AMBRO. Thank you, Mr. Chairman.

I must say I have heard testimony orchestrated in favor of legislation before but what we hear today is almost a 180-degree turn from that, maybe 160 degrees. We've had a 20-percent endorsement so far. But that apart, with respect to the specifics of your testimony, if you are now dealing with the National Science Foundation, Corps of Engineers, USGS, EPA, NOAA, and a variety of programs, all of which I would suppose come from and are overseen by executive branch agencies, where in the executive branch would you put the lead coordinating responsibility?

Maybe I am not clear here, but your third point says that the consortium recommends that the problem of research coordination be referred to the executive department of the Government. Where in the executive department of the Government would you place it?

Dr. CRONIN. We are not experts in the structure of the Federal Government or its best operation. It would seem to me, as an interested citizen, that the Office of the Executive, the Office of the President, can tell the executive agencies "I want established a Council on the Chesapeake Bay. I want that Council to accomplish the following purposes. I will designate this particular agency or that as the lead agency."

The problems of the Chesapeake are enormously complex. That is why there are so many agencies there. The problems relating to transportation—as transportation, for traffic control sufficiency of safety devices, whether or not bridge clearances can be approved—are quite different from those of Fisheries Management. They are in the same body of water but they are very diverse, that is why there are many actors. But I hope that the Federal Government, where it finds an area of national interest, can direct agencies to develop a plan, to work with a group of citizens and State agents in development of that plan, to stimulate conferences, meetings, other discussions where it is appropriate and to be sure that all the information about that area gets out to the public and that would accomplish our intent.

Mr. AMBRO. Well, you see, we have this problem which cuts across a variety of areas, concepts and jurisdictions.

For example, in order to try to do something about the regulatory function, a number of agencies put together something called the IRLG—the interagency regulatory liaison group—which brings together a number of departments, and they discuss or are supposed to discuss the approaches of regulation on a variety of interests.

We know in the Science Committee that in a number of programs or areas there is so much diversity and so many fingers in the pie, if you will that coordination is nonexistent. The climate program is suffering, the materials program is almost nonexistent—although elements of these exist in a variety of departments

and bureaus—nonionizing radiation appears to pose a threat as well yet there lacks a coordination regarding this problem. These are areas in which we are seeking better coordination. Invariably, witnesses come in and tell us that we do not need legislation but Frank Press' office in the White House should handle coordination for all of this. Sometimes Frank Press throws up his hands and says I do not want it, but, of course, these problems are national and they are very comprehensive and they impact on the diversity that is in this Nation. Here you have got a nice little entity, where you have a couple of States involved and a variety of Federal departments and local governments, and a variety of programs. You have problems with your coastal zone and your tides and clean water and threats to fish and marine life and plant life and vegetation and things like that, but it is something which legislation can do something about. We can pull together those diverse and multi-leveled Government institutions and try and coordinate it and plan it and research it better.

I hope that a good deal of this testimony does not stem from the attitude that if we have this kind of coordination it would inhibit us, meaning this group that you represent, the Chesapeake Research Consortium, Inc., from getting a grant and to hell with the coordination that may be envisioned in the bill. I do not know that that is true. I do not know you nor do I know your group.

Mr. Bauman assures us that you are a man of great integrity and great background, and I am sure he is right. Perhaps, there is a feeling on the part of boards, whether they vote for or against something like this, that here is a layer of bureaucracy that may interdict their ability to directly do what they want to do. They would be required to speak and coordinate their activities with others.

One might view coordination with open hostility. In the view of others, everybody nods and says it is a wonderful thing. Of course, the witnesses before us, and I do not want to continue this monolog, but it is surprising to me that your board, after reaching an agreement between you and Mr. Bauman, and after you had so much input with respect to this legislation, would now ask you to come down here and oppose it. It seems to me this coordination can only be a good first step.

Having said that, what do you say?

Dr. CRONIN. I appreciate your comments, Mr. Chairman, that the national aspects of it are very serious indeed. I recognize that problem. It is not irrelevant in science or other fields as well, but the board feels that creation of an office threatens to either be innocuous and, therefore, useless, or to become the controlling mechanism.

Mr. AMBRO. To become what?

Dr. CRONIN. Become a controlling mechanism to an excessive degree and therefore begin to be a point of undue restriction on the freedom of research. It is a difficult prospect.

Mr. AMBRO. Well, I think, Mr. Chairman, I have said as much as I want to say. Thank you very much.

Mr. STUDDS. Thank you, Mr. Ambro.

I guess there is a clear consensus that there is a problem. No one has disputed that as far as I can recall, and the question becomes how does one deal with it?

Mr. Bauman, do you wish to have the last word at this time?

My own inclination, after spending almost 7 years in this city, is to greet with extreme skepticism for the proposal for a new part of this Government. I must say that having served that time, along with the gentleman from Maryland, when the suggestion comes from that source, it bears careful scrutiny.

Dr. CRONIN. Mr. Chairman, if I might add something entirely gratuitously, when Mr. Bauman arranged for a hearing on the previous bill a little earlier last year, we had the heaviest snow-storm in 100 years in Maryland. I drove from 3 o'clock in the morning, through a blizzard, to 10 o'clock, to get here. I drove from 5 hours yesterday in a subtropical hurricane, or it seemed like it to me, to get to the hearing.

Somebody is listening. I don't know whether they are for or against the bill, but they certainly are noticing.

Mr. AMBRO. Somebody up there is telling you something.

Dr. CRONIN. I cannot read the message but it is getting attention.

Mr. STUDDS. I hate to think what might happen if we still have that stand next year.

Mr. BAUMAN. When the hearing started, the Sun came out, which might be some omen.

Mr. STUDDS. Are you planning to return by the bay or by land route?

Dr. CRONIN. Mr. Chairman, I might ask which way Mr. Bauman is going.

Mr. STUDDS. Thank you, gentlemen.

The subcommittee stands adjourned.

[The following was submitted for the record:]

SIERRA CLUB,
Washington, D.C., September 10, 1979.

HON. GERRY E. STUDDS,
Chairman, Oceanography Subcommittee, Committee on Merchant Marine and Fisheries, House of Representatives, Washington, D.C.

DEAR CHAIRMAN STUDDS: In order to understand the possible effects of the proposed Chesapeake Bay Research Coordination Act, I have consulted with a number of citizens who have worked for years on Chesapeake Bay issues and on various aspects of water resource protection for the bay and its tributaries.

Their advice, which I summarize below, leads me to make the following recommendations:

1. Do not approve H.R. 4417.
2. Ask the U.S. Comptroller General to compile a report on all of the Chesapeake Bay research presently being funded wholly or in part by federal grant money, plus a list of the grantees, project topics, and grant amounts of such research projects that were completed in the past five years.
3. Ask the Office of the Federal Regional Council to do the following: (a) seek advice periodically from members of the general public as well as from research institutions; and (b) set priorities in order to evaluate grant applications.
4. Request a follow-up GAO report two years after the first report, to see whether project coordination has been improved.

Use existing agencies for better economy—this is the advice of the citizens I contacted, most of whom are founding members or officers of organizations in Maryland bay-area counties. Economy will be realized, first in dollar savings. GAO and Federal Regional Council costs should amount to substantially less in three years, than the \$1.5 million that H.R. 4417 authorizes. There will be a savings in time, as well. Every newly formed agency requires a considerably long start-up time, until it begins to function effectively. Further, there will be an economy of

effort. A streamlined chain of command represented by the Federal Regional Council, acting on the findings of a GAO report, will result in real authority where it counts: grant approvals based on a set of priorities.

There already is a Coastal Resource Advisory Committee that plays a role in reviewing research grant applications. This organization makes recommendations to the grantor as to possible redundancies or gaps in a proposed project's scope of work, as compared with programs already underway. Because the United States Environmental Protection Agency has just recently begun a coordination study of Chesapeake Bay research projects, H.R. 4417 is at least premature—though it appears to be duplicative—and might even result in this worst-case scenario:

"A politically appointed body deciding who gets the grants, without a specified public participation program, without a requirement to keep an open record on its decision-making, could seal the fate of the Bay by funding research meant to justify risky construction proposals and by weighing in with recommendations to proceed with such construction."

If the aim is to conserve scarce research dollars and to apply them for the greatest benefit, setting up a new agency is difficult to justify. The Chesapeake Bay and the U.S. taxpayers deserve better.

Sincerely,

RHEA L. COHEN,
Washington Representative.

JOINT POSITION PAPER—STATE OF MARYLAND AND COMMONWEALTH OF VIRGINIA

Maryland and Virginia are pleased to offer further comments on the Chesapeake Bay Research Coordination Act of 1979. We are particularly pleased to note that these comments represent a joint position of both states. We wish to compliment Congressman Bauman for his dedication to our shared, priceless resource—the Chesapeake Bay. We are very impressed with his work and grateful for the cooperation he has helped foster between Virginia and Maryland.

Maryland and Virginia welcome the opportunity to support a principal purpose of the bill, to require federal agencies to coordinate their Chesapeake Bay research efforts. At times federal agencies conducting or supporting research in the Chesapeake Bay appear to be competing with each other. Therefore, we agree that compulsory coordination of federal agency research programs on the Chesapeake Bay is needed. We also agree that the authority to effect this coordination should be established in an office within the Department of Commerce, although that office would have fewer authorities and responsibilities than those proposed in H.R. 4417.

Because Chesapeake Bay lies entirely within the boundaries of the Commonwealth of Virginia and the State of Maryland, it would seem that interstate coordination of Chesapeake Bay affairs could be handled through simple and direct bi-state relationships. However, management of Chesapeake Bay affairs is made difficult by two factors that lie beyond the direct control of Virginia and Maryland. The first of these factors is the influence of actions of other States on the major river tributaries to the bay. Maryland's and Virginia's response to this problem is to foster and participate in interstate organizations and agreements, some of which are federally supported.

The second factor is the federal presence. it is the primary reason for our support of H.R. 4417's principal purpose, because it has such a profound effect on Chesapeake Bay affairs. The problem is complicated because the federal presence exists in the form of several major independent federal agencies. Each agency performs its separate actions according to its mandates of law, regulation and budget. From the State viewpoint, the federal presence is manifested as a number of single purpose units. In numerous instances, Congress has given these single purpose units of federal government authorities that preempt or are equal to, but are hardly ever subservient to the authority of the State. In the Case of federal research on the bay, the intent of Congress would seem to be better served if these separable federal agencies were required to coordinate their research programs rather than being allowed to act independently.

As a general rule, federal agencies active in Bay research appear to establish good machinery for internal coordination, but do much more poorly in coordinating their actions with one another. Quite simply, agencies appear unwilling to subject themselves to the purview of other agencies.

We believe it is absolutely essential that a means to coordinate federal research and federally supported research on the Bay be Congressionally mandated. The office in which the authority to coordinate will reside will have to be cognizant of research being managed and/or carried out by state, local, and private interests. Its

authority to influence the direction of research programs once they are underway should be confined to federally conducted research. Once the research programs are approved, the office should not be authorized to interfere with research funded by federal agencies but carried out by the states through such programs as water pollution control, wetlands management, or coastal zone management.

There is another need, equally as important. The research must help the intended beneficiaries—the Bay users—and therefore they should have more to say about the research itself. An inter-state institution, such as our Bi-State Working Committee of executive agencies, could work with the many, well-organized Bay interest groups to define their research priorities. These priorities, in turn, would become guidelines for federal and state agencies and scientific institutions conducting research. The results of the research and its implications for Bay users and for those who must decide how the Bay can be used must be made clear to these people. Both the states and the federal government can improve their efforts to explain the implications of research findings to the decision-makers. We must do a better job of selecting research that is needed and of telling people how they can use it.

Over the past year, Virginia and Maryland have been taking historic steps towards close cooperation in managing the uses of the Chesapeake Bay. This joint position paper is but one example of our close working relationship. Legislators and representatives from both states have been working since 1978 to improve the institutional means by which we share responsibility for the Bay. On the executive side, Governor Dalton and Governor Hughes signed an agreement in August 1979 pledging the cooperation of the operational agencies in both states. This has resulted in the Bi-State Working Committee of Maryland and Virginia agencies, referred to previously. This Committee is working out ways in which many activities of the states can be consistent and complementary.

Virginia and Maryland stress that the states ought to have an equal voice with the federal government in deciding what to pursue in Bay research. Any arrangement by which federal research programs are decided or coordinated should be a genuine state-federal partnership.

Virginia and Maryland agree that the following principles must be clear in H.R. 4417, if it is to be the basis for achieving the goal of federal coordination and true partnership with Virginia and Maryland for research in the Chesapeake Bay. A revised copy of H.R. 4417 is attached to reflect these views and other points which are not discussed in this statement.

1. The role of the proposed Office should not extend into management. Section 4(c) does give the Office a management role. We recommend that this section be deleted in its entirety.

2. The Office should review research programs, not projects. Section 4(b)(2)(A) would have the Office "ascertain the extent to which any research project . . . complies with the research plan established by the Research Board." This is unrealistic, given the many research projects, and would duplicate the extensive peer reviews now conducted by the scientific community on research proposals. For example, the Sea Grant program takes up to nine months to approve the many and varied project proposals. Peer reviews are made within the institution making the proposal, outside the institution, and finally within the state and federal governments.

In this context, "program" needs to be understood as applying to research dealing with a management program within the Chesapeake Bay. For example, the Maryland Sea Grant Program concentrates its research on the State's declining oyster industry, which is currently plagued by insufficient natural reproduction, falling harvests, and growing labor shortages in seafood processing. Maryland's oyster research projects fall into the basic biology of the oyster, the chemistry and microbiology of estuarine waters, the development of various aquaculture options, and the major problems of harvesting and marketing.

We recommend that "programs pertaining to the management of the Chesapeake Bay" replace wording in lines 5 and 6, page 6 and that "project" be replaced by "program" wherever necessary.

3. The purpose of the Office's review should not be to decide the scientific validity of projects or programs. It should focus on how well federal research programs are being coordinated and how well they meet Bay research priorities. Coordination of federally funded research conducted by the states should occur during the grant application stage. Once approved and funded, such research programs should not be subject to further federal direction.

4. The Office should not engage in planning. Including this function in the Office's title implies that it will prepare plans for Bay use. We recommend that "planning" be deleted from the title. The proposed Board should prepare a Chesapeake Bay

Research Plan based upon priorities recommended by the states, federal agencies, the scientific community, Bay users, and local jurisdictions. These priorities would be commonly known. Individuals and institutions proposing research projects as well as federal agencies funding research would be expected to make their proposals and decisions based on this plan. It should be updated biennially instead of annually.

5. The Congress should direct federal agencies that fund Bay research to report to it annually on their activities and results. This would be most readily accomplished through the Office in the Department of Commerce. The Secretary of Commerce should prepare an annual report which would define the cost, intended use, and expected results of the research programs conducted or supported by each federal agency pertaining to the management of the Chesapeake Bay.

The states are not without obligations, for we are premising much of our case on the belief that the states can be the driving force behind better coordination and use of Bay research. It would be entirely appropriate for the Congress to have the states give an accounting of how they have organized to set research priorities and what they are doing to see that the results are made available—in clear, usable form—to Bay users and decision makers. Maryland and Virginia themselves need to define Bay issues periodically, set forth the resulting research needs, report on state-conducted Bay research funded by the federal government, and describe the implications of research findings to Bay users. The forum for getting this done can be our Bi-State Working Committee. It is a matter that we shall take up shortly.

Congressman Bauman and his staff have indicated their willingness to consider amendments and revisions to the bill. We would be happy to work with him and his staff, subcommittee staff, and other interested parties from Maryland and Virginia to assist in any way possible.

Again, we express our appreciation to Congressman Bauman for his efforts in Chesapeake Bay affairs and for his consideration of our interests.

JAMES B. COULTER,
Secretary of Natural Resources,
State of Maryland.

MAURICE B. ROWE,
Secretary of Commerce and Resources,
Commonwealth of Virginia.

[Whereupon, at 4:28 p.m., the subcommittees adjourned, subject to the call of the chairman.]

NACOA AUTHORIZATION AND OVERSIGHT

TUESDAY, APRIL 24, 1979

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON OCEANOGRAPHY,
COMMITTEE ON MERCHANT MARINE AND FISHERIES,
Washington, D.C.

The committee met, pursuant to notice, at 10:15 a.m., in room 1334, Longworth House Office Building, Hon. Gerry E. Studds (chairman) of the subcommittee presiding.

Present: Representatives Studds, Hutto, Lowry, Forsythe, and Pritchard.

Staff present: Richard Norling, Tom Kitsos, Don Lippincott, Elizabeth Dooling, Jeffrey Pike, and Curt Marshall.

Mr. STUDDS. This is the reauthorization of NACOA.

Our first witness is Mr. Michael Glazer, Assistant Administrator for Policy and Planning of NOAA.

STATEMENT OF MICHAEL GLAZER, ASSISTANT ADMINISTRATOR FOR POLICY AND PLANNING, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, DEPARTMENT OF COMMERCE

Mr. GLAZER. Thank you.

With your permission, I will file my statement for the record, and just summarize it.

Mr. STUDDS. We will be delighted.

[The following was received for the record:]

STATEMENT BY MICHAEL GLAZER, ASSISTANT ADMINISTRATOR FOR POLICY AND PLANNING, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, DEPARTMENT OF COMMERCE

Mr. Chairman and members of the committee, I appreciate the opportunity to testify before this Committee today on the authorization of appropriations for fiscal years 1980 and 1981 for the National Advisory Committee on Oceans and Atmosphere (NACOA).

As you know, Mr. Chairman, NACOA was reestablished in 1977 by Public Law 95-63, with the responsibility to undertake a continuing review of the Nation's oceanic and atmospheric programs, to report annually to the President and Congress on the state of United States marine and atmospheric activities, to advise the Secretary of Commerce regarding programs of the National Oceanic and Atmospheric Administration (NOAA), and to provide any other reports on these matters that are commissioned by the President or Congress.

We believe that a source of regular, informed and independent advice on such matters can be a valuable asset for NOAA and other Executive Branch agencies as well as for the Congress. Oceanic and atmospheric policy issues are often complex, and no one person or group of people has all the answers to them. Those who deal with such issues and administered programs on a daily basis need the insights and the challenges to established patterns of thought that can be provided by an expert body such as NACOA.

During last year's authorization hearings, NACOA was in the process of starting to operate under Public Law 95-63, and this Committee received considerable testimony about the manner in which NACOA could most effectively serve the Congress and the President. We indicated our view that NACOA could be most effective by focusing on broad oceanic and atmospheric issues that were not only of current interest but also had important implications for the future. We also indicated our hope that NACOA would provide advice on a basis that would sufficiently timely for us to reflect on it and carry out necessary actions. In particular, we felt it would be helpful if NACOA could make its reports on a "when-needed" basis rather than on an "annual report" basis.

Others made similar observations, and we believe NACOA has successfully responded to these comments over the past year. NACOA has focused on a small number of important and timely issues, has made timely policy recommendations on these basic issues, and has accompanied its policy recommendations with draft legislative language when appropriate.

After extensive solicitation of outside views, NACOA sent its recommendations to both the President and the Congress regarding the proposed reorganization of the Federal Government's natural resources functions. It continues to participate in the discussion of this issue.

One of the major questions pending before this Congress is the future direction of the Nation's Coastal Zone Management program. NACOA studied the program and forwarded a report to the Congress and the President this January concluding that more needs to be done to achieve its original objectives. Detailed legislative recommendations were prepared to accompany the report.

NACOA has reviewed NOAA's proposed program for research on an improved short-term, short range weather forecasting capability—the PROFS program. It recently strongly endorsed funding for this research.

NACOA sponsored a workshop in February to provide input into Congressional Committee studying the provisions of a NOAA Organic Act with respect to weather services.

In the 95th Congress, NACOA actively participated in the development of several important pieces of legislation. It was instrumental in developing natural resource damage assessment provisions for the Senate's Oil Spill Liability and Compensation bill, and prepared a section-by-section analysis of the House and Senate bills for use by all members of Congress. It forwarded recommendations on the National Climate Program to this Committee last spring and prepared a reconciliation of the differing bills for use by members of this Committee.

We have worked closely with NACOA to identify issues that we believe are worthy of its attention, and we believe that NACOA's program for the remainder of 1979 is equally timely. For example, NACOA is studying the future direction of NOAA's ocean technology and ocean engineering programs. It will review the Reports of the Department of Commerce's Fishery Development Task Force, our first five-year Ocean Pollution Research and Research and Development and Monitoring Plan, and the Secretary of Commerce's Weather Modification Report. It will continue to be involved in any NOAA Organic Act legislation and issues related to natural resources organization. It will review NOAA's Ocean Dumping and Marine Sanctuaries programs, the Federal Government's Arctic research programs and the pending Antarctic negotiations. These are important issues with respect to which major policy decisions must be made by NOAA and by other Federal agencies in the near future. Both the Congress and the President will benefit from NACOA's studies and recommendations with respect to them.

In summary Mr. Chairman, we believe that the new NACOA is performing and will continue to perform a valuable function. We support proposed legislation to provide authorization for fiscal year 1980 at the level of \$465,000, and authorization for fiscal year 1981 for such sums as may be necessary. The figure for fiscal year 1980 was arrived at after consideration of competing budget needs, and is \$19,000 less than the amount recommended by the Administration for the 1979 fiscal year.

Mr. Chairman, I would like to conclude my remarks by stating that NOAA looks forward to working with NACOA during the coming year and to benefiting from its advice and counsel.

Mr. GLAZER. We believe that a source of regular, informed and independent advice on matters such as NACOA charged with is reviewing can be a valuable asset for NOAA and other executive branch agencies as well as for the Congress. Oceanic and atmospheric policy issues are often complex, and no one person or group

of people has all the answers to them. Those who deal with such issues and administer programs on a daily basis need the insights and the challenges to established patterns of thought that can be provided by an expert body such as NACOA.

During last year's authorization hearings, NACOA was in the process of starting to operate under Public Law 95-63, and this Committee received considerable testimony about the manner in which NACOA could most effectively serve the Congress and the President. We indicated our view that NACOA could be most effective by focusing on broad oceanic and atmospheric issues that were not only of current interest but also had important implications for the future. We also indicated our hope that NACOA would provide advice on a basis that would be sufficiently timely for us to reflect on it and carry out necessary actions. In particular, we felt it would be helpful if NACOA could make its reports on a when-needed basis rather than on an annual report basis.

Others made similar observations, and we believe NACOA has successfully responded to these comments over the past year. NACOA has focused on a small number of important and timely issues, has made timely policy recommendations on these basic issues, and has accompanied its policy recommendations with draft legislative language when appropriate. Chairman McKernan will discuss the precise issues NACOA has devoted itself to over the past year, so I will refrain from going over these items, other than to indicate we believe they were important and timely subjects for consideration.

We have worked closely with NACOA to identify issues that we believe are worthy of its attention, and we believe that NACOA's program for the remainder of 1979 is equally timely. For example, NACOA is studying the future direction of NOAA's ocean technology and ocean engineering programs. It will review the reports of the Department of Commerce's Fishery Development Task Force, our first 5-year ocean pollution research and development and monitoring plan, and the Secretary of Commerce's weather modification report. It will continue to be involved in any NOAA Organic Act legislation and issues related to natural resources reorganization. It will review NOAA's ocean dumping and marine sanctuaries programs, the Federal Government's Arctic research programs and the pending Antarctic negotiations. These are important issues with respect to which major policy decisions must be made by NOAA and by other Federal agencies in the near future. Both the Congress and the President will benefit from NACOA's studies and recommendations with respect to them.

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Mr. Chairman, I would like to conclude my remarks by stating that NOAA looks forward to working with NACOA during the coming year and to benefiting from its advice and counsel.

Mr. STUDDS. Thank you, Mr. Glazer. Are you the liaison between this world of NACOA and NOAA?

Mr. GLAZER. Yes.

Mr. STUDDS. You spend a lot of time liaisoning between the two?

Mr. GLAZER. I think we are spending a fair amount of time trying to insure that the subjects of discussion that they choose are sound ones, and we are helping them in every way we can.

Mr. STUDDS. Is it true you personally, or through your staff, are responsible for the coordination that exists between you and NACOA?

Mr. GLAZER. Both. I think my deputy has the formal responsibility, but I spend a fair amount of time on it. For instance, I participated in their last meeting.

Mr. STUDDS. You seem to think they can get along on a lot less money than they do.

Mr. GLAZER. The President's budget is less than the committee itself would like to have.

Mr. STUDDS. But what about NOAA? You have some money there. You have a figure of \$465,000 for fiscal year 1980. Mr. McKernan will follow you by saying that would be an unbounded catastrophe if he were restricted to that. That is a miserly sum. You do not look like a miserly kind of person. Why would you do such a thing to him?

Mr. GLAZER. The President's budget does have a figure for NACOA that is \$19,000 less than last year. I think last year was \$484,000. This year it is \$19,000 less, which reflects a proportionate share of the cutback that we were required to supply to the budget item under which NACOA appears. Last year we did have an increase in their budget over the \$484,000, a \$23,000 reprogramming of funds from the administrator's discretionary fund, to bring them up to \$506,000.

We do believe that \$465,000 as set forth in the President's budget is an adequate level given their requirements.

Mr. STUDDS. I hate to give away the gist of Dr. McKernan's testimony. Let me say that at one point it is quite likely that he will say to us:

A minimum of \$467,000 is required before any funding of committee member activity or staff travel is considered * * * the minimum authorization requirement to support NACOA in fiscal year 1980 is \$604,000.

What do you have to say to that?

Mr. GLAZER. I think the difference between his figure and our figure has to be accounted for by the type and level of staff that NACOA has. We have thought about the issue of how NACOA could best work under the President's budget. I think it would require a re-examination of the numbers and levels of their staff, perhaps a change in the number of meetings. There is no doubt it would require some adjustments.

Mr. STUDDS. Let me ask you a quick question. Did you consult with NACOA in the process of determining the \$465,000 figure?

Mr. GLAZER. My understanding is that NACOA was consulted with respect to the figure of \$484,000. I checked this out because I know that question has been raised. When we were required to have a \$1 million cutback in the line item in the budget in which they appear, a \$19,000 pro rata share was applied to their budget,

and they were not informed at that time. I think that was lamentable, and it will not happen again.

Mr. PRITCHARD. I can appreciate the fact that the gentleman is supporting the administration's figure here. I would only ask you, are you going to be too disappointed if we change the figure a little?

Mr. GLAZER. I think this committee, in its wisdom, has the power to do what they believe will be appropriate. I personally would not be disappointed, no.

Mr. STUDDS. Do you feel an attack of fiscal irresponsibility coming on?

Mr. PRITCHARD. Sometimes we conservatives have flights of fantasy.

Mr. STUDDS. You work with the Coastal Zone Management Advisory Committee, the Sea Grant Advisory Committee and the Marine Fisheries Advisory Committee. How do you handle all this advice?

Mr. GLAZER. We consider it all. I think NACOA is a broader committee than those other committees. It has a wider range of activities. I do not think NACOA duplicates these other committees.

Mr. STUDDS. They do not? Then what are they doing? Does not NACOA advise you on marine fisheries and coastal zone management?

Mr. GLAZER. They do on occasion advise us with respect to those. But they also deal with important issues, such as the reorganization, all of the atmospheric issues——

Mr. STUDDS. I know they do. But in those areas, are they? The coastal zone management report was a big project for NACOA. What the heck was the Coastal Zone Management Advisory Committee doing?

Mr. GLAZER. I cannot answer that.

Mr. STUDDS. Do they not advise you?

Mr. GLAZER. They do advise NOAA.

Mr. STUDDS. But not you?

Mr. GLAZER. I am not the liaison to that committee. I think one has to say they do advise NOAA.

Mr. STUDDS. What do you do with these reports, like the report on CZM?

Mr. GLAZER. In this case we looked at it very seriously, as we were starting to work through the process of determining what the future of the coastal zone management program should look like.

Mr. STUDDS. Did you share it with whoever in NOAA would have responsibility over the coastal zone management?

Mr. GLAZER. Absolutely. They participated in NACOA hearings——

Mr. STUDDS. But they do not share their advice with you?

Mr. GLAZER. I was aware of the advice as well.

Mr. STUDDS. I guess you can see how eyebrows get raised when we speak of how many advisory committees there are, and how many people there are on what appears to be the same subject.

Mr. HUTTO. Thank you.

I would like to direct a question, perhaps to you, Mr. Chairman. Some of us freshmen Members, I think, are a little unfamiliar with

the process of funding. Is the NACOA budget included in the NOAA appropriation formally, and then funneled to the Advisory Committee? Is that the way it works?

Mr. STUDDS. Yes. It will be in the NOAA item in the appropriations bill.

Mr. HUTTO. And NOAA has the responsibility of releasing to NACOA what any funding might be which they receive?

Mr. STUDDS. I believe that is correct.

Mr. GLAZER, is that correct?

Mr. GLAZER. Any funding which they receive?

Mr. HUTTO. Essentially what I am asking is, NOAA releases the funds to NACOA, is that correct? It is not given to them in a block, but you channel it down to them as you see fit?

Mr. GLAZER. I am not an expert on the intricacies of the actual funding process. There is an amount in the President's budget which, if approved as part of the appropriation of funds, is released over the year, I presume, as it is needed. My understanding is that if the full amount is not expended it goes back into the NOAA pot.

Mr. HUTTO. But the NACOA funding is actually a line item in the appropriations bill?

Mr. GLAZER. It is not a line item in the appropriation bill. It is part of our operations, research and funding item, which is several hundred of millions of dollars. It is a line item in the budget, but it is not a separate line item in the appropriation bill.

Mr. STUDDS. It does not get the detailed scrutiny in appropriations that it does here.

Mr. HUTTO. Thank you.

Mr. STUDDS. Thank you very much.

Next we will have Prof. Donald McKernan, Chairperson, National Advisory Committee on Oceans and Atmosphere, and also director of the Institute for Marine Studies of the University of Washington Seattle, Wash.; accompanied by Dr. Evelyn Murphy, Dr. Alfred Keil, and Doctor Warren Washington.

STATEMENT OF PROF. DONALD L. McKERNAN, CHAIRMAN, NATIONAL ADVISORY COMMITTEE ON OCEANS AND ATMOSPHERE, AND DIRECTOR, INSTITUTE FOR MARINE STUDIES, UNIVERSITY OF WASHINGTON, SEATTLE, WASH., ACCOMPANIED BY DR. EVELYN F. MURPHY, VICE CHAIRMAN AND FELLOW, INSTITUTE OF POLITICS, KENNEDY SCHOOL, HARVARD UNIVERSITY, CAMBRIDGE, MASS.; DR. ALFRED A. KEIL, FORD PROFESSOR OF ENGINEERING, MASSACHUSETTS INSTITUTE OF TECHNOLOGY; AND DR. WARREN M. WASHINGTON, SENIOR SCIENTIST, NATIONAL CENTER FOR ATMOSPHERIC RESEARCH, BOULDER, COLO.

Professor McKERNAN. I would like to summarize my testimony, and put the full testimony in the record.

Mr. STUDDS. Without objection.

[The following was received for the record:]

STATEMENT BY DONALD L. MCKERNAN, CHAIRMAN, NATIONAL ADVISORY
COMMITTEE ON OCEANS AND ATMOSPHERE

NACOA REAUTHORIZATION TESTIMONY

Mr. Chairman, it gives me great pleasure to appear before this subcommittee to discuss the activities of NACOA during its first full year of operation since reauthorization of our Committee in 1977.

Last year, while appearing before this subcommittee, I expressed my eagerness to begin work as Chairman of NACOA. The new Committee members were equally anxious, and I believe the ensuing year was a highly productive one for the "new" NACOA. Since our last meeting with you, Mr. Chairman, NACOA has met 12 times, sponsored two workshops on oceans and atmosphere organization, and held a third workshop on the weather and climatic aspects of a potential NOAA organic act.

After a year of operation, and after consultation with appropriate members of Congress and the Executive Branch, the Committee selected several important issues on which to advise Congress and the Executive Branch in carrying out their respective decision-making processes. We emphasized the need for quick response to issues under active consideration in Congress or in the Executive Branch. Combined with this emphasis on timeliness, NACOA's approach is to accompany its policy recommendations with draft legislative language where appropriate. The Committee believes that by being both selective on issues and specific in its recommendations, it more effectively serves Congress and the President.

With this new approach in mind, Mr. Chairman, I would like to discuss briefly NACOA's activities over the past year and then examine the issues we have chosen to address this year.

A major item of NACOA's advisory responsibility this past year has been to make recommendations on the best organization of the civilian atmospheric and oceanic programs of the Federal Government. On November 27, 1978, after extensive Committee study and assemblage of outside views, NACOA sent the President a recommendation for reorganization of Federal oceans and atmosphere programs into a new Executive Department.

This Nation has only begun to acquire and apply the scientific understanding and advanced technology needed to explore, predict, and control complex oceanic and atmospheric phenomena. The challenge to understand the oceanic and atmospheric systems, protect our environment, and develop our Nation's resources requires an organization that is more than a collection of programs, each dedicated to some phase of the problem. NACOA concluded that stronger Executive Branch oversight of Federal ocean programs is needed. The Nation needs a responsible authority able to resolve the conflicts of competing ocean uses by judging specific development options against a cohesive national policy for the oceans and the atmosphere.

In order to formulate recommendations for Federal atmospheric and oceanic organization, the Committee organized and directed two major workshops this past Fall to obtain the broadest range of current information and timely advice. As preparatory work for these workshops, in which 175 individuals participated, 17 papers dealing with ocean activities were prepared at NACOA's invitation by experts in the academic and research community, government, and industry for the use of workshop attendees. Following these workshops, additional papers were volunteered to elaborate on the important issues raised regarding Federal reorganization.

The final NACOA report recommending a new organization of national programs for oceans and the atmosphere was submitted to both Congress and the President in early March of this year. This new Department would include NOAA, the U.S. Coast Guard, and the Maritime Administration, and would coordinate oceans policy by using the interdependence of the marine environment as the organizing principle for Federal Government activities.

A similar effort to the Federal reorganization task was undertaken by NACOA in assessing the Coastal Zone Management (CZM) program. The Committee sought a broad base of views by inviting position papers and participation in NACOA meetings by knowledgeable persons in State CZM programs, industry, public interest groups, and the Federal Government. Additionally, a workshop was held in July 1978, which brought together nongovernment organizations with generally quite divergent interests. In a report transmitted to the President and Congress 29, 1979, NACOA concluded that the Coastal Zone Management Act is falling short of its original objectives and that the Nation's coastline is more threatened by adverse developments today than in 1972. This Committee made specific recommendations to encourage greater State participation in order to restore the coastal zone program incentive that had been dissipated through administrative interpretation.

NACOA also recommended an intensive third phase of coastal zone management to further a more specifically defined national interest. The recommendations contain draft legislative language worded to accomplish these changes.

An important piece of legislation that is under active deliberation by this Congress provides for oil spill liability and compensation. As part of the larger scheme to handle tanker accidents and offshore drilling mishaps, a law for oil spill liability and compensation is necessary to help reduce oil spills. The House of Representatives has passed this legislation twice now, in both the 94th and 95th Congresses.

In June 1978, NACOA wrote to Senator Muskie, Chairman of the Subcommittee on Environmental Pollution, Senate Committee on Environment and Public Works, requesting that his Subcommittee consider stronger measures to compensate States and the Federal Government for damage to natural resources, as an amendment to the Senate Commerce Committee bill. In considering that legislation, the Senate Committee on Environment and Public Works adopted strong language to assess natural resource damage. NACOA fully supported this position which we felt would motivate owners and operators of vessels and offshore platforms to adopt stringent operating rules, employ better-trained crews, and, in general, work to reduce the number of oil spills that can be attributed to human error and environmentally unsound business practices.

After the Senate passed S.2083 in October 1978, NACOA provided the House and the Senate a Section-by-Section analysis of both H.R. 6803 and S.2083, along with our recommendations on every provision contained in the Two bills. Unfortunately, this legislation died during the last days of the 95th Congress. We are actively supporting the passage of such a law by this Congress. We testified before the Subcommittee on Coast Guard and Navigation on March 14th of this year, strongly supporting what we consider to be improvements in H.R. 85, including several features of Mr. Studds' bill, H.R. 29. We look forward to working with members of this Committee in developing a strong form of this legislation.

In 1980, the International Decade of Ocean Exploration (IDOE), administrated by the National Science Foundation (NSF), will draw to a close. At the request of the NSF Director, NACOA reviewed plans to continue large-scale oceanic research.

In February 1979, a letter to the NSF Director from NACOA's Research and Development Panel commended NSF for reaffirming its commitment to large-scale ocean science research as indicated in the Fiscal Year 1980 budget. The results of IDOE, if not immediately apparent to the public, have altered the scientific views of the oceans. The IDOE program has produced many positive benefits for oceanographic technology and instrumentation, and has significantly encouraged international ocean science cooperation. In order to ensure the continuation of large-scale oceanographic research and provide flexibility in the overall ocean science research program, NACOA urged NSF to maintain an identifiable administrative program for post-IDOE ocean science.

NACOA initiated an effort within its Research and Development Panel to review the marine science and technology programs of NOAA. In February 1979, Mr. Chairman, NACOA recommended to the Administrator of NOAA, a continuing mix of both project-oriented and traditional discipline-oriented efforts to meet NOAA's responsibilities, but with additional emphasis on multidisciplinary efforts. NOAA's responsibility for developing a National Ocean Pollution Research and Development Plan under authority of Public Law 95-273 provides a significant opportunity for project leadership by NOAA in an area of interdisciplinary research.

Another recommendation for active NOAA research and development programs includes the maintenance of data bases that can be used to effectively design programs for oceanic development and protection. A NOAA program for ocean engineering development could consolidate existing data bases, develop a thorough knowledge of ocean industries, and expand the foundation for ocean technology in order to open up new opportunities for economic development of ocean resources.

The 95th Congress enacted a National Climate Program Act. The legislation contained many of the features that NACOA recommended to the Congressional Conference Committee. Among the features was the strong emphasis on climatic data and information services that can and should be provided to users—those concerned with agriculture, transportation, industry, recreation, and other sectors of our society. Another feature was non-Federal participation, through the Intergovernmental Climate Program.

Our Committee has followed the initiative taken in NOAA to develop a short-term, short-range weather forecasting capability. We gave Congress a strong endorsement of the multi-year program, Prototype Regional Observing and Forecasting System (PROFS), and outlined the potential benefits of such a program.

Our Committee has also been involved with the issues related to the weather services that a potential NOAA organic act will address. NACOA sponsored a workshop in February 1979 to provide input to the House Subcommittee on Natural Resources and the Environment of the Committee on Science and Technology.

Looking forward to this next year, our Committee has chosen to address a number of issues needing timely consideration. We will continue to solicit the views of your committee, Mr. Chairman, as we proceed. Our program is an ambitious one. However, with the past year's experience, NACOA believes it can address a larger number of selected topics and still retain the flexibility needed to respond to emergent issues. A brief outline of the topics NACOA is presently addressing or is seriously considering for this year follows.

In the areas of ocean uses and environmental conservation, our Committee will investigate the NOAA Fisheries Development Plan as it pertains to commercial development of underutilized species. At a time when the national economy is a major issue, the development of fishing capability to harvest underutilized species offers potentially significant economic benefits to the fishing industry, and it could be crucial in reducing our severe negative balance of payments in fishery products of over \$2 billion. In addition, NACOA plans to review the implementation of both the Ocean Dumping and Marine Sanctuaries programs under the Marine Protection, Research, and Sanctuaries Act of 1972.

Presently, we are assessing the need for a stronger Federal role to support the development of civil ocean technology. The development of our offshore nonrenewable resources, fisheries, marine transportation, offshore structures, pipelines, and harbors all speak to the need for an aggressive program to further our national presence in the oceans. We must ensure that the United States actively maintains its position in the forefront of global ocean development and technology.

You may recall, Mr. Chairman, that in the 1974 NACOA Report we recommended an institute for Engineering Research in the Oceans. The recommendation was intended to stimulate more foresight within the Federal Government to meet the rapidly expanding need for civil ocean technology, but the proposal has not been fully realized. We are concerned the excessive industrial regulation is inhibiting our Nation's competitive edge, constraining the development of U.S. civil ocean technology, and restricting our ability to use fully and safely the oceans to our economic advantage. We see the need for more effective Federal participation in developing our national ocean engineering capabilities, and in producing and maintaining adequate supporting data bases. We will continue to address these issues.

The Executive Branch is presently developing a comprehensive 5-year plan of activity in response to Public Law 95-273, the National Ocean Pollution Research and Development and Monitoring Planning Act of 1978. We see a strong need for such a plan. Its successful development is clearly a national priority. This plan should allow the Nation to assess the total Federal program to determine what role each agency should have, and to determine more clearly the scope and effectiveness of the Federal role. Recent NOAA testimony before the Subcommittee on Oceanography estimated that Federal programs in this area involve over 1,000 projects costing about \$140 million—certainly, a significant sum. NOAA, the lead agency in preparing the plan, has briefed our Committee, and we propose to comment in detail to both the Executive and the Legislative Branches.

Our Nation needs to study the complexity of interactions between human-induced pollutants and the marine environment, including the effect of these pollutants on human activities and marine ecosystems and organisms. Additionally, we must develop a more realistic understanding of the impact of developmental activities on our oceans and coastal waters to allow our Nation to proceed in a sure and safe manner in developing the economic and recreational potential of the seas.

In the area of weather services, I anticipate that NACOA will maintain an active role in the preparation of the legislation for a potential NOAA organic act.

A report by the Secretary of Commerce on weather modification will be submitted to Congress and the President in the near future. NACOA will review and comment on this report prior to its submission.

As I mentioned earlier, Mr. Chairman, NACOA has played an active role in establishing a National Climate Program. Plans are to review the preliminary 5-year plan that will be submitted to Congress this spring, and provide advice to Congress and the President prior to the submission of the final plan this fall.

Having determined an agenda of topics which NACOA needs to address this year, we gave careful consideration to the resources NACOA will need to accomplish program objectives. Experience with the "new NACOA" has reaffirmed what we suspected a little over 1 year ago—that the present staff structure and level of member activity are the bare minimums for effective operation. Projecting the

currently authorized staff level and current level of activity, to obtain contractual services, print reports, and purchase supplies and equipment, a minimum budget of \$467,000 is required before any funding of Committee member activity or staff travel is considered. Consequently, the authorization recommended by the Department of Commerce and the Office of Management and Budget does not provide any resources to support the Committee members themselves. Accordingly, I directed, the staff to develop a minimum authorization figure necessary to support only the current level of activity of our Committee, based on 11 Committee meetings per year plus several separate panel meetings. Mr. Chairman, I have determined the minimum authorization requirement to support NACOA in fiscal year 1980 is \$604,000.

Thank you, Mr. Chairman. I will be happy to answer your questions.

Professor McKERNAN. NACOA emphasizes the need for quick response to issues under active consideration in Congress or in the executive branch. Combined with this emphasis on timeliness, NACOA's approach is to accompany its policy recommendations with draft legislative language where appropriate. The committee believes that by being both selective on issues and specific in its recommendations, it more effectively serves Congress and the President.

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The final report, our final report, recommending a new organization of national programs for oceans and the atmosphere was submitted to both Congress and the President in early March of this year. This new department would include NOAA, the U.S. Coast Guard, and the Maritime Administration, and would coordinate national oceans policy by using the interdependence of the marine environment as the organizing principle for Federal Government activities.

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An important piece of legislation that is under active deliberation by this Congress provides for oil spill liability and compensation. As part of the larger scheme to handle tanker accidents and offshore drilling mishaps, a law for oil spill liability and compensation is necessary to help reduce oil spills. The House of Representatives has passed this legislation twice now, in both the 94th and 95th Congresses.

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NACOA fully supported this position which we felt would motivate owners and operators of vessels and offshore platforms to adopt stringent operating rules, employ better trained crews, and, in general, work to reduce the number of oil spills that can be attributed to human error and environmentally unsound business practices.

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The 95th Congress enacted a National Climate Program Act. The legislation contained many of the features that NACOA recommended to the Congressional Conference Committee. Among these features was the strong emphasis on climatic data and information services that can and should be provided to users—those concerned with agriculture, transportation, industry, recreation, and other sectors of our society. Another feature was non-Federal participation, through the intergovernmental climate program.

Our committee has followed the initiative taken in NOAA to develop a short-term, short-range weather forecasting capability.

We gave Congress a strong endorsement of the multiyear program, Prototype Regional Observing and Forecasting System (PROFS), and outlined the potential benefits of such a program.

Our committee has also been involved with the issues related to the weather services that a potential NOAA organic act will address. NACOA sponsored a workshop in February 1979 to provide input to the House Subcommittee on Natural Resources and the Environment of the Committee on Science and Technology.

Looking forward to this next year, our committee has chosen to address a number of issues needing timely consideration. We will continue to solicit the views of your committee, Mr. Chairman, as we proceed. Our program is an ambitious one. However, with the past year's experience, NACOA believes it can address a larger number of selected topics and still retain the flexibility needed to respond to emergent issues. A brief outline of the topics NACOA is presently addressing or is seriously considering for this year follows.

In the areas of ocean uses and environmental conservation, our Committee will investigate the NOAA fisheries development plan as it pertains to commercial development of underutilized species. We plan to review the implementation of both the ocean dumping and marine sanctuaries programs under the Marine Protection, Research, and Sanctuaries Act of 1972.

In response to Public Law 95-273, the National Ocean Pollution Research and Development and Monitoring Planning Act of 1978, the executive branch is developing a 5-year plan of activity.

Recent NOAA testimony before the Subcommittee on Oceanography estimated that Federal programs in this area involve over 1,000 projects costing about \$140 million—certainly, a significant sum. NOAA, the lead agency in preparing the plan, has briefed our committee, and we propose to comment in detail to both the executive and legislative branches.

A report by the Secretary of Commerce on weather modification will be submitted to Congress and the President in the near future. NACOA will review and comment on this report prior to its submission.

As I mentioned earlier, Mr. Chairman, NACOA has played an active role in establishing a national climate program. Plans are to review the preliminary 5-year plan. It will be submitted to Congress this spring and provide advice to Congress and the President prior to the submission of the final plan this fall.

Having determined an agenda of topics which NACOA needs to address this year, we gave careful consideration to the resources NACOA will need to accomplish program objectives. Experience with the "New NACOA" has reaffirmed what we suspected a little over 1 year ago—that the present staff structure and level of member activity are the bare minimums for effective operation. Projecting the currently authorized staff level and current level of activity, to obtain contractual services, print reports, and purchase supplies and equipment—a minimum of \$467,000 is required before any funding of committee member activity or staff travel is considered.

Consequently, the authorization recommended by the Department of Commerce and the Office of Management and Budget does

not provide any resources to support the committee members themselves. Accordingly, I directed the staff to develop a minimum authorization figure necessary to support only the current level of activity of our committee based on 11 committee meetings per year, plus several panel meetings.

Mr. Chairman, I have determined the minimum authorization requirement to support NACOA in fiscal year 1980 is \$604,000.

Thank you, Mr. Chairman. I will be happy to answer your questions.

Mr. STUDDS. Thank you.

Do you want any of the other folks to say anything?

Professor MCKERNAN. I have asked them to comment and add with respect to my testimony, or with respect to questions. I would hope that the committee would feel free to ask the members accompanying me any questions.

Mr. STUDDS. You refer to your budget request as the bare minimum. As I have noted you have projected a staff of 12 for fiscal 1980, and an average salary somewhat in excess of \$31,000, which, I might add, is more than any of my staff makes. Your average, is that not a little topheavy in terms of staff?

Professor MCKERNAN. Mr. Chairman, I cannot answer with respect to the average salary, but I can say that average level of grade in NACOA is dropping at the present time, and partly in response to questions that have been raised by congressional committee members and staff. For example, we anticipate in fiscal 1980 that we will delete a GS-14 position, and add some lower grade people in order to bring the staff down to a lower grade level. We also believe that the average grade level is perhaps at or slightly less than the grade level in various comparable groups within NOAA itself. We have tried to take a look at this.

We also determined that we are going to reduce the grade level in the organization. What we are trying to do is to get a combination of experienced people, but bring in some young people as well.

Over the past 2 years we have reduced the average grade level, and we plan to continue. We do have some problems with this, because these people are civil service employees, and we must assure that careers, longstanding careers, are not adversely affected.

We are trying to start, and we have made a significant change in that direction. For example, in 1979, fiscal 1979, our average grade level was 11.72. In fiscal 1980 we anticipate that the average grade level will be 11.16. That is a significant decline. We intend to continue in that particular trend.

Mr. STUDDS. I appreciate what you are saying. It is just a contrast between this and the way most people have to survive within Government. It is quite striking. For that to be addressed as an absolute bare minimum, I think it is a safe statement to say that most of us are hiring entire staffs at or below your average salary, and we seem to get people working hard and doing a good job.

Professor MCKERNAN. On the other hand, since all members of NACOA are part-timers, very much so, we put in a couple of days a month, we do call upon the staff, and the experience of the staff to a considerable degree, more than many other agencies. But even so—

Mr. STUDDS. Are you saying that your staff works harder than most of the executive branch?

Professor MCKERNAN. Yes. I do hear what you are saying.

Mr. STUDDS. We will not compare with the congressional staffs that are making a lot less.

Professor MCKERNAN. I am not in a position to do that.

Mr. STUDDS. What would happen if you were to receive a cut? Would you sacrifice a GS-15, or how would you do that?

Professor MCKERNAN. We would have to sacrifice several positions, and we would have to cut down on the number of meetings per year. We undoubtedly could not meet the schedule that we hear both the Congress and the executive department asking us to consider and carry out.

It seems to me that if the advisory committee is to function, it ought to be able to function so we keep a certain continuity, so the committee can meet, can plan, can hold panel meetings, and can be effective. In my judgment it cannot be effective with that budget.

Mr. STUDDS. You are asking us to support a GS-13, 14, three 15's, and others, and you say that you need this kind of expertise. At the same time you are asking \$53,000 for contracts. With that kind of expertise, why are we going outside?

Professor MCKERNAN. In certain specialized areas we have, from time to time, seen the need for some very special expertise. For example, it might be in marine shipping or it might be in some highly specialized area of marine technology or ocean engineering. But we hold that to a minimum, and we do our very best to carry out our tasks with our staff.

Mr. STUDDS. It seems to me with the kind of membership you have, you have two distinguished educational institutions on either side of you—three, really. Are not the resources of those institutions available through the members affiliated with them? Do you have to go out and get further expertise on top of the expertise you already have?

Professor MCKERNAN. We do utilize our own members, and their expertise, but the answer is, yes, we occasionally do, and we have found it very desirable. This occurs only occasionally, but it has been very, very useful indeed when we have wanted some very special expertise that lies in the hands and minds of a few people.

Of course, the amount of that budget is relatively low in comparison to our total budget.

Mr. STUDDS. Do you work at all with the Coastal Zone Management Advisory Committee, the Sea Grant Advisory Committee, or the Marine Fisheries Advisory Committee?

Professor MCKERNAN. Yes. I listened with interest to your questions of Mr. Glazer. We do attempt to keep in contact with these advisory committees. We certainly attempt to look at issues that are not necessarily being looked at by these particular committees.

Mr. Cleveland's special committee that wrote a report to the Administrator of NOAA, for example, we took that report and we are following through and trying to be helpful with respect to it. But we do not look at the same issues with respect to the coastal zone area.

With respect to the weather and climate problem, we did not look at the same problems that were looked at by that special committee.

With respect to the coastal zone committee, once again we followed the course of what Chairman Hussey's group are doing, and our own particular selection of topics and subjects were along different lines. We have done our very best, and it was not very hard to work on problems that were quite different and quite unique.

Mr. STUDDS. You did a general review of the Coastal Zone Management program last year?

Professor McKERNAN. Dr. Murphy perhaps can speak to the same subject.

Dr. MURPHY. Good morning. Let me add a little bit to your question about the overlaps between the committees and our review of the coastal zone. We did look at, and review extensively what the Coastal Zone Advisory Committee was doing. We found earlier on that we were going to come to a difference of opinion about the effects of the coastal zone itself. The committee advising NOAA was interested in extending citizen participation, adding to the existing legislation, and doing it better.

For those of us who have struggled in the States to implement that legislation, it is clear that it is not enough, that it is not doing what it was intended by Congress when it was passed, and our conclusion was that we have to have legislative change.

We differed with NOAA and the staff on that same point. We have come around with a consensus with the NACOA Committee saying we need clarification on what needs to be protected. The protection side of the coastal zone, even in places like Massachusetts, where indeed we are supposed to have the strongest protection—if that is the case, is still not good enough. We see a lot of our coastal zone developing appropriately, and a lot of other places not developing enough.

So, in part, our standing responsibility to the Congress, as well as to the executive branch, led us down a different track, and a track we are coming back to you on, to appeal more closely to the legislation, because we feel it needs to be beefed up.

Mr. STUDDS. I have gone over my time. I will come back again.

Mr. PRITCHARD. Nice to see you.

We have kind of gone through the phase where this committee that you chair was in pretty bad shape, and we seriously questioned whether we should keep NACOA. You have had some time here. I think the timing is unfortunate for you people, at a time when you are turning things around and making it valuable, we are at the same time, here in Congress and the Federal Government, cutting back and holding the line.

I think it is unfortunate that these two things are happening at the same time, because I think what you bring and what your charter are very important.

My point is that you people are going to have to get along on somewhat less than you would like, and that you will have to make some cutbacks. I am going to offer an amendment a little later on, to give you about half of what you would like compared to the administration request which would be around \$550,000.

I guess my question to you would be what will you do if you have to get along on \$550,000? Have you thought that through?

Professor MCKERNAN. We have not looked specifically at what we would do if we were cut to \$550,000, but you can be sure that we will do the very best we possibly can. This may result in some reduction in staff, and in some reduction in meetings. Of course, we realize that the administration is attempting to hold to a very tight budget. Many of us have worked within the Federal Government and we know the problems Congress and the executive department have.

I must say, with respect to this particular budget, we were not treated very well. In spite of what Mr. Glazer said, the proportionate cut for NACOA should have been much less. The total budget for NOAA increased. Our total expenditures will be far greater in fiscal 1979, and NOAA itself has provided us with adequate funds to carry out our programs. Our funding this year will be at \$520,000. The increases that we are asking do take into account a full year's operation of our committee, and having our staff at the appropriate level.

So we are simply saying that we do not know how NOAA got this figure. The figure we were planning on was \$600,000. The last figure we saw on paper was \$600,000, not \$400,000. That was a figure that they presented us, and that we prepared our budget for.

I am frank to say that I cannot really go through the machination of how they got it down to where they got it.

Mr. PRITCHARD. You feel you were had?

Professor MCKERNAN. We feel Mr. Frank, Mr. Glazer, and other people—I am satisfied, after looking into this thoroughly, did not realize what was happening. It is a very small item. It is incorporated in their executive direction budget. But any way, we were had.

We have to have some help in order to get through. I feel certain that they will help us, providing we have adequate authorization from this committee.

Dr. MURPHY. Can I add to that? It would be useful if in the proposed amendment it could back into it to some extent. The committee meets once a month, for 11 meetings. The proposed figure you have makes no provision for that.

If there is a difference of opinion on how to downgrade the salaries, and I agree with Congressman Studds, you might serve a useful function in toning down the salaries. That is great, but if you can also help us with the once a month meetings as part of the budget, the staff will work with the Committee staff, because if you undercut those 11 meetings a year, the committee is hampered quite significantly.

Mr. PRITCHARD. I would agree. You may have to do a little cutting in the contracts.

Professor MCKERNAN. We are very happy to work with the staff members of the committee. We are willing to accept responsibility to hold the budget down to a minimum. We are not trying to consider ourselves different from other parts of the executive and legislative bodies.

Mr. PRITCHARD. You are talking to a sympathetic group, by and large. Wait until you get to the whole floor.

Let me ask you, leaving that aside, a question of broader range. Back in, when was it, 1965 or—I guess it was 1964. There was a great effort in Lyndon Johnson's administration to upgrade our oceans policy and the public attention to the oceans. I may be a little wrong on my timing, but it seems to me about 1964 there was a great push. Vice President Humphrey took a very active part. There was really a lot of attention. It was a high priority. It got put on the front burner, and the future of the oceans looked very bright.

Then we had the new Vice President. I think his name was Agnew. I have always forgotten that. But it seems to me his name was Agnew. I do not know how you would put it, but we went under a cloud, and the attention and the highlights of the ocean problems seemed to go into the back burners of the administration's consciousness.

I guess what I am asking, is whether there has been some turnaround in this area. Do you feel that this is a fair statement, that we are taking a turnaround, and that we are now applying more attention to the oceans?

Where do we stand, as one who has been involved? How do you view it today?

Professor MCKERNAN. There is no question but that the Nation's interest in the ocean has become far greater than it was at that particular time. A number of people, including yourself and others in Congress at that time, saw that this was going to happen, and it has happened.

Look at the increase in merchant marine, or the increase in the use of our coastal zone areas for all kinds of purposes, including pollution, of course. In fisheries, we have assumed jurisdiction over an area past our coast that is equal to the size of the United States, Continental United States, an enormous area, with potential resources, not only fisheries, but other resources.

Mr. STUDDS. We will somehow not remind you of what you were saying 6 years ago on that subject. It was sort of exciting. It was my first year.

Professor MCKERNAN. At that time I was trying very hard to see that we get an international convention to take into account these particular problems.

Mr. STUDDS. You were working with a strange master referred to by the gentleman from Washington.

Professor MCKERNAN. I see that the Nation has been heading more and more to fully using the sea. This particular use can be one that is reasonably planned, with prevention of conflict and multiple use of siting offshore ports, of developing our oil and gas resources, of using offshore areas for recreation and fishing and shipping, with a minimum of conflict. Or we can let the development happen in a haphazard manner with conflicts of the kinds that have been developing over the past 2 or 3 years. Look at the controversy extension of the jurisdiction to 200 miles has brought us with respect to our neighbor to the north, Canada, with respect to boundaries. These are not settled yet, by a long run.

It seems the Nation has moved in the direction of utilizing these resources, and utilizing the space, but it also seems to me we are

not well organized to make the best use or to plan for its use, or to prevent conflict anywhere near as well as we should.

Those are some of the things that Congress, in my judgment, is in a leadership role to look at, as well as the Organic Act of NOAA, the reorganization of NOAA our ocean research. This committee is an excellent one to point that out.

It seems to me that in our ocean research, and the realization of the economic potential of the ocean—we are not seeing these translated into an effort as we did in the early sixties. I think that those were the times when we had a great awareness in the country of what we needed, and what the potential was, potential for good, as well as for potential for conflict and harm.

I do not think we are doing a very good job at the present. I do not think we are doing what we should be doing.

Mr. PRITCHARD. I take it that your committee looked pretty thoroughly at the Reorganization Act?

Professor McKERNAN. Yes.

Mr. PRITCHARD. If I remember, you are not in agreement with what the administration is attempting to do, is that correct?

Dr. McKERNAN. That is correct.

Mr. PRITCHARD. I might ask one of the other gentlemen, as long as you made the trip over here, Mr. Keil. Were you on the committee that looked at the reorganization?

Dr. KEIL. The whole committee was working on the reorganization question. Certainly we felt that due to the charter of NACOA we have to look at what is best with respect to utilization of the oceans and protection of the oceans. From that standpoint we came to the conclusion that we have a splintered effort throughout the executive branch, with respect to individual facets, which is detrimental to getting the most for the country out of our ocean environment, that we must look at it not only from the standpoint of economic development, but at the same time from the standpoint of protection.

Both of these parts have to be positive for developing the well-being of the country. It was for that reason that we felt that we had to argue for a department which would put all of these efforts in the executive branch together, and at the same time provide, as Don said, the opportunity to make the tradeoffs and balances between the various uses, to provide for conflict resolution. There are elements there which have been hindering development of the ocean, because of regulations, and particularly long, long delays in decisionmaking.

We felt that only a centralized approach could overcome this problem, that it could not be done through coordinating.

Mr. PRITCHARD. I would like to ask Dr. Washington, how do you feel about the reorganization plan?

Dr. WASHINGTON. If I could expand on that a small bit. The administration has come up with the DNR proposal. It is our feeling that that proposal would lead to a state of affairs where oceans and the atmosphere would only be part of essentially a land-based organization. I think our views, if we want to heighten the oceans and the atmosphere in the public's mind, and government's mind, are that they ought to be a separate entity, and not be a part of a big land-based organization.

Mr. PRITCHARD. Thank you.

Mr. STUDDS. No wonder they cut your budget.

Mr. LOWRY. That was really getting into the question I was interested in. My colleague from Seattle has an amendment that he will offer, noting that the Pacific Ocean is also represented here.

I note you say, "authorized level of staffing" in your statement, that the \$467,000 would simply continue that. Are those positions filled?

Professor MCKERNAN. No. There is one vacancy at the present time.

Mr. LOWRY. Is that a vacancy that would need to be filled?

Professor MCKERNAN. What we would like to do with that vacancy is fill it with a staff writer of a lower grade. What we would like to do is take this opportunity to fill that at a lower level, and help bring about the change in general grade level that has been mentioned here.

Mr. LOWRY. When you mention the \$604,000 figure, at what grade level are you filling that vacant position?

Professor MCKERNAN. We were considering a vacant position at the GS-11 level, and a GS-9, considerably less than the vacant position of the GS-14.

Mr. LOWRY. I assume you have a work program with which you matched your projected contract figure and projected staffing figure?

Professor MCKERNAN. Yes. We have a series of panels that are considering certain issues, and those panels then are staffed by staff members who essentially get material together for us and do a good deal of writing. After we finish our 2 day meetings they put together the material in a form so that the members of the panels can edit it. Of course, they also contact committee counsel and staff here on the Hill, and members of the executive department.

Mr. LOWRY. Matching this work program against your projected need, I assume then you should be able to get to the figure that Mr. Pritchard is talking about, which is halfway in between your request and what was recommended?

Professor MCKERNAN. Yes. I think Dr. Murphy made a very important point, and that is that there is a minimum that we ought to maintain, and we think the committee assumes we will maintain it.

We would like to work with committee staff members to make certain we have that particular minimum. We would be happy to work with the counsel of the committee toward that end.

Mr. LOWRY. Thank you.

Mr. HUTTO. Professor McKernan, I think we all realize the responsibility you have, and appreciate what your committee does. But there is a thing out there with the public about cutting Government spending, and that is why we have to look at all of the alternatives.

You have 11 meetings per year?

Professor MCKERNAN. Yes.

Mr. HUTTO. Are those all held in a centralized location, or—

Professor MCKERNAN. Most are held here in Washington. We hold an occasional one in some area where there is a very great

marine or atmosphere activity. For example, our May meeting will be held in Rhode Island. But most of the meetings, perhaps 9 or 10, will be held here in Washington, and are open to the public, except occasionally when we have a personal matter requiring a closed meeting.

Mr. HUTTO. Are they regularly scheduled times, like the first Tuesday of the month?

Professor MCKERNAN. Yes. We have regularly scheduled meetings, and we advertise these, and we let the public know. We have attendance from the public and from the executive department, and often staff members from the Congress, as well.

Mr. HUTTO. From what I gathered from your testimony, the amount of funding in the bill apparently pretty well takes care of everything except the members' expenses. That is what I gathered. That is one of the reasons I am asking this series of questions.

Professor MCKERNAN. Yes. Of course, the important part of the meeting is the member's meeting.

Mr. HUTTO. What is the average cost of the 2-day meeting?

Professor MCKERNAN. About \$9,500.

Mr. HUTTO. Would it severely curtail your activities, or your effectiveness, if you reduced from 11 down to 6, meet every 6 weeks, instead of every month?

Professor MCKERNAN. I think that it would have very, very serious affect. Part of the point about the meetings once a month is that we can keep in touch with the staff, Members of the Congress, and members of the executive department. I would recommend against such infrequent meetings.

In fact, it gets the committee members completely out of touch with working together, in my judgment. I just do not think it would be very useful, and I am not sure I would particularly care to participate in that. That would be a terrible job, to keep current with legislation, and complexities, with the changing scene in oceans and atmospheres in this country.

I would recommend that the Congress—if they felt that we should meet on such a limited basis might suggest doing away with the committee. We thought about this, and that is why I speak so definitely about it. I just do not think it would be worth our while if we could not meet and keep in more reasonable contact.

I do not think the public would be as well served.

Dr. KEIL. Could I comment on the same topic? I served for half a year on the other committee. I am a carryover of the old committee which was then extended to the summer of this year. So I have seen the two operations.

I would like to acknowledge publicly how Don McKernan, with this approach, has created much greater effectiveness in the committee. The fact that we address a lot of immediate problems which you are facing, which the executive branch faces, requires rather prompt action, and if we had not had the monthly meetings, we would not have come as rapidly as possible—we are part of a team. We have a large number of new members. We also have to get into a frame, and act in accord, rather than as representatives of personal interests.

If we had not had monthly meetings to discuss the projects, the conclusions we derive, and to develop recommendations, we would not have been effective at all.

Mr. HUTTO. Thank you.

Mr. STUDDS. Let me ask one further question. There have been several references to NACOA arriving at a consensus. Do your conclusions have to be unanimous?

Professor MCKERNAN. No, Mr. Chairman. We do not require a consensus, and we have decided that when any of the members have a strongly held view, that we would address those as minority points of view, or another point of view to our reports.

In almost all cases, and since we have been the "new NACOA" we have not had to do that. This has meant that there has been very strong debate, and some strong feelings, but we have been able to get around these through additional information, additional thought. There has been a remarkable sense of coalescence of views, for example, on many of the coastal zone questions.

Michael Naess is a good example, from a shipping family, and firm, but he has been able to work with members of NACOA who have a strong view in terms of conserving the environment. We have been able to work out what appeared to us to be good approaches, and in some instances one might say compromises. But at least approaches that reflect the national interest.

On the other hand, every member knows that we would be willing to put a point of view of even one member in our report.

Mr. STUDDS. How often do you do that?

Professor MCKERNAN. We have been in operation, the "new NACOA," about a year. We have not had to do that yet.

Mr. STUDDS. So as far as everything that has been done, it has been unanimously agreed to?

Professor MCKERNAN. Yes. I would say consensus with some members saying, if I were representing myself, or my own particular point of view, I might see this differently, but I am willing to accept this view of the committee.

Mr. STUDDS. How do you suppose it is we in the Congress are unable to reach unanimity? It seems when the oil industry and other concerns meet it is very rare to get unanimity if one is doing anything of substance.

Professor MCKERNAN. I guess I would say some of our decisions are not decisions of unanimity, but more decisions of people being willing to go along with the views of practically everybody. So I see a consensus being different from unanimity.

Mr. STUDDS. Yes, it is. But I worry about—I think it was Robert Kennedy that said if nobody is standing in your way then you are not going anywhere. I worry about what ability you would have to come to tough decisions in areas of controversy if you did it by consensus.

Professor MCKERNAN. Let me use the reorganization question. When we started out we had very strongly held views by various members of the committee. We held some hearings, and we brought in people. We had papers developed by experts. We looked at these, and I recall on one issue in particular, the issue of whether or not we ought to include or recommend that NASA be part of the new department, that there were a number of people

that felt strongly that it should not. We almost put in another point of view, that those who favored putting NASA in, against those that did not. We finally decided to indicate that that particular question ought to be looked at further, that there were some reasons for including it, but on the other hand there were some members of the committee who felt there were strong reasons for not including it.

Mr. STUDDS. When you cannot reach a consensus you avoid the question?

Professor MCKERNAN. In this particular case we said perhaps it deserves more examination, more examination than we feel we ought to put into it at the present time. So you can call that delay, or you can call it avoiding it. But we had some very long and very interesting debates on that. There were merits on both sides. It was not a clear cut yes or no, in my judgment. That is the way we resolved that issue, where there were strongly held views on both sides. Our report to you reflects that.

Mr. STUDDS. If you have those powers, you ought to be advising Dr. Kahn and Dr. Schlesinger and all these people that are having difficulty agreeing.

Professor MCKERNAN. They have not asked us.

Mr. STUDDS. Does anyone accompanying you wish to say anything before we make a magic transformation from a hearing to a markup?

Any other questions from the committee?

Thank you very much.

[Whereupon, at 11:15 a.m., the subcommittee proceeded to other business.]

OCEAN POLLUTION RESEARCH AUTHORIZATION AND OVERSIGHT

THURSDAY, MARCH 1, 1979

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON OCEANOGRAPHY,
COMMITTEE ON MERCHANT MARINE AND FISHERIES,
Washington, D.C.

The subcommittee met, pursuant to call, at 10:10 a.m., in room 2247, Rayburn House Office Building, Hon. Gerry E. Studds (chairman) presiding.

Present: Representatives Studds, Stack, Hutto, Lowry, Pritchard, Forsythe, and Lent.

Staff present: Richard Norling, Curt Marshall, Don Lippincott, and Sharon Goldinger.

Mr. STUDDS. I will forgo the reading of my statement, in part because it has the word "prioritization" in it, and I thought we could ban words like that. Henceforth, without objection, that is banned from the proceeding.

I would point out to the members that this hearing is on what must be one of the least artfully named statutes around—and that is saying something: The Ocean Pollution Research and Monitoring Planning Act Authorization. If you think the Committee on International Relations is having difficulty pronouncing itself—it went back to Foreign Affairs because 90 percent of the members could not pronounce their new name—it may be that one of the amendments we should consider of this act is the title.

The members have in their folders a letter from the President's Office of Science and Technology Policy describing some of the measures taken to implement the act, and a copy of the bill which was filed yesterday to extend the authorization. If there are no objections, the bill and the letter will be included in the hearing record following the conclusion of my remarks, which, as I say, I will spare you the reading of.

[The following were received for the record:]

OPENING STATEMENT OF HON. GERRY E. STUDDS, CHAIRMAN, SUBCOMMITTEE ON OCEANOGRAPHY

This morning's hearing is on legislation to authorize appropriation of \$5 million of fiscal year 1980 for use under the provisions of the National Ocean Pollution Research and Development and Monitoring Planning Act of 1978, which became law last year. The original Act (Public Law 95-273) authorized \$5 million for fiscal year 1979 only.

The Act itself provides for coordination among the various Federal agencies involved in ocean pollution research and monitoring; requires development of five-year plans including assessment and prioritization of national needs, specification of existing Federal capabilities, policy recommendations for changes in the overall

Federal level of effort, and a description of actions, taken to coordinate the budget review process; and authorize grants and contracts for projects to fill the gaps in existing Federal programs. According to the law as passed, the first of these plans was to be submitted to the Congress by February 15 of this year. However, the chairmen of the committees involved in overseeing the Act have agreed to an extension until May 15, to allow more time for preparation of the detailed and comprehensive report contemplated in the Act.

The letter in the Members' folders from the President's Office of Science and Technology Policy describes some of the administrative measures taken to implement P.L. 95-273.

The bill before us today would authorize \$5 million for grants and contracts for fiscal year 1980 to fill in gaps in Federal programs which are identified in the plan. Our witness this morning is Bud Walsh, Deputy Administrator of NOAA, who has been designated as the Chairman of the Interagency Committee on Ocean Pollution Research and Development and Monitoring, which is developing the plan required by the law.

96TH CONGRESS
1ST SESSION

H. R. 2520

To amend the National Ocean Pollution Research and Development and Monitoring Planning Act of 1978 to authorize appropriations to carry out the provisions of such Act for fiscal year 1980.

IN THE HOUSE OF REPRESENTATIVES

FEBRUARY 28, 1979

Mr. MURPHY of New York (for himself, Mr. McCLOSKEY, Mr. STUDDS, Mr. PRITCHARD, Mr. AMBRO, and Mr. Walker) introduced the following bill; which was referred jointly to the Committees on Merchant Marine and Fisheries and Science and Technology

A BILL

To amend the National Ocean Pollution Research and Development and Monitoring Planning Act of 1978 to authorize appropriations to carry out the provisions of such Act for fiscal year 1980.

- 1 *Be it enacted by the Senate and House of Representa-*
- 2 *tives of the United States of America in Congress assembled,*
- 3 That section 10 of the National Ocean Pollution Research
- 4 and Development and Monitoring Planning Act of 1978
- 5 (Public Law 95-273) is amended by striking out "1979."
- 6 and inserting in lieu thereof "1979, and not to exceed
- 7 \$5,000,000 for the fiscal year ending September 30, 1980."

I-E

EXECUTIVE OFFICE OF THE PRESIDENT,
OFFICE OF SCIENCE AND TECHNOLOGY POLICY,
Washington, D.C., February 26, 1979.

HON. GERRY E. STUDDS,
Chairman, Subcommittee on Oceanography, Committee on Merchant Marine and Fisheries, House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: This letter is to assist your subcommittee in its deliberations on the implementation of Public Law 95-273, the National Ocean Pollution Research and Development and Monitoring Act of 1978 and in its consideration of authorization legislation. I very much regret not being able to attend the hearing scheduled for March 1, 1979, and would ask that you include this letter in the record of that hearing.

Enclosed is a copy of a recent letter from Dr. Press to Chairman Murphy. That letter expresses our confidence that meaningful progress is being made by the Agencies in meeting the Act's goals. We remain satisfied with that progress and are appreciative that our request for extension of the reporting schedule has been granted, enabling us to produce a better report.

I understand you are considering an authorization of \$5 million for continuing work under the Act. This would be consistent with the President's fiscal year 1980 budget request of \$4.3 million for this purpose.

Thank you for your consideration.

Sincerely,

PHILIP M. SMITH,
*Associate Director for Natural Resources
and Commercial Services.*

Enclosure.

EXECUTIVE OFFICE OF THE PRESIDENT,
OFFICE OF SCIENCE AND TECHNOLOGY POLICY,
Washington, D.C., February 1, 1979.

HON. JOHN M. MURPHY,
*Chairman, House Committee on Merchant Marine and Fisheries,
Rayburn House Office Building, Washington, D.C.*

DEAR MR. MURPHY: In May 1978 President Carter signed the National Ocean Pollution Research and Development and Monitoring Planning Act of 1978 into law (Public Law 95-273). Since your committee has oversight responsibility for this legislation, I am writing to advise you of the progress we have made in implementing the mandate of the law and to request an extension of the report schedule contained in the law.

Interagency cooperation

Many Federal agencies have programs in ocean pollution research and development and monitoring. Thus, to ensure that our efforts under Public Law 95-273 reflect the needs and concerns of all appropriate Federal entities, I established, under the aegis of the Federal Coordinating Council for Science, Engineering, and Technology which I chair, the Interagency Committee on Ocean Pollution Research and Development and Monitoring (COPRDM) to develop the Federal Plan required by this new law. The Interagency Committee, chaired by James P. Walsh, NOAA Deputy Administrator, is made up of policy level representatives from the eleven Federal agencies and departments with significant programs relating to ocean pollution and from the Office of Management and Budget.

The Interagency Committee formed four working subcommittees which are well along in developing substantive material necessary for the Federal Plan. The Subcommittees are:

National Needs and Problems.—Chaired by Dr. Stephen Gage, principal representatives of the Environmental Protection Agency.

Research and Development.—Chaired by Dr. John Slaughter, principal representative of the National Science Foundation.

Monitoring.—Chaired by Dr. Ferris Webster, principal representative of the Department of Commerce (NOAA).

Data Collection, Storage, and Distribution.—Chaired by Dr. William Menard, principal representative of the Department of Interior (USGS).

The National Oceanic and Atmospheric Administration has made a major commitment of resources to ensure the success of this effort. An ad hoc project office has been established with the necessary administrative and clerical support to coordinate interagency activities and expedite preparation of the plan. The Inter-

agency Committee members have all made significant commitments of personnel to participate in the extensive analysis necessary to construct a comprehensive plan.

Public workshops

Since the Federal Plan will have consequences for State and local governments and many private groups, the Committee has sought to involve these groups in its planning activities. Two public workshops have been held and the Committee hopes to conduct extensive public review of the documents generated by these workshops.

At the first workshop more than 60 scientists recognized for their research in this area assessed the ocean pollution problem from the scientific perspective and identified key pollutants and the related high priority research and development and monitoring needs. The Interagency Committee members and other members of the scientific community are now reviewing the findings and recommendations of the workshop which, along with the reviewers' comments, will be used in developing the Federal Plan.

The second workshop, involving participants from industry, public interest groups, state and local government, planning agencies, and groups involved in adjudication of environmental issues, was organized into panels by ocean use areas: energy generation, marine minerals, marine living resources, transportation, coastal development and recreation, and waste disposal. The participants developed a series of needs and problems from their point-of-view—a perspective vital to ensuring that the 5-year plan is truly responsive to the national interest.

Overall schedule

The inventory of existing federal capabilities required by § 4(b)(2) of the Act is nearing completion. The assessment and ordering of national needs and problems required by § 4(b)(1) is also approaching the final stages. However, due to the complexities of the analysis necessary to develop the policy recommendations required by § 4(b)(3) of the Act and to document the rationale behind these recommendations, I do not anticipate that the Federal Plan will be completed by February 15, 1979.

NOAA and OSTP are committed to maximum public participation in order to develop a plan responsive to national rather than limited Federal interests. I feel that additional time for non-Federal review of our recommendations is necessary to achieve this goal. On this basis, I believe that May 15, 1979, will be a reasonable date for submission to Congress of the first 5-year plan for ocean pollution research and development and monitoring.

In summary, I feel that the Executive Branch is working conscientiously and effectively to implement Public Law 95-273. If you should desire to discuss the activities mentioned here and the work of the Committee, its Chairman, Bud Walsh, and Phil Smith of my staff would be happy to meet with you and/or your staff at any time.

Yours sincerely,

FRANK PRESS, *Director.*

STATEMENT OF JAMES P. "BUD" WALSH, DEPUTY ADMINISTRATOR, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), ACCOMPANIED BY JOSEPH W. ANGELOVIC, DIRECTOR, ENVIRONMENTAL ASSESSMENT OFFICE, AND LAWRENCE SWANSON, DIRECTOR, OFFICE OF MARINE POLLUTION ASSESSMENT

Mr. STUDDS. The witness today is Bud Walsh, Deputy Administrator of NOAA. But that is not his important title; his important title is two lines long: Chairman of the Interagency Committee on Ocean Pollution Research and Development and Monitoring. You must have marvelous stationery.

Mr. WALSH. What we do is use just the capital letters—I think it's "COPRDM." We just walk around saying "COPRDM."

Mr. STUDDS. It is an unpronounceable acronym.

Mr. WALSH. It is—truly unpronounceable.

Mr. STUDDS. Perhaps the seagull on your tie can serve as a symbol.

Mr. WALSH. This is the official NOAA tie. Hopefully it won't change to something else.

Thank you very much, Mr. Chairman. I have fairly lengthy statement which I would like to have included in the record in full, and I will summarize it this morning.

Mr. STUDDS. Fine. Without objection, it will be included.

[The following was received for the record:]

TESTIMONY OF JAMES P. WALSH, DEPUTY ADMINISTRATOR, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

I am pleased to have the opportunity to report on the progress we have made in implementing Public Law 95-273, the National Ocean Pollution Research and Development and Monitoring Planning Act of 1978. This new Act became law on May 8, 1978, and initiated a major interagency effort to improve coordination of the Federal government's program in this important area, and to make more effective use of available funds and resources.

While we have been working quite hard, we will not have the first Federal five-year plan ready for the Congress until May 15 of this year. The reasons for this delay are spelled out in a letter to Chairman Murphy from Dr. Frank Press, the President's Science Advisor. I would like to make that letter a part of record at this point.

Let me summarize for you now what we have done to implement Public Law 95-273. As you know, use of the oceans is expanding rapidly. Many uses, such as oil and gas drilling, may conflict with other uses, such as fishing, if pollution should result. In order to resolve these conflicts adequately, we need to know more about, first, the sources and kinds of pollutants in the marine environment; second, the fates of the pollutants after they enter the marine environment; and third, the effects of pollutants on plant and animal life and, of course, on humans. More and more we are being confronted with questions about ocean pollution: What are the impacts of oil on the environment? Are endangered whales threatened by offshore oil development? To what extent are carcinogenic substances being transported through the marine environment, ultimately threatening human health? Can we safely discharge municipal wastes into coastal waters? Are the oceans becoming more and more polluted? These are difficult but critical questions. The answers, or more often the lack of answers, greatly affect our decisions about how we use the oceans.

Mr. Chairman, numerous agencies and departments of the Federal government conduct activities relating to ocean pollution research and development and monitoring. By our preliminary inventory of the overall Federal effort there are more than 1,000 separate projects involving approximately \$140 million. The bulk of these projects are carried out by the Environmental Protection Agency, the Department of the Interior, and the National Oceanic and Atmospheric Administration in the Department of Commerce.

The mandate of Public Law 95-273 is to ensure cooperation and coordination among Federal agencies, principally through creation and implementation of a comprehensive 5-year Federal plan. The National Oceanic and Atmospheric Administration is designated as the lead agency for preparing that plan.

At the outset, we in NOAA saw that a formal interagency committee was necessary to achieve full cooperation at the policymaking level. That committee was created in June 1978, under the auspices of the Federal Coordinating Council for Science, Engineering and Technology. I serve as Chairman of the Committee; Dr. Steve Gage, EPA's Assistant Administrator for Research and Development, is the Vice Chairman. Eleven agencies and departments and the Office of Management and Budget, each have representatives on the committee.

The Interagency Committee has formed four working subcommittees to develop specific portions of the comprehensive 5-year Federal Plan required by Section 4 of the Act. The subcommittees are:

National Needs and Problems Subcommittee, which is chaired by EPA's Assistant Administrator for Research and Development. This Subcommittee is responsible for developing the statement of national needs and problems which forms the cornerstone for determining priorities in the overall Federal effort during the 5-year Plan period of fiscal year 1979 through fiscal year 1983.

Research and Development Subcommittee, which is chaired by NSF's Assistant Director for Astronomical, Atmospheric, Earth and Ocean Sciences. The R&D subcommittee is responsible for identifying all existing Federal ocean pollution re-

search programs and facilities, for analyzing the extent to which present programs meet national priorities, and for making recommendations to the parent committee regarding changes necessary to satisfy more fully those priorities.

Monitoring Subcommittee, which is chaired by NOAA's Assistant Administrator for Research and Development. The Monitoring Subcommittee is operating in a manner similar to the R&D Subcommittee, but identifying and analyzing Federal monitoring programs.

Data Subcommittee, which is chaired by the Director of the U.S. Geological Survey. The Data Subcommittee is analyzing the current Federal capability to respond to the requirement of Section 8 for accurate and timely dissemination, in useful format, or information on Federal ocean pollution research, development and monitoring programs. The subcommittee is preparing recommendations to the parent Committee on means of implementing a responsive data and management information system which will use existing Federal capabilities to the maximum extent possible.

The working subcommittees are made up of members designated by each of the parent Committee members to assure broad participation in the substantive program and policy analysis work by all the agencies and departments.

Finally, we have set up a small Task Force that is engaged in preparation of the plan and supporting material.

Progress on the 5-year plan

Mr. Chairman, while this is a complex undertaking, we believe we have made considerable progress so far. Simply creating the Interagency Committee has improved the government's program by facilitating cooperation. Moreover, we have sought to involve the scientific community and the affected public in our efforts.

Two public workshops have been held and we plan an extensive public review of the draft plan before it is submitted to Congress and the President.

The first workshop, held in the summer of 1978, focused on the problem from the scientific perspective with participation by more than 60 scientists recognized for their research in the ocean pollution area. The scientists identified key pollutants and related research, development and monitoring needs. The second workshop, held last fall, involved participants from industry, public interest groups, State and local government planning agencies, and groups involved in adjudication of environmental issues. The workshop was organized by ocean use areas: energy conversion, transportation, marine minerals, living resources, waste disposal, and coastal development and recreation. The participants developed a series of needs and problems from the point of view of those involved in resource management policy—a vital perspective for ensuring that the 5-year plan is truly responsive in the national interest.

The proceedings of the workshops are being given extensive review both inside and outside of the Federal government and the recommendations from both are being heavily relied upon in developing the plan.

This first draft of the plan should be available for review later this month. Our schedule calls for submission of the final version of the first comprehensive 5-year Federal plan on May 15, 1979.

The NOAA program

The act, in section 5, also directs the Administrator of NOAA to establish a comprehensive program within NOAA to address questions of ocean pollution research and development and monitoring. We have moved to create this program under the direction of Dr. Ferris Webster, NOAA's Assistant Administrator for Research and Development.

The NOAA program is to include projects and activities that (1) relate to ocean pollution research and development and monitoring conducted under other provisions of law; (2) address priority questions identified in the plan that are appropriate for NOAA to address; and (3) are supported by financial assistance provided pursuant to section 6 of the act.

An Office of Marine Pollution assessment is being proposed to coordinate the NOAA program. The Office also will have administrative responsibility for the financial assistance program required by section 6 of the act. That program will distribute funds appropriated under Public Law 95-273 to Federal and State agencies as well as private institutions, for the purpose of conducting priority ocean pollution research, development and monitoring not otherwise being addressed under existing Federal programs. Policy guidance regarding distribution of these funds will come from the priorities identified in the 5-year plan.

The NOAA program presently involves projects and activities conducted by the National Marine Fisheries Service, the Sea Grant Program, the Environmental

Research Laboratories, the MESA Program, the National Ocean Survey and the Environmental Data and Information Service. According to preliminary results of the inventory of Federal marine pollution projects which was mandated by Public Law 95-273, NOAA based funded in-house research and out-of-house contracts totaling \$17.5 million in 1978. This figure represents only the actual research activities included within the rather narrow limitations determined by the Interagency Committee and NOAA to be marine pollution projects covered by the law. It does not represent other budget line items, or many general marine-research related activities.

While a similar inventory has not been prepared by fiscal year 1979 or 1980, significant increases have been approved or are pending in NOAA's National Marine Fisheries Service, Sea Grant, MESA, National Ocean Service and Environmental Research Laboratories budgets. NOAA also manages marine pollution research programs funded by other agencies, such as the Outer Continental Shelf Environmental Assessment Program (funded by the Department of the Interior) and a project to determine the effects on the marine environment of disposing brine wastes from the strategic petroleum reserve (funded by the Department of Energy).

Reauthorization of Public Law 95-273

The Administration requests that Public Law 95-273 be reauthorized through fiscal year 1983. The act presently authorizes appropriations not to exceed \$5 million for fiscal year 1979. Because the first 5-year plan will not be completed until May 1979, NOAA will not request any appropriations for fiscal year 1979. However, the President's Budget for fiscal year 1980 requests an appropriation to NOAA of \$4.3 million to carry out the act. It is intended that approximately \$100,000 be expended on administrative expenses, \$450,000 on development and implementation of data and management information systems, and the remaining \$3.75 million be used to fund priority research, development and monitoring needs not presently being addressed. Accordingly, we are requesting authorization for fiscal year 1980 of \$4.3 million under the act. The specific projects to be funded in fiscal year 1980 have not yet been identified as the first 5-year plan is not completed.

However, as examples of project categories we have included: (1) environmental characterization; (2) effects of man-induced and natural changes to the marine environment; (3) ecosystem process-dynamics and fates of pollutants; (4) prediction and modeling; (5) monitoring; and (6) technology development. Policy decisions on areas of emphasis will be addressed by the Interagency Committee immediately upon completion of the first plan. In addition, the Department of Commerce has completed an extensive ocean policy study and is supporting an ocean policy review within the executive branch which may address ocean pollution R. & D. options.

The period addressed by the first comprehensive 5-year Federal plan is fiscal year 1979 through fiscal year 1983. it is not possible to estimate out-year requirements under the act in detail in advance of the first plan. On this basis, we are requesting that the act be reauthorized for fiscal year 1981 through fiscal year 1983 at a level of "such sums as will be necessary." Coupled with a fiscal year 1980 authorization level of \$4.3 million, this will make the authorization period consistent with the period covered by the first 5-year plan. Of course, we will subsequently prepare and submit detailed justifications for specific appropriation requests for each fiscal year (fiscal years 1981 through 1983) which will be based on priorities identified in the 5-year plan as well as future deliberations of the Interagency Committee as the program evolves.

Summary

Despite its short existence, Public Law 95-273 has proved to be an effective device for enabling the Federal government to manage better its ocean pollution research programs. We are seeking to identify and remove duplication and overlap. We are also striving to find and, hopefully, fill the gaps in our program. More importantly, I believe we now have a more rational process for debating our priorities, since we cannot address every ocean pollution question at once.

Mr. Chairman, that concludes my prepared statement. I am ready to try to answer any questions the subcommittee may have.

Mr. WALSH. I am pleased to have this opportunity to report to you on the progress that the administration has made in implementing Public Law 95-273—the easy way to say it. This new act became law May 8 of last year, and initiated a major interagency effort to improve coordination of the Federal Government's pro-

gram in this important area, and to make more effective use of our available funds and resources.

While we have been working quite hard, we will not have the first Federal 5-year plan ready for the Congress until May 15 of this year. The reasons for this delay are spelled out in the letter that you mentioned, Mr. Chairman, from Dr. Frank Press, the President's Science Adviser, to Chairman Murphy.

Let me now summarize for you what we have done to implement this new law.

As you all know, use of the oceans is expanding quite rapidly. Many uses of the ocean, such as oil and gas drilling, may conflict with other uses, such as fishing, if pollution should result. In order to resolve these conflicts adequately, we need to know much more than we do right now first, about the kinds and sources of pollutants in the marine environment; second, the fates of the pollutants after they enter the marine environment; and, third, the effects of these pollutants on plant and animal life and, of course, on human beings.

More and more we are being confronted with questions about ocean pollution: What are the impacts of oil on the environment? Are endangered whales threatened by offshore oil development? To what extent are carcinogenic substances being transported through the marine environment, ultimately threatening our health? Can we safely discharge municipal wastes into coastal waters? Are the oceans becoming more and more polluted?

These are difficult but critical questions. And the answers, or more often the lack of answers, greatly affect our decisions about how we use the oceans.

Mr. Chairman, numerous agencies and departments of the Federal Government conduct activities relating to ocean pollution research and development and monitoring. By our preliminary inventory, there are more than 1,000 separate projects involving approximately \$140 million presently underway. These projects are carried out principally by the Environmental Protection Agency, the Department of the Interior, and the National Oceanic and Atmospheric Administration in the Department of Commerce.

The mandate of this new law is to insure cooperation and coordination among these Federal agencies, principally through creation and implementation of a comprehensive 5-year plan. NOAA has been designated as the lead agency for preparing that plan.

We realized at the outset that the best way to approach this problem is to establish a formal interagency committee at the policy making level. We have done that under the auspices of the Federal Coordinating Council for Science, Engineering, and Technology.

Mr. STUDDS. What is that?

Mr. WALSH. When the Congress created the Office of Science Adviser to the President, they formulated an umbrella organization called the Federal Coordinating Council for Science, Engineering and Technology. It serves as an organization under which all other science-related activities are established. That is its function by law in the statute that created the Science Adviser to the President.

So we have numerous interagency committees that are all created under the Federal Coordinating Council, and that is why we

use that mechanism and that is why you received a letter from Dr. Frank Press and why our interagency group was established by a charter signed by Frank Press.

I serve as Chairman of the Committee, and Dr. Steve Gage, who is EPA's Assistant Administrator for Research and Development, is the Vice Chairman. Eleven agencies and departments and the Office of Management and Budget each has a representative.

We have four working subcommittees that essentially are primary mechanisms for developing material to go into the report:

The National Needs and Problems Subcommittee is essentially charged with identifying what the key priority national needs and problems are that need to be addressed in this area of ocean pollution research.

The Research and Development Subcommittee's responsibility is to identify, that is, inventory all existing research programs and, to some extent, identify from the standpoint of research and science what should be the priorities.

The Monitoring Subcommittee is to approach monitoring programs in the Federal Government in the same way as the Research and Development Subcommittee is.

And, finally, the Data Subcommittee is an important and key committee, because we need to rearrange the manner in which we develop data, store it, and make it available to people and the general public. There are some recommendations that have already come out of that subcommittee that are proving to be quite useful.

These working subcommittees, of course, are made up of members of the parent committee, and are presently engaged in writing the report.

We also have a small task force whose job is to actually put words to paper, and we hope to have something available fairly soon from them.

Mr. Chairman, this has proved to be an extremely complex undertaking, given the many agencies involved, but I think we have made considerable progress. While it may be somewhat humorous, just creating the interagency committee has proved useful, simply because in the past many of these agencies and many of the policy-making individuals that are responsible for these kinds of research activities never interacted with each other. And, therefore, many agencies were not aware of what the other agencies were doing in the same areas.

Moreover, we have sought to get more direct advice from the scientific community and from the public. We have already conducted two workshops for that purpose, and there will be extensive review of the draft plan, which will be available at the end of this month, before our interagency committee establishes the priorities, approves the plan, and submits it to Congress and the President.

The first workshop was a scientific workshop that was organized and headed by Dr. Ed Goldberg, who is considered to be one of our Nation's leading scientists in the area of ocean pollution research. That workshop approached the problem from the standpoint of science—what are the scientific questions that need to be answered.

I will provide for the staff a copy of the draft report by the workshop that was conducted last year in Colorado. There is a

quick summary—it's a very good job, I think, by Dr. Goldberg, at the front, no more than 10 or 11 pages that are useful for us nonscientists to read and get an understanding of what's being talked about. I will make that available.

[The text of the summary follows:]

OCEAN POLLUTION RESEARCH, DEVELOPMENT,
AND MONITORING NEEDS

Report on a Workshop at Estes Park, Colorado
July 10-14, 1978

REVIEW AND OVERVIEW

Edward D. Goldberg

1. INTRODUCTION

The scientists who convened at Estes Park in July 1978 to prepare a research and monitoring program in marine pollution were guided by several prevailing moods. First, there was an overwhelming, and possibly overemphasized, sense of the complexity of both the marine environment and its pollutants. Hosts of interactions take place between the organisms of the sea, their environment, and people. Formulating effective laboratory experiments or making relevant field measurements tries the abilities of our most competent workers. Marine pollutants may act individually or in concert; natural phenomena are often difficult to distinguish from human-induced changes.

Second, in a more positive vein, the scientists recognized that the marine system must be treated as a resource for humans, and that the ability of the waters and sediments to accept wastes must be assessed continually. These two concerns influenced the setting of priorities for research.

A goal of the scientists who met at Estes Park was to provide tactics for early recognition of potential pollutants in the coastal zone. In the past we have recognized some and managed them effectively, for example, the radionuclides introduced from the nuclear fuel cycle. For others a catastrophe has provoked action; for example, the Minamata Bay epidemic poisoning led to identification of mercury methyl compounds, and the impact on non-target organisms caused concern about DDT and other biocides.

Our aims are to keep the resources of the oceans renewable. By doing this we are protecting our ability to utilize foods from the sea without jeopardizing public health, to maintain healthy ecosystems, which in turn provide food resources, to utilize the oceans as recreational areas without fear of poisoning by pollutants, and to enjoy the beauties of the marine system.

The panel recommendations presented herein propose research activities that are relevant to recognized and potentially solvable problems in marine pollution.

2. SOURCES OF POLLUTION

2.1 Synthetic Organics

Synthetic, organic chemicals present a "text-book" example of the complexities involved between the antagonists, the pollutants, and the protagonists, the organisms they affect. It is tragic that, so far, we have identified these pollutants only through catastrophic events. As a consequence, the proposed research activities center about strategies to manage and manipulate the existing and forthcoming data that relate to both pollutant concentrations and their biological effects.

The pesticide DDT was the first synthetic organic to be regulated as a result of its effect on non-target organisms. Marked decreases in the reproductive success of spotted seatrout, a commercially important marine fish on the south Texas coast, were associated with high DDT residues in the fishes' eggs; fish productivity rose after the United States banned DDT usage in the early 1970's. Of readily recognizable economic concern is the recent "Kepone incident" in which the synthetic organic pollutant was identified as dangerous through the morbidity of people engaged in its manufacture. Wastes from the production facility were released into the James River and subsequently entered the Chesapeake Bay estuary. The levels of Kepone in some fish exceeded the permissible FDA levels. The commercial fishery was closed for many species with losses not only to fishermen but also to dock-workers, restaurants, truckers, railways, boat dealers, and tackle and bait suppliers. Several decades must pass before the estuary is cleansed enough to bring the Kepone residues in fish below the maximum permissible levels.

The synthetic organic chemicals of concern contain chlorine atoms and are analyzed by gas chromatographic techniques. The spectra issuing from these instruments contain many unknown peaks. Some peaks may represent substances that occur naturally, whereas others may represent those introduced by human activity. The polychlorinated biphenyls (PCBs), chemicals that have been extensively used in industry, were identified as pollutants through the widespread occurrence of their peaks in environmental samples.

To determine the compound represented by an unknown peak costs tens of thousands of dollars and many months of study. Since hundreds of peaks occur, it is proposed to develop an inventory of them and of problems associated with them even though their identity may not be known. By developing standardized methods of analysis, each peak can be assigned a number characteristic of its appearance in the gas chromatograms. The number for each environmental sample can be stored in a computer system as a function of the date and site of collection. The development of a national, computerized, network for accumulation and storage of information about the peaks is the primary research activity proposed.

When a peak occurs in only one area, a point source of pollution is indicated, which can be investigated. Cosmopolitan occurrences of peaks suggest widespread pollution or naturally occurring material. Biological disasters in a given area may be considered in the light of information within the computer. The identification of problems before they reach crisis proportions is the desired result.

2.2 Chlorination Products

In the future the coastal ocean ^{may} ~~will~~ be used mainly as a reservoir for excess wastes and heat produced by human activity. The transfer of heat and some wastes to the marine system is producing another category of pollutants--the chlorination products. Chlorine is introduced to waste waters to disinfect them partially and to cooling waters of electric-power generating plants and other industrial facilities to minimize slime and other types of biofouling. The chlorine interacts with the organic materials of seawater to produce chlorinated substances and with the bromate ion to produce bromine and hence brominated organic compounds. Among the compounds formed are chloroform and bromoform, both of which have carcinogenic and mutagenic properties. The use of chlorine is expected to increase in the future, and hence it is a cause for concern.

Scattered but increasing evidence indicates that undesirable impacts on marine organisms are associated with the use of these chlorination products. Lethal effects were found in a California commercial mariculture enterprise that used chlorinated power plant effluents. Oysters, which exhibit measurable uptakes of halocarbons (such as chloroform and bromoform) provide a potential route to humans for these toxic substances. Waste waters with no measurable chlorine residuals caused measurable shifts in the colonization and composition of communities of marine algae. Current regulations are based solely on residual oxidant levels and not on oxidation (chlorination) products and thus may need evaluation.

The priority problems concern the composition and formation of the higher molecular weight organic halocarbons. The production of specific products is governed by temperature, salinity, light intensity, and other factors that have not been characterized. Perhaps toxicity of effluents can be reduced under some conditions. Once oxidation products are identified, studies of their impact on marine ecosystems and their fates and persistences in the marine system can be undertaken.

Finally, the reactions of the anthropogenic organics present in waste water to the treatment process may be important. More toxic substances may result from the treatment process, such as the chlorination of phenol which produces chlorophenols, or the pollutant may be destroyed, as by the oxidation of a pollutant metal from a bio-available to a less bio-available form.

2.3 Dredging and Large-Volume Waste Disposal

New disposal sites must be designated to accommodate the increasing volumes of dredged materials and solid wastes in the future. Present sites for disposal, both onshore and in sub-tidal areas, are becoming scarce and costly to acquire and to maintain. Since sites and the material to be disposed have unique characteristics, the ability of a given site to safely receive a given material must be assessed. Therefore, criteria must be developed for new site selection and techniques discovered for disposal of materials. In each instance, a choice must be made between containment and dispersal of the material to be disposed. Each site must be evaluated for its capacity to retain discharged materials, on the basis of its physical, biological, and geological characteristics.

Dredged materials and barged wastes must be characterized as to their physical and chemical properties so that their fates at a given site can be predicted. Pollutants identified in this report should be assayed to ascertain if any public health or ecological risks are involved in their disposal. Contact should be established with major United States chemical companies and industrial facilities to determine the amounts and types of wastes they expect for the future and their plans for disposal.

To formulate appropriate models to evaluate the adequacy of potential disposal sites, on-site investigations of long-term changes of materials are needed, especially with regard to the release of pollutants and to any increased turbidities in the areas.

Finally, alternative procedures for cleanup or rehabilitation of severely polluted areas are urgently needed. Examples of severe pollution include Kepone in the James River, polychlorinated biphenyls in the Hudson River, and mercury in Lake St. Clair and the Detroit River. Remedial activities have been delayed because no substantial scientific base has been developed to guide operations. Research programs should be initiated with a first-phase feasibility study, followed by a second-phase pilot scale operation, and ending with a third-phase formulation of contingency plans.

2.4 Litter

The definition of litter is clear: any solid anthropogenic or natural product that is out of place in the environment. The term litter encompasses a variety of substances: plastics and synthetic organic materials, glass, metals, wood, petroleum products in the form of tar balls, grease balls, and the natural organic articles. Litter can be found in beaches, coastal and open ocean waters, in or on bottom sediments, and in marine organisms. Its sources include recreational

activities on land and on sea, ship discharges, industrial inputs, and sewage-related additions such as storm system overflow and by-pass of treatment systems.

Although litter has been found in the internal organs of marine organisms, there is no clear evidence of morbidity or mortality from its ingestion. For example, 1-mm to 5-mm polystyrene spherules have been found in terns and seagulls off Long Island Sound. Elastic threads (like rubber bands) have been found in puffin populations from Scotland and Norway, resulting in obstructions in their alimentary canals, and some dead puffins with apparently clogged guts have been observed. Polystyrene spherules have also been found in fish from the United Kingdom and Long Island Sound. In larvae up to 5 mm in length, spherules of 0.5 mm in diameter, a size about half that of the larva's width, were observed. Again, no harm has yet been linked conclusively to the ingestion of litter.

The accumulation and fouling of beaches is a major aesthetic problem of litter. The cost of clean-up is high, and economic losses to beach-related industries for a single beach can reach annual values of tens of millions of dollars, as noted at Long Island Sound. Few quantitative studies of the types, fluxes, and persistence of litter have been made. Once the quantity of litter on beaches, in waters, and in sediments has been assessed, ways must be developed to keep litter out of the oceans, especially litter that fouls beaches or jeopardizes the health of marine organisms. Studies on the persistence of plastics in the marine system (i.e., their destruction through photo-oxidation, biodegradability, and mechanical breakdown) should indicate the direction that regulatory actions of litter should take.

2.5 Artificial Radionuclides

The management of releases of artificial radionuclides into the environment is a classic case of using scientific information to minimize losses or restrictions on the use of environmental resources. Soon after production of nuclear energy began, the question was posed as to what amounts of artificial radionuclides could be accommodated in the marine system without danger to public health, marine ecosystems, or marine organisms. With the minimal information available in the 1950's, guidelines for acceptable levels were formulated and then modified with time as better and more complete data became available. Monitoring and surveillance programs provided descriptions and then predictions of the distribution of radionuclides in the oceans. As a consequence no impacts on human health have been documented; no effects harmful to marine organisms are known, even at the sites of large discharges, such as the reprocessing plant in Windscale, England.

The Estes Park panel on artificial radionuclides posed as the major problem the assessment of the deep ocean floor for the emplacement of high-level radioactive waste. Sub-seabed storage is an alternative to terrestrial depositories. Yet existing information is inadequate to

predict the consequences of inadvertent releases of radioactive material to the deep-ocean environment. Research programs are needed in geology, geophysics, sediment physics and chemistry, oceanography, abyssal ecology, and radio-ecology.

The speciation of many artificial radionuclides in marine waters is still unknown, especially for transuranic elements (i.e., plutonium, americium, and curium). Such information is essential to predict their behavior in the coastal ocean and their availability to marine organisms. The behavior of a species with respect to sedimentation is important to ascertain the species persistence in the aqueous state.

Finally, existing dump sites should be watched for leakage of radionuclides to test the validity of present assumptions about the retention of disposed materials in the sediments and to provide a basis for the selection of future disposal areas for low-level radioactive wastes.

2.6 Microorganisms

Microorganisms released into the coastal environment by discharges of human and lower animal wastes can jeopardize public health, since some of these organisms are agents of both human and faunal disease. Infective or toxigenic agents can be produced in the marine environment itself, for example, the proliferation of dinoflagellates responsible for paralytic shellfish poisoning.

Hepatitis A and gastroenteritis, probably caused by the Rotaviruses and Parvo-like viruses, are the most common enteric diseases associated with recreational water use or consumption of shellfish harvested from coastal and estuarine waters. The development of recovery and enumerative methods for these viruses constitutes a priority research need. In addition, an assessment of epidemiological data to ascertain the relationship between populations of organisms and the response in terms of human health is needed. Risk analyses of the data are essential.

Recent investigations suggest that the prevalence of infectious diseases in fish, crustaceans, and mollusks, caused by viruses, bacteria, fungi, and protozoa, is higher in degraded marine environments. Fin rot is significantly more common in demersal flatfishes from areas receiving domestic wastes than in those from more pristine areas. Perhaps more important than establishing the etiology of the diseases is establishing a relationship between degraded environments and the occurrence of infectious disease, with more emphasis on larvae and juveniles — ~~the~~ *vulnerable stages of organisms.*

Finally, there is a concern about the affect of wastes on the existing populations of marine micro-organisms. If the load capacity of the oceans is exceeded, the marine ecosystem may be drastically altered,

perhaps with the loss or restricted use of food or recreational resources. Thus, research is needed to ascertain the load capacities of coastal waters. Such investigations should include the rates at which existing marine populations degrade wastes, such as petroleum products, pesticides, and organic industrial effluents. The delineation of areas that can accommodate greater waste burdens may result from such studies.

2.7 Trace Metals

During the past 5 years marine chemists have found that the concentrations of some trace metals in sea water are one or several orders of magnitude less than had previously been believed. The ability to sample sea water and to analyze it accurately for its trace metal without introducing contaminants has led to this discovery. As a consequence, human mobilization of some of these metals, such as lead, cadmium, copper, zinc, and chromium, may be as great or even greater than movement of the metals in the major weathering cycles. Several areas of concern have developed: the impact on human health of the ingestion of seafoods enriched in trace metals, the toxicity of trace metals to marine organisms, and the disruption of ecosystems through trace-metal caused alterations of phytoplankton populations.

A notorious case of metal poisoning of humans through the consumption of seafood is the Minamata Bay incident in which methyl mercury chloride was released from a chemical plant into the bay, then consumed in seafood, causing fatalities and morbidities. No metal pollution episodes have been reported for United States coastal waters. However, researchers must be aware of potential dangers because many sea organisms consumed by people are able to concentrate such toxic metals as mercury, cadmium, lead, and selenium.

There are reports of an abalone kill from pollutant copper and of the loss of detoxification abilities of mussels by overexposure to trace metals. But perhaps of greater importance is the possibility that such metals as zinc and copper can alter the assemblages of phytoplankton species. The form of an element determines its toxicity. For example, the toxicity of copper is related to the abundance of free copper ions, which is decreased through complexation with natural and anthropogenic organic compounds.

Important research areas include accurate measurements of metals in coastal waters and the fluxes of such metals from anthropogenic inputs. Further, knowledge of the forms of such metals in sea water and their relative availability to marine organisms, especially phytoplankton, will make possible study of their potential impacts on the existing food chains.

2.8 Biostimulants

A continually increasing input to coastal waters of substances that enhance the growth of marine plants has altered marine ecosystems, usually in an undesirable way. These biostimulants, which include compounds of nitrogen, phosphorus, silicon, and metals, as well as dissolved organics, are introduced primarily in sewer outfalls. Perhaps their most dramatic effects are alterations in the composition of the food chain base and increases in the plant population. Usually, the small microscopic plants, the diatoms, which are the food of filter-feeding fishes and zooplankton and hence support large fish populations, are displaced by flagellates (marine weeds), poor foods for many of these grazers. The increased productivity can result in excessive oxygen consumption in the waters, leading to anoxic conditions, a situation that has been reported to result in fish kills, often of commercially important species. Anoxic conditions also discolor and cause unpleasant odors in waters and render them unpleasant for aesthetic and recreational uses.

There are many widespread and well-documented examples of biomass increases, anoxia, and changes in community structure resulting from the anthropogenic inputs of biostimulants: Chesapeake Bay, New York Bight, California embayments, San Francisco Bay, Kaneohe Bay, Hawaiian Islands, Lake Erie, and Long Island's Great South Bay and Moriches Bay. Ocean dumping has little effect on these problems in the New York Bight; biostimulants introduced from outfalls have caused the trouble.

The priority research problem is distinguishing between natural events and human impacts on coastal ecosystems and assessing the magnitude of each. The interactions among the biostimulants, toxic pollutants, food chains, and physical parameters make the problem especially complex. Solutions may be found in coupling predictive models with necessary inputs from field and laboratory studies. Although variations in many of the parameters from place to place tend to make each model site-specific, general models of wide applicability should be sought. The complementary laboratory and field studies should provide an understanding and quantification of the interactions among the phytoplankton, biostimulants, and the physical forcing functions. Such models will enable researchers to gauge the trend of a coastal water zone toward either a healthy situation or one approaching eutrophication, the overstimulation of plant activity.

2.9 Fossil Fuel Compounds

Petroleum compounds and their degradation products are the main components of this group of pollutants. Petroleum usage is predicted to decrease substantially in the next 30 years or so; simultaneously, utilization of coal and oil shale will increase as energy sources and feedstocks for the production of chemicals. Coal gasification and

liquefaction, shale processing, and combustion and transport introduce many of the same compounds into the environment that petroleum does. Thus, a knowledge of the fates and impacts of petroleum hydrocarbon in the marine environment will be a basis for understanding coal and oil shale problems.

The sources of inputs of fossil fuel compounds are not completely known. Such information is necessary to describe their present distributions more adequately and to predict future ones. The accumulation of such data constitutes a priority research activity. The following sources of fossil fuel compounds have been identified: marine transportation and operations; offshore production; atmospheric transport from fossil fuel combustion; land-based discharges via rivers and industrial and domestic outfalls; and dumping. In addition identification of fluxes of hydrocarbons from seeps, forest and grass fires, and vegetation is necessary to distinguish natural from pollutant inputs.

To construct descriptive and predictive models, the fates of the petroleum hydrocarbons in the marine system must be understood. Their destruction or alteration by biological and inorganic processes is of first-order interest. Singled out for priority study are the rates of microbial degradation of petroleum components and the role of photochemical reactions in altering or destroying the compounds.

The acute, biological effects of oil pollution, such as mass mortalities, require immediate remedial measures. However, future research should emphasize long-term, interdisciplinary studies of sublethal effects. Since not all compounds or organisms can be studied, initial efforts should be directed toward persistent toxic substances or compounds that produce toxic substances upon degradation. Because petroleum compounds have shorter residence times in water than in the sediments, benthic organisms are subjected to greater exposure than are pelagic organisms. Hence, benthic organisms are to be emphasized in either individual organism or community studies.

3. BIOLOGICAL EFFECTS

Researchers have not identified biological effects, other than the very obvious mass mortalities, associated with the entry of pollutants into the marine system. Not only is there a complexity associated with the interactions between the organisms constituting a community but there is a complexity concerning the pollutants themselves. Do they interact independently or are there synergistic or antagonistic effects through exposure to two or more contaminants? The following variety of available approaches further complicates a research program: studies on single organisms, food chains, communities of organisms, and entire ecosystems by approaches that may be physiological, behavioral, biochemical, or ecological.

The Estes Park Workshop Panel on Biological Effects submits that the outstanding problem is determining whether pollution is the cause of a significant alteration in ocean life, even when pollution is clearly associated with ~~the~~ change. *an environmental*

The panel proposes that long-term studies of the natural variation in unpolluted marine ecosystems be initiated so that we can ascertain what types of changes are normal. To accumulate enough significant data, the studies should continue through a decade, although three-to five-year programs would provide the stepping stones for future work. The study sites should be representative and easily accessible. They would include an intertidal muddy site such as a salt marsh (e.g., Savannah River Estuary); a nearshore mud bottom community; an intertidal rocky coast community; a nearshore sand bottom community; a pelagic community in a bay or estuary. A species list would be prepared for each site studied. The list would provide a basis for studying the community structure and the flow of energy through it during longer time periods. Surveys would be made at frequent intervals. Thus, the range of natural variations could be determined.

Complementing these ecological studies would be investigations involving the manipulation of small ecosystems by introducing pollutants, followed by studies of their effect. The goal would be the determination of how pollutants, singly and in combination, affect ecosystem structure and function. Ecosystem studies of this type have been carried out for the forests at Hubbard Brook, for salt marshes at Cape Cod, and for lakes in Manitoba. Whole ecosystem studies, although more expensive and more complicated to manage, are preferable to the large-scale enclosure studies popular at the present time.

4. MONITORING

Complementing the proposed research programs must be surveillance programs to monitor pollutant levels at given sites during extended time periods. The ongoing Mussel Watch project measures pollutant levels for heavy metals, petroleum hydrocarbons, synthetic organics, and artificial radionuclides at 120 coastal stations, using bivalves (e.g., oysters, mussels, clams) as sentinel organisms (Goldberg, 1975, 1978). Surveillance techniques must be developed to study pollutants that cannot be monitored by bivalves, e.g., litter microorganisms, biostimulants, dumped wastes, and oxidation products. Since pollutants may stress organisms or ecosystems in cumulative ways, coordinated programs in coastal marine monitoring are essential. To ascertain whether any biological impacts have occurred at a site, all monitoring data should be stored in one place and made available to investigators.

Countries sharing coastal waters must depend on each other for

monitored pollutant data that in turn may be used to formulate guidelines for marine pollutants. The increasing uses of materials and energy by most countries has led to increasing disposal of pollutants in coastal waters, and the marine pollution of one country may be created by another. The International Atomic Energy Agency has written guidelines for the oceans' abilities to handle radioactive wastes, but such information is lacking for other pollutants.

The research and monitoring strategies formulated by United States efforts will provide patterns for their expansion to global or regional programs.

5. REFERENCES

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Mr. WALSH. In addition, we had a workshop on national needs and problems in which we invited a series of individuals to work in particular areas, to talk about what the problems are from their perspective. We invited representatives of environmental organizations, State, industry, and invited some people from the staffs of Congress. We broke this down into certain ocean-use areas—for example, energy conversion, and transportation. What are the ocean pollution problems associated with these activities, and what are the key problems that we need to address in any kind of a plan?

We have also a draft of the proceedings of that workshop, which I will make available for the committee.

[The executive summary follows:]

PROCEEDINGS OF A WORKSHOP ON NATIONAL NEEDS AND PROBLEMS, NOVEMBER 14-16, 1978; TYSONS CORNER, VA.

PREFACE

The workshop was held November 14-16, 1978 and reports by the six panels were submitted to the Subcommittee's staff by November 30, 1978. The Draft Preliminary Report was prepared by an EPA contractor during the period December 1-8, 1978, utilizing the panel reports and transcripts of the workshop proceedings. The statements presented in each Panel Report in this report do not necessarily reflect the views of all members of each panel.

EXECUTIVE SUMMARY

In the spring of 1978, Congress enacted the National Ocean Pollution Research and Development and Monitoring Planning Act (Public Law 95-273). The Congress concluded that there was a need to develop a comprehensive Federal Plan that would better identify the needs for ocean pollution research and development and monitoring. The Plan should demonstrate how the Federal effort was organized to meet these needs in a timely and efficient way and how it could be improved to meet them. The Plan calls for: an assessment and ordering of national needs and problems; an inventory of existing Federal programs, resources, and facilities; policy recommendations; and a budget review.

The assessment of national needs and problems is the first step and establishes the objectives toward which the Federal Ocean pollution research, development, and monitoring plan is directed. Six areas of human activity in coastal and ocean areas that may cause or be impacted by pollution have been identified:

- Energy Generation,
- Coastal Development and Recreation,
- Living Resources,
- Marine Transportation,

Waste Disposal, and Mineral Resources.

These activity areas were used to organize the panels of this workshop; a preliminary evaluation of national needs and problems for each area was presented as a "straw" document to the panels prior to the workshops for their consideration in their deliberations. The panels drew from the "straw" document and their own expertise to define uses within the six category areas. Generally they addressed, in different formats, the level and location of the uses, value, and importance with respect to the marine environment, environmental quality concerns, the decision-making framework, and limiting factors to making decisions. Conclusions and recommendations for research, development, and monitoring needs were generally presented as priority lists or as matrices.

Since the research, development, and monitoring needs evolved from broad consideration of marine-related activities in their societal context, they were not limited to science and technology alone. Thus, a better understanding of economic aspects of impacts and alternatives, clarification of the institutional framework—particularly the complex network of federal agency mandates, and implementation of better public awareness programs were listed as needs by several panels. The breadth of approach was further evident in the willingness of some panels to relate marine activities to land activities. Economics of landfill disposal and pathogen viability in river waters are diverse examples of the connection between land-based activities or processes and eventual marine impacts.

Regarding research, development and monitoring more specifically keyed to science and technology, the panels uniformly took note of the need for more rational decision-making. Less well recognized was the tentative nature of scientific understanding and of technology as related to societal and institutional stability. A flexible institutional framework is needed to keep pace with new understanding. While the panels set varying priorities on research and development keyed to their topical assignments, there was pervasive concern for more knowledge of fate and effects of toxic pollutants, extrapolation of laboratory findings to onsite realities, and fundamentals of marine ecology, chemistry and physics. Many of the specific research priorities address implicitly the problem of evaluating the assimilative capacity of the oceans with respect to the impacts from and impacts on the varied uses.

Monitoring needs were not always clearly distinguished from research and development needs, which may reflect the panels' appreciation of the close relationship of these activities and somewhat arbitrary separation. Uniform monitoring standards and better monitoring indices were listed as high priorities in most panel reports.

The key assumption underlying this enterprise, that goal-directed research is a fruitful approach to controlling marine pollution, was not questioned.

Energy generating systems

The initial task undertaken by the Energy Generating Systems Panel was to address the question of the users of the information from marine pollution research, development, and monitoring. It was felt that in defining or assigning priorities to needs, attention had to be given to the needs of decision makers, primarily in Government, on issues dealing with energy. They also emphasized the real need to address the public in order to promote a better link with the research community and governmental authorities dealing with energy questions.

After registering concern about focusing too closely on government decision makers, the group identified and assigned priorities to eleven technologies that they would deal with in their discussions. These eleven were initially ranked in accordance with the immediacy of their application in the marine environment. The top six in rank order were nuclear-fuel-powered plants, fossil-fuel plants, geothermal plants, pumped storage systems, the OTEC system, and marine biomass. The last five, which were given lower priorities, were seen as separate from the first six in terms of immediacy; i.e., they are seen as being so far in the future as to be considered in a separate category. These five included waves, tides, currents, salinity gradient, and satellite power systems. The group also ranked the eleven technologies according to their probable environmental impact.

Some time was spent addressing the straw document, omitting portions that were seen as inappropriate or incorrect and annotating in areas that were seen as inadequate. The final and most important product of the panel deliberations, however, was the attempt to list and prioritize research, development, and monitoring needs regarding energy technologies in the marine environment. Three basic criteria were used in assessing the needs: the immediacy of technological application, the scale of probable environmental impact and the level of existing knowledge pertain-

ing to position effects. Some 55 needs were identified and ranked. Thirteen of these fell into the high priority category, 20 into the medium, and 22 into the low. The highest priority needs were those associated with the important technology of energy production in the coastal environment for fossil—and nuclear-fuel plants, on and offshore. The needs dealt with thermal effects, the effects and behavior of radionuclides, and low-level and chronic effects from the operation of these plants. Special emphasis was placed on the need to develop methodologies for taking a more accurate view of effects and the need to look at aggregated effects in addition to examining localized site-specific conditions.

Coastal development and recreation

The Coastal Development and Recreation Panel initially had difficulty in identifying the scope of this use and, therefore, developed a working matrix for their discussions which included six types of activities in the coastal zone and four types of information needs. Significant activity categories were (1) point sources of pollution, (2) non-point sources of pollution, (3) habitat alteration and destruction, (4) water diversion, (5) shore stabilization, and (6) facility siting. Information needs were classified as scientific data, technology, economics, and social and institutional. Much of their discussion focused on identifying decision makers in the regulation of these activities. Detailed lists of specific information needs within their discussion matrix were formulated, and general research, development, and monitoring needs were defined and prioritized.

Research, development, and monitoring needs were categorized into (1) physical, biological, and chemical needs; and (2) economic and institutional needs. Physical, biological, and chemical needs were further subdivided into pollutant discharge information, transport and fate of pollutant information, and pollutant-effects information. High priority was assigned to developing methods for estimating existing and future pollutant discharges from municipal outfalls, industrial outfalls, and agricultural runoffs, particularly synthetic, organic and heavy metal compound discharges. Development of models that relate pollutant discharges from multiple sources to ambient conditions and exposures is needed, particularly for synthetic organics and heavy metals. Human health effects of microorganisms and synthetic organic compounds, and evaluations of indicator organisms and test procedures for detecting microorganisms, fossil fuel compounds, heavy metals, and synthetic organics were assigned a high priority for research.

Economic and institutional needs were not prioritized by the Panel, but general needs were defined. Economic needs involve the study of the costs of alternative pollution control strategies; of the distribution costs geographically, over time and among demographic groups; and of the benefits of goods and services whose production might be subject to control for environmental purposes. Institutional research questions are presented that relate to management-model structure; decision-making systems; and the performance effectiveness and costs of existing institutions and programs.

Living resources

The Living Resources Panel had broad discussions and formulated recommendations that extended well beyond pollution from the seafood industry, which was their initial working concept of this use. Interactions of living marine resources and other uses of the oceans were discussed. A list of pollutants was reviewed and ranked according to research needs; synthetic organic compounds and toxic metal compounds were given the highest priorities. General and specific program recommendations for research, development, and monitoring were formulated.

Three broad areas of research which should proceed simultaneously in an integrated, complementary way were identified:

- Description and quantification critical, functional components of undisturbed and perturbed ecosystems.

- Measurement of rates and interactions associated with processes and fluxes within individual organisms and in major ecosystems.

- Determination and evaluation of effects of changes, both acute and chronic, on components, processes and fluxes that constituted significant alterations in organisms and ecosystems.

Thirteen specific project needs and problems were identified and given priority rankings: the highest priority projects were:

- (1) standardization of marine pollutant analysis methodologies;
- (2) source control of hazardous materials before release; and
- (3) need for information on distribution, nature, and impact of certain pollutants.

Decisions on the environment should be based on knowledge of existing levels of contamination, their rates of increase or decrease, and their effects on organisms and ecosystems under different environmental conditions. Pollution-oriented research activities should be a closely, coordinated, interactive program of monitoring and research. Information must be made available and utilized by decision makers.

Marine Transportation

The Marine Transportation Panel first discussed the straw document presented to them. It was noted that this document dealt to a large degree with fate and effects. While it was agreed that this is a crucial area, especially when dealing with oil and hazardous substances, the panel did not feel qualified to develop this area in depth. Rather, the panel members saw their role in examining prevention and mitigation work that needs attention in the marine transportation field. They restricted themselves to the transportation by water of hazardous substances, broadly defined to include every stage of handling in connection with such transportation.

It was agreed that any effective regulatory regime in this area must have three parts: one to deal with the control and limitation of normal discharges from everyday operations; one with the prevention or mitigation of accidental discharges; and a third to assure an effective liability and compensation regime to compensate victims. The panel also noted that the prevailing roles and practices regarding salvage are inappropriate for modern conditions, and that a high priority should be placed on developing new (international) salvage rules.

In examining and listing the needs in regards to prevention and mitigation work, the panel divided marine transport consequences into two areas—hazardous substances spills from marine transportation and oil pollution resulting from marine transportation. In dealing with hazardous substance spills, the major need that was defined was for better spill information concerning hazardous substance spills and trend analysis in this area. Only after such analyses, will it be possible to determine rational strategies for new transportation requirements. In general, the panel expressed more concern about chemicals than oils. In dealing with the areas of pollution resulting from marine transportation, a number of needs were identified. The needs list was divided into eight major categories: cargoes, vessels, personnel, terminals, environmental operating conditions, institutional and legal ramifications, and accident response. Within each of these areas two to six areas which need study to develop information or produce action were listed and ranked in terms of high, medium, or low priority. Of these eight categories, the panel designated the areas of personnel and institutional and legal ramifications as being of particular importance. Personnel needs were: a profile of various standard requirements, a study of owner/crew relationship, study of reasons for failures, examination of normal and emergency procedures, and procedures for training and regulating pilots. Institutional and legal ramification needs included: salvage law compensation, better monitoring capability for operational discharge, substandard ship identification, international enforcement capability, and liability compensation.

Marine waste disposal

The Panel accepted a broad definition of ocean use for waste disposal that encompassed disposal of all sludges, dredged materials, radioactive wastes, and point and non-point, and riverine pollution. Ocean dumping, ocean outfalls, and riverine pollution received particular emphasis. Radioactivity was addressed as a separate category of both waste and process.

Many statutory authorities and agencies are involved in the decision-making processes. Sufficient information for preparing a complete inventory of regulations bearing on marine pollution was not available during the panel discussions. The interaction between land and marine disposal and the need for a balanced consideration of both types of approaches were discussed at several points.

In its general recommendations of needs for research, development, and monitoring, the Panel mentions:

- Development of an inventory of the sources of pollutants by location and type of discharge

- Quantification of the amounts, and rates and types of pollutant addition to the marine environment, including riverine sources

- Evaluation of effects, with more on-site data collection

- Definition of the assimilative capacity for different materials in relation to other uses of the marine environment

- Development of institutional frameworks to regulate marine environmental uses on the basis of the assimilative capacities

- Improve public awareness as a facet of all federal programs.

The final priority recommendations were presented in a matrix wherein 17 research, development, and monitoring needs were applied to ocean dumping, outfalls, radioactive wastes, and riverine pollutants. The six needs for which a high priority was placed on research and development in all four categories were:

- Evaluation of potential health effects of persistent pollutants, and nuclear wastes (including carcinogens, teratogens, and mutagens)

- Evaluation of distribution, persistence, and pathways to man of pathogens

- Development of better analytical quality control and standardized monitoring methods

- Development of public awareness programs

- Development of feasible methods for altering the amounts and types of materials reaching the ocean in excess of the capacity of the ocean to assimilate those materials

- Monitoring existing ocean disposal sites according to requirements of EPA criteria.

Research and development needs, are opposed to monitoring, were not clearly distinguished, which may tacitly reflect the close intertwining of these activities.

The Panel concurred on the need for widely divergent constituencies to participate in long-range planning, both in its inception and on a continuing basis.

Mineral resources

The Panel discussed a wide range of mineral resource extraction activities in order to define the scope of their considerations. Although they identified a variety of minerals whose extraction processes will be likely to induce ocean pollution, because of the composition of the group and the overall importance of the activities at present, the discussion focused primarily on information needs for OCS oil and gas and deep seabed mining. Some limited discussion of sand and gravel mining was also included.

The Panel identified Federal agencies and other organizations involved in the decision making process and described the uses and needs of these groups for ocean pollution related information. It noted that a great deal of information already exists in various reports and provided a listing of the more important references.

Primary emphasis was placed on generating a list of information needs and ranking the needs according to importance. The Panel did not feel it was qualified to address relative priorities among the mineral areas, and evaluated priorities within each mineral area only.

Highest priorities for oil and gas extraction were identified as:

- Research and development related to catastrophic oil spills and blowouts, particularly in the arctic;

- Determination of effects of long term, low level, chronic pollution resulting from spills, production and operational discharges and development of predictive models;

- Development of bioassay techniques for on-site monitoring.

Highest priorities for deep seabed mining were identified as:

- Determination of the fate and effects of surface discharged sediments;

- Evaluation of the necessity for shunting discharges below the euphotic zone.

Additional issues were categorized for sand and gravel mining, desalination and salt dome extraction.

Mr. WALSH. These proceedings are now being given extensive review and they are forming the basis, in many ways, for the plan material that we are now developing.

Our schedule calls for submission of the final version of the first comprehensive plan on May 15. However, we will have, as I mentioned, a draft available at the end of this month, and it will go through the review process between March and when it is finally submitted.

Mr. Chairman, the act in section 5 also directs the Administrator of NOAA to establish a comprehensive program within NOAA to address questions of ocean pollution research, development, and monitoring. In the past NOAA also did not have a single focal point for this kind of research.

We have moved to create this program under the direction of Dr. Ferris Webster, NOAA's Assistant Administrator for Research and Development.

The NOAA program is to include projects and activities that relate to ocean pollution research and development, whether they are conducted under provisions of any other law, under this law, or are supported by section 6 of the act.

An Office of Marine Pollution Assessment has been proposed to coordinate the NOAA program. And Larry Swanson, who is with me this morning, is slated to be the head of that office. It will also be primarily responsible for administering the financial provisions of Public Law 95-273. The financial assistance is intended to be made available under the act as we identify gaps in our existing program, and these funds are to be made available to Federal and State agencies, universities, and other private sector organizations so that studies can go on in areas of significant gaps.

Policy guidance concerning the distribution of the funds by NOAA will be given by the 5-year plan and the priorities set forth therein.

The NOAA program presently involves projects and activities conducted by the National Marine Fisheries Services, the sea grant program, the Environmental Research Laboratories, the marine ecosystems analysis program, the National Ocean Survey, and the Environmental Data and Information Service. Nearly every one of the organizations within NOAA does some kind of activity relating to ocean pollution research and monitoring.

According to the preliminary results of the inventory that we have done, NOAA's base funding for marine pollution-related research and development and monitoring totalled \$17.5 million in fiscal year 1978. This figure represents only the actual activities included within the narrow limitations that we have determined in the interagency committee to be marine pollution projects covered by the act. It does not represent other budget line items, or many general marine research-related activities within NOAA.

While a similar inventory has not been prepared for fiscal year 1979 or 1980 as yet, significant increases have been approved or are pending in NOAA's National Marine Fisheries Service, sea grant, Marine Pollution Assessment Office, National Ocean Survey and Environmental Research Laboratories budgets. NOAA also manages marine pollution research programs funded by other agencies, such as the Outer Continental Shelf environmental assessment program in Alaska, funded by the Department of the Interior, and a project to determine the effects on the marine environment of disposing brine wastes from the strategic petroleum reserve, funded by the Department of Energy.

The administration requests that Public Law 95-273 be reauthorized through fiscal year 1983. The act presently authorizes appropriations not to exceed \$5 million for fiscal year 1979. Because the first 5-year plan will not be completed until May 1979, NOAA will not request any appropriations for fiscal year 1979. However, the President's budget for fiscal year 1980 requests an appropriation to NOAA of \$4.3 million to carry out the act. It is intended that approximately \$100,000 of this be expended on administrative expenses, essentially related to the interagency effort; \$450,000 on

development and implementation of data and management information systems; and the remaining \$3.75 million to be available to fund priority research, development and monitoring needs not presently being addressed.

Accordingly, we are requesting legislation to establish authorization for fiscal year 1980 of \$4.3 million under the act. The specific projects to be funded in fiscal year 1980, of course, have not been identified, as the first 5-year plan is not completed.

However, we do have some idea of where we think we need to spend the money. As examples of project categories, we have included: (1) environmental characterization, (2) effects of man-induced and natural changes to the marine environment, (3) ecosystem process-dynamics and fates of pollutants, (4) prediction and modeling, (5) monitoring, and (6) technology development. Policy decisions on areas of emphasis will be addressed by the interagency committee immediately upon completion of the first plan. As I mentioned, Mr. Chairman, the period addressed by the first comprehensive 5-year plan is fiscal year 1979 through fiscal year 1983. It is not possible to estimate our out-year or ensuing requirements for these fiscal years in detail in advance of the first plan.

On this basis, we are requesting that the act be authorized for fiscal year 1981 through 1983 at a level of "such sums as will be necessary." Coupled with the fiscal year 1980 authorization level of \$4.3 million, this will make the authorization period consistent with the period covered by the first 5-year plan. Of course, we will submit detailed information about how we spend the money in each fiscal year as we identify the priorities and our budgets are submitted.

In summary, let me say, Mr. Chairman, that we have been working quite hard, and despite the short existence of the act—less than a year now—Public Law 95-273 has proved to be an effective device for enabling the Federal Government to manage better its ocean pollution research programs. We are seeking to identify and remove duplication and overlap. We are also striving to find and hopefully, fill the gaps in our program. More importantly, I think we now have a more rational process for debating our priorities, since we cannot address every ocean pollution question at once.

Mr. Chairman, that concludes my prepared statement, and I am ready to try and answer any questions you may have.

Mr. STUDDS. Thank you very much. For the record, would you formally identify your two associates.

Mr. WALSH. Larry Swanson, who is with the Office of Research and Development, and Joe Angelovic, who is also with the Office of Research and Development in NOAA.

Mr. STUDDS. Thank you. I neglected at the beginning to invite the ranking minority member to make his usual eloquent and lengthy statement. I will atone for that error by recognizing Mr. Pritchard first.

Mr. PRITCHARD. I was shocked at the oversight. [Laughter.]

It's nice to see Mr. Walsh here before us again. I am sort of appalled at the complexities of one small part of our Federal Government, and the incredible interrelation between so many sectors of Government, when we get into this business of ocean pollution and all. And I guess I am worried about the timeframe and how

fast you can really react to the major problems of coordination which we have.

You say you have a 5-year plan coming up?

Mr. WALSH. Yes.

Mr. PRITCHARD. And that will be in May?

Mr. WALSH. It will be in May that we will have the plan. Of course, it is to be updated periodically, as we discover more information. We are going to try to have a fairly comprehensive 5-year plan, but I think the first one one should expect is not going to be as good as the second.

As to the complexity you mentioned, what has occurred in the Federal Government, particularly in the oceans area, is that there are a number of agencies which have specific functional missions, and it is the policy of the Federal Government, primarily through the Office of Management and Budget, that the agency with the primary function is to do their so-called function- or mission-related research.

So when the Department of Energy has an activity—for example, permitting nuclear floating powerplants, they do research on the effects of the floating nuclear powerplants on the ocean. If you are the agency such as the Department of the Interior and you are to lease the OCS, you are to do the research and to do the supporting mission-related activities related to leasing the Outer Continental Shelf.

Already you see that there are two oceanography programs going up right there. And what we have discovered is that it is useful for those to talk to each other, because they may be in some way developing expertise or capability or conducting programs that could be shared or somehow jointly planned, such that economies could result.

NOAA also has similar programs. We worry about the effects of pollutants on fish; EPA worries about water quality, and they also have an obligation to conduct supporting programs.

So that's one of the reasons why there is a possibility, I think, to achieve some economies with coordinated planning, so that we are looking at common problems, we are not duplicating ourselves unnecessarily.

Mr. PRITCHARD. Well, at least you will have some shared data that you make available even if you are unable to achieve the economies at this time.

Mr. WALSH. That's also been a problem. Research programs have generally squeezed each and every penny they could out for research, and not a lot has been left over to write up the material and make it available. And some of the data, of course, is stored in different places. There are people conducting programs right now that other people who might be interested in doing the same kind of research could share that data—they don't even know about the program.

Presently there is not one single up-to-date information system that tells you everything that is going on in the Federal Government in this area and who's doing it. We are striving to get that kind of a system, if we can. Different pieces are here and there, but someone may be out doing a research program on something you want to do in your agency and it may be in another agency. And

you don't know that now. And, of course, ship time and research-platform time is extremely expensive. You could have piggy-backed if you had known.

We are trying to sort that problem out.

Mr. PRITCHARD. You think you will make some progress?

Mr. WALSH. Starting from zero we have got a good chance. It's not totally zero—there are well-known networks in terms of kinds of research. For example, EPA people are doing pesticide effects research on fish—they are required to by law. We do some of that as well. We coordinate well within the scientific realm, and they tend to know more or less what's going on. Not always often, however, do the managers up the line who are making budget decisions know how well integrated it is.

But I think we will make some progress.

Mr. PRITCHARD. Your budget—this has all been approved by OMB?

Mr. WALSH. Our budget submission and the testimony today have been approved by OMB.

Mr. PRITCHARD. No further questions.

Mr. STUDDS. I want desperately to believe your optimism when you say, at the end, that the law in its short time has proved an effective device to enable the Government to better manage its ocean pollution research programs, to identify and remove duplication and overlap.

And I trust your judgment enough not to be totally despairing.

But, as you know, the cynic could look at what we in the Congress have done here, or what you are doing, and say, here we have taken an already Byzantine Federal bureaucracy and added another layer, with an even longer name. You are operating under the Federal Coordinating Council for Science, Engineering, and Technology; you are the Interagency Committee on Ocean Pollution Research and Development and Monitoring—and 11 agencies and departments comprise that committee, is that right?

For the record, could you tell us what they are, as we hold our breath?

Mr. WALSH. Yes, I can. As a matter of fact, I will submit for the record a copy of the charter. I have the names in there, but I didn't want to read them all off in my statement.

[The material follows:]

INTERAGENCY COMMITTEE ON
OCEAN POLLUTION RESEARCH AND DEVELOPMENT AND MONITORING

RepresentativeDEPARTMENT OF INTERIOR

Dr. H. William Menard (Phone 860-7411)
Director, U.S. Geological Survey
101 National Center
12201 Sunrise Valley Drive
Reston, Virginia 22092

ENVIRONMENTAL PROTECTION AGENCY

Dr. Stephen Gage (Phone 755-2600)
Assistant Administrator for
Research and Development
(RD 672)
401 M Street, S.W.
Washington, D.C. 20460

DEPARTMENT OF DEFENSE

Dr. Ruth M. Davis (Phone 695-5036)
Deputy Under Secretary of Defense
for Research and Engineering
(Research & Advanced Technology)
Pentagon, Room 3E114
Washington, D.C. 20301

COAST GUARD

Rear Admiral A.P. Manning, Jr. (Phone 426-1010)
Chief, Office of Research and
Development
U.S. Coast Guard
Headquarters (GD/TP53)
Washington, D.C. 20590

DEPARTMENT OF COMMERCE

Dr. Ferris Webster (Phone 443-8202)
Assistant Administrator for Research
and Development, NOAA
WSC-5, Rm. 825, 6010 Executive Boulevard
Rockville, Maryland 20852

DEPARTMENT OF ENERGY

Dr. Helen M. McCammon (Phone 353-5549)
Senior Oceanographer
Environmental Programs
Division of Biomedical & Environmental Research
Department of Energy
Washington, D.C. 20545

Alternate

Richard B. Krah (Phone 860-7531)
Chief, Branch of Marine Oil and
Gas Operations
Conservation Division
U.S. Geological Survey
(Same address)

Dr. David Flemer (Phone 426-2317)
Director, Ecological Effects Division
(RD 683)
(Same address)

Col. E. W. Friday (Phone 695-9759)
Military Assistant for Environmental
Sciences
Office of the Under Secretary for
Research and Engineering
Pentagon, Room 3D129
Washington, D.C. 20301

Captain F.P. Schubert (Phone 426-2000)
Deputy Chief
Marine & Environment & Systems
U.S. Coast Guard
Headquarters (GW/73)
Washington, D.C. 20590

Sam Bleicher (Phone 254-3375)
Director, Office of Ocean Management
NOAA, Page 1, Room 200
2001 Wisconsin Avenue, NW
Washington, D.C. 20235

Dr. Arnold Joseph (Phone 353-3045)
Division of Biomedical & Environmental
Research
Department of Energy
Washington, D.C. 20545

Representative

COUNCIL ON ENVIRONMENTAL QUALITY
 Edward Strohbehn (Phone 633-7034)
 Executive Director
 722 Jackson Place, N.W.
 Washington, D.C. 20006

NATIONAL SCIENCE FOUNDATION
 Dr. John Slaughter (Phone 632-7300)
 Assistant Director for Astronomical,
 Atmospheric, Earth and Ocean Sciences
 National Science Foundation
 Washington, D.C. 20550

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 Dr. William P. Raney (Phone 755-4826)
 Chief Engineer
 Office of Space and Terrestrial Applications
 NASA Headquarters, Code E-1
 Washington, D.C. 20546

HEALTH, EDUCATION AND WELFARE
 Dr. Julius B. Richmond (Phone 245-7694)
 Assistant Secretary for Health
 Dept. of Health, Education and Welfare
 200 Independence Avenue, S.W.
 Washington, D.C. 20201

DEPARTMENT OF AGRICULTURE
 Mr. Glen Loomis (Phone 447-3853)
 Coordinator for Land, Air, Water and
 Solid Waste
 Office of the Secretary
 Washington, D.C. 20250

OFFICE OF MANAGEMENT & BUDGET

Alternate

Dr. John D. Buffington (Phone 633-7107)
 Acting Senior Staff Member for
 Environmental Data and Monitoring
 722 Jackson Place, N.W.
 Washington, D.C. 20006

Dr. Dirk Frankenberg (Phone 632-5913)
 Director, Division of Ocean Sciences
 National Science Foundation
 Washington, D.C. 20550

Dr. Lawrence R. Greenwood (Phone 755-8620)
 Director, Environmental Observation Division
 Office of Space and Terrestrial Applications
 NASA Headquarters, Code EB-8
 Washington, D.C. 20546

Dr. Lowell T. Harmison (Phone 443-2650)
 Science Advisor
 Office of Health Policy, Research and
 Statistics
 Room 17A55, Parklawn Building
 5600 Fishers Lane
 Rockville, Maryland 20857

Alternate to be designated.

SUBCOMMITTEE ON MONITORINGCHAIRMAN

Dr. Ferris Webster (301-443-8202)
 Assistant Administrator for Research
 and Development
 National Oceanic and Atmospheric
 Administration
 WSC05, Room 825
 6010 Executive Boulevard
 Rockville, Maryland 20852

Members

William Van Horn (202-343-6264)
 Bureau of Land Management
 Department of the Interior
 Washington, D.C. 20240

Paul Leftcourt (202-426-9454)
 Environmental Protection Agency
 (RD 681)
 401 M Street, S.W.
 Washington, D.C. 20460

Edward Johnson (202-697-3689)
 U.S. Navy/OP 453
 Room BD-766
 The Pentagon
 Washington, D.C. 20301

Lt. G. Voyik (202-755-7938)
 U.S. Coast Guard
 Department of Transportation
 400 7th Street, S.W.
 Washington, D.C. 20590

Members

Alexander Malahoff (301-443-8720)
 National Oceanic and Atmospheric
 Administration
 WSC-1, Room 1015
 6001 Executive Boulevard
 Rockville, Maryland 20852

Herb Volchok (212-660-3607)
 Environmental Measurement Laboratory
 Department of Energy
 376 Hudson Street
 New York, N.Y. 10014

John Buffington (202-633-7107)
 Acting Senior Staff Member for
 Environmental Data and Monitoring
 Council on Environmental Quality
 722 Jackson Place, N.W.
 Washington, D.C. 20006

Roger Baier (202-632-7356)
 National Science Foundation
 Washington, D.C. 20550

Howard J. Curfman, Jr. (FTS 8-928-2717)
 Langley Research Center
 National Aeronautics and Space
 Administration
 MAIL STOP 422
 Hampton, Virginia 23665

Linda Anderson (FTS 8-236-7761)
 Biologist, Program Development Branch
 Environmental Health Service Division
 Department of Health, Education & Welfare
 CDC, Room 507
 255 E. Paces Ferry Road, N.E.
 Atlanta, Georgia 30305

No Members Named

Department of Agriculture
 Office of Management and Budget

Ex Officio Member

James P. Walsh (202-377-3436)
 Deputy Administrator
 National Oceanic and Atmospheric
 Administration
 Department of Commerce, Room 5802
 14th & Constitution Avenue, N.W.
 Washington, D.C. 20230

National Response Team Contact

Dick Hess (202-426-9568)
 Coast Guard Liaison
 Marine Environmental Protection
 Division (G-MEP-4/73)
 Washington, D.C. 20590

SUBCOMMITTEE ON MONITORING

The duties of the Subcommittee on Monitoring grow out of section 4(b)(2)(B) and section 4(b)(3)(A) of P.L. 95-273. Working from the inventory now being conducted to identify all existing Federal monitoring programs and facilities related to ocean pollution, the subcommittee should assess how these programs and facilities address the national needs and problems which have been identified and ranked by the full committee. This priority ranking of national needs for monitoring related to ocean pollution should be developed by the full committee by early November.

The subcommittee should determine if redundant monitoring programs exist, where coordination could improve the results or usefulness of programs, and what additional monitoring efforts are needed.

It should make specific recommendations for changes in the overall Federal effort in order to ensure that the national needs are adequately met during the plan period. Such recommendations may include, but need not be limited to, changes in the goals of various programs, increases or decreases in funding for existing programs, proposals for interagency cooperation in specific instances, and legislation to establish new programs.

If new monitoring programs are recommended, the subcommittee should also suggest specific objectives for the programs, determine what level of effort and time are required to produce useful results, and estimate resources required to conduct the programs.

The subcommittee should coordinate closely with the research and development subcommittee to insure that work is not duplicative. It should also coordinate, as needed, with the subcommittee on national needs to insure mutual understanding of the needs and problems and to determine that monitoring programs meet those needs. The subcommittee also ought to coordinate, as possible, with the National Response Team (NRT) created by the National Oil and Hazardous Substance Contingency Plan in order to avoid duplicating efforts which have already been made to coordinate monitoring programs which support certain operational mandates.

SUBCOMMITTEE ON NATIONAL NEEDS AND PROBLEMSCHAIRMAN

Dr. Stephen Gage (202-755-2600)
 Assistant Administrator for
 Research and Development (RD 672)
 Environmental Protection Agency
 401 M Street, SW
 Washington, D.C. 20460

Members

Sieling Chiang (703-860-6188)
 Conservation Division (630)
 U.S. Geological Survey
 Department of the Interior
 12201 Sunrise Valley Drive
 Reston, Va. 22092

Jan Frager (202-755-9211)
 Director of Technical Assistance
 Environmental Research Laboratory
 Environmental Protection Agency
 Narragansett, R.I. 02882

Lt. Cdr. Wayne Becker (202-426-1023)
 Environmental Technology Branch
 Operations and Environmental
 Technology Division
 Office of Research and Development
 Commandant (G-DOE-1/TF54) USOC
 Washington, D.C. 20590

Members

Dail W. Brown (202-254-3375)
 Associate Director
 Critical Area Planning and Analysis
 National Oceanic and Atmospheric
 Administration
 Page I, Room 280
 2001 Wisconsin Avenue
 Washington, D.C. 20235

Jeff Swinebroad (202-353-4208)
 Biomedical and Environmental
 Research Division
 Office of Environment (F-2040TN)
 Department of Energy
 Washington, D.C. 20585

David Burmaster (202-633-7101)
 Council on Environmental Quality
 722 Jackson Place
 Washington, D.C. 20006

James L. Mueller (301-982-2895)
 Goddard Space Flight Center (913)
 National Aeronautics and
 Space Administration
 Greenbelt, Md. 20771

Philip Janus (301-443-2670)
 Office of Health Policy Research
 and Statistics
 Department of Health, Education
 and Welfare
 Room 17A55, Parklawn Building
 5600 Fishers Lane
 Rockville, Md. 20857

No Members Named

Department of Defense
 National Science Foundation
 Department of Agriculture
 Office of Management and Budget

Ex Officio Member

James P. Walsh (202-377-3436)
 Deputy Administrator
 National Oceanic and
 Atmospheric Administration
 5802 Main Commerce Building
 14th and Constitution Streets
 Washington, D.C. 20230

National Response Team Contact

Dick Hess (202-426-9568)
 Coast Guard Liaison
 Marine Environmental Protection
 Division (G-MEP-4/73)
 Washington, D.C. 20590

SUBCOMMITTEE ON NATIONAL NEEDS AND PRIORITIES

The tasks of the Subcommittee on National Needs and Priorities grow out of section 4(b)(1)(A) of P.L. 95-273. The subcommittee should identify those national needs and problems, which relate to specific aspects of ocean pollution (including, but not limited to, the effects of ocean pollution on the economic, social, and environmental values of ocean and coastal resources), which exist and will arise during the plan period.

In view of the short time frame for preparation of the first 5-year plan, the subcommittee should concentrate initially on (1) identifying existing legislative mandates for ocean pollution research and development and monitoring; (2) identifying the needs of program offices and mission agencies involved in ocean use, regulation or environmental protection; and (3) identifying what information is needed to enforce regulations, set standards and criteria, support operational mandates, and make decisions about future uses of the ocean and its resources. To the extent possible, the subcommittee should also determine the economic, social and environmental value of ocean and coastal resources; how these resources are affected by ocean pollution; and what information is needed to make decisions regarding protection of these resources.

The subcommittee should also assess the adequacy of existing information for decision-making purposes and estimate the value and cost of additional information that might be produced through research, development and monitoring.

Finally, the subcommittee ought to coordinate, as possible, with the National Response Team (NRT) created by the National Oil and Hazardous Substance Contingency Plan, and any similar units in order to identify properly the needs of such operational programs.

SUBCOMMITTEE ON RESEARCH AND DEVELOPMENT

CHAIRMAN

Dr. John Slaughter (202-632-7300)
Assistant Director for Astronomical
Atmospheric, Earth and Ocean Sciences
National Science Foundation
Washington, D.C. 20550

Members

Robert Roland (703-860-7241)
U.S. Geological Survey
Geologic Division (915)
Department of the Interior
12201 Sunrise Valley Drive
Reston, Virginia 22092

David Flemer (202-426-2317)
Director, Ecological Effects Division
(RD 683)
Environmental Protection Agency
401 M Street, N.W.
Washington, D.C. 20460

Col E.W. Friday (202-695-9759)
Military Assistant for Environmental
Sciences

Office of the Under Secretary for
Research and Engineering
Department of Defense
Pentagon, Room 3D129
Washington, D.C. 20301

Members

D. Birkimer (203-445-8501)
Research and Development Center
U.S. Coast Guard
Avery Point
Groton, Connecticut 06340

Robert F. Scott (202-634-7469)
Office of Fisheries
National Oceanic & Atmospheric
Administration, Page Building 2
33000 Whitehaven Street, N.I.
Washington, D.C. 20235

Helen McCammon (202-353-5549)
Senior Oceanographer
Environmental Programs
Division of Biomedical and
Environmental Research
Department of Energy
Washington, D.C. 20545

Neil Anderson (202-632-4212)
National Science Foundation
Washington, D.C. 20550

Frank S. Lisella (FTS 8-236-7761)
Chief, Program Development Branch
Environmental Health Service Division
Department of Health, Education & Welfare
CDC, Room 507
255 E. Paces Ferry Road, N.E.
Atlanta, Georgia 30305

No Members Named

Council on Environmental Quality
National Aeronautics and Space
Administration
Department of Agriculture
Office of Management and Budget

Ex Officio Member

James P. Walsh (202-377-3436)
Deputy Administrator
National Oceanic and Atmospheric
Administration
Department of Commerce, Room 5802
14th & Constitution Avenue, N.W.
Washington, D.C. 20230

National Response Team Contact

Dick Hess (202-426-9568)
Coast Guard Liaison
Marine Environmental Protection
Division (G-WEP-4/73)
Washington, D.C. 20590

SUBCOMMITTEE ON RESEARCH AND DEVELOPMENT

The duties of the Subcommittee on Research and Development grow out of Section 4 (b)(2)(B) and Section 4 (b)(3)(A) of P.L. 95-273. Working from the inventory now being conducted to identify all existing Federal research programs and facilities related to ocean pollution, the subcommittee should assess how these programs and facilities address the national needs and problems which have been identified and ranked by the full committee. This priority ranking of national needs for ocean pollution research and development should be developed by the full committee by early November.

The subcommittee should determine if redundant research and development programs exist, where coordination could improve the results or usefulness of programs, and what additional programs may be necessary.

It should make specific recommendations for changes in the overall Federal effort in order to ensure that the national needs are adequately met during the plan period. Such recommendations may include but need not be limited to, changes in the goals of various programs increases or decreases in funding for existing programs, proposals for interagency cooperation in specific instances, and legislation to establish new programs.

If new research and development programs are recommended, the subcommittee should also determine the feasibility of accomplishing the research and development objectives, determine the time required to produce useful results, and estimate resources required to conduct the program.

The subcommittee should coordinate closely with the monitoring subcommittee to insure that work is not duplicative. It should also coordinate, as needed, with the subcommittee on national needs to insure mutual understanding of the needs and problems and to determine that research programs meet those needs. The subcommittee also ought to coordinate, as possible, with the National Response Team (NRT) created by the National Oil and Hazardous Substance Contingency Plan in order to avoid duplicating efforts which have already been made to coordinate research and development programs which support certain operational mandates.

SUBCOMMITTEE ON DATA COLLECTION, STORAGE AND DISTRIBUTION

CHAIRMAN

Dr. H. William Menard (703-860-7411)
 Director, U.S. Geological Survey
 101 National Center
 12201 Sunrise Valley Drive
 Reston, Virginia 22092

Members

James R. Balsley (703-860-7488)
 U. S. Geological Survey (104)
 101 National Center
 12201 Sunrise Valley Drive
 Reston, Virginia 22092

Sam Williams (202-426-2317)
 (RD-683)
 Environmental Protection Agency
 401 M Street, S.W.
 Washington, D.C. 20460

Kent H. Hughes (202-443-8731)
 National Oceanic and Atmospheric
 Administration
 Page Building 2, Room 555
 Wisconsin Avenue & White Haven Street, NW
 Washington, D.C. 20235

Susan Rose (202-353-3225)
 Environmental Programs
 Division of Biomedical & Environmental
 Research
 Department of Energy
 Washington, D.C. 20545

Members

John Ficke (202-633-7107)
 Council on Environmental Quality
 722 Jackson Place, N.W.
 Washington, D.C. 20006

 Henry Kissman (301-496-3147)
 National Library of Medicine
 Room C-6B
 National Institutes of Health
 Bethesda, Maryland 20014

No Members Named

Department of Defense
 Department of Transportation
 National Science Foundation
 National Aeronautics and Space
 Administration
 Department of Agriculture
 Office of Management and Budget

Ex Officio Member

James P. Walsh (202-377-3436)
 Deputy Administrator
 National Oceanic and Atmospheric
 Administration
 Department of Commerce, Room 5802
 14th & Constitution Avenue, N.W.
 Washington, D.C. 20230

National Response Team Contact

Dick Hess (202-426-9568)
 Coast Guard Liaison
 Marine Environmental Protection
 Division (G-WEP-4/73)
 Washington, D.C. 20590

SUBCOMMITTEE ON DATA COLLECTION,
STORAGE AND DISTRIBUTION

The tasks of the Subcommittee on Data Collection, Storage and Distribution grow out of section 8 of P.L. 95-273. Using information gathered during the research facilities inventory and such other information as is needed, the subcommittee should describe the Federal capability to collect, store and distribute results, findings, and information generated by ocean pollution research, development and monitoring programs.

The subcommittee should assess the adequacy of the existing Federal capability to implement the intent of section 8 and make recommendations for improving that capability. The subcommittee should coordinate with all three other subcommittees, and as possible with the National Response Team created by the National Oil and Hazardous Substance Contingency Plan, in order to determine what information should be available, in what form it is most useful, and to whom it should be available.

Initially, the subcommittee should concentrate on determining what data systems exist, what form and information in those systems takes, and how to access those systems for specific types of information. It should also address the feasibility of establishing a centralized source of information about existing systems so that an agency or person who needs to know what research is underway in a specific area can contact one office which will be able to directly or indirectly access all systems.

In the long term, the subcommittee should address the need for a coordinated data management system containing information generated by the national 5-year plan for ocean pollution research and development and monitoring.

Mr. STUDDS. We are rested now; I think we can take it.

Mr. WALSH. The Department of Agriculture, the Department of Commerce (NOAA), the Department of Defense (both the Navy and the Army Corps of Engineers), the Department of Health, Education, and Welfare, the Department of Interior, the Department of Transportation, the Department of Energy, the Environmental Protection Agency, NASA, the National Science Foundation, and then the White House offices of the Council on Environmental Quality and the Office of Management and Budget.

Mr. STUDDS. Which component of HEW is involved?

Mr. WALSH. I believe that most of that is related to the health effects of seafood, and that probably is in the National Institute of Health; the FDA does some, the National Institute of Health does some.

Mr. STUDDS. It's an awesome task you have been charged with.

Mr. WALSH. Well, this is a good capsule listing of the agencies that have activities somehow relating to the ocean, and this is one area in which we can get better coordination.

Mr. STUDDS. Well, clearly it's needed, but I want to know how strongly you feel that tone of optimism. You've been around long enough in the city to know the temptation of the Congress is simply to throw another level into the bureaucracy and say we have coordinated something.

Mr. WALSH. I do not believe that what we have you would call another layer—there is really a need for the Federal Government to find ways of coordinating these activities, and unfortunately we have to resort to the hackneyed interagency committee.

But these can be extremely useful, if they are participated in by higher level policymaking people who have the power to commit resources and individuals to getting something done and if there is a problem, a singular problem such as this, as required by the act—otherwise, they do tend to be debating sessions as opposed to acting sessions.

We have attempted in our effort here to make it an action organization that is really intimately involved in putting together a common plan to get a consensus.

Mr. STUDDS. No one would support that more strongly than I. I remember very clearly in the months after the *Argo Merchant* incident a couple of years ago, this committee had a hearing on Cape Cod where we attempted to determine which Federal agencies were responsible for assessing the damage on George's Bank—and some of you who are nodding are probably familiar with that—and who was responsible for monitoring the long-term effects. And, to my astonishment, we found the most remarkable bunch of Federal scrambled eggs I have ever seen in my life. We had agencies in there claiming they were; the next witness would claim oh, no, no, we are; we had the EPA and the Interior fighting each other about who was responsible—neither was doing anything, of course. And the long-range studies and monitoring were not done, at least as far as I know—and certainly were not actually funded.

And it was not at all clear.

So the need for what you are charged with doing is enormous. I assume that when you talked about monitoring, or when the act talked about monitoring, it means just that—monitoring the

long-term over-time effects of a pollution incident, is that what is meant by that?

Mr. WALSH. Generally I think that is the definition. I guess that one of the best examples is one that is set forth in the—mentioned in the statement by Ed Goldberg in the overview to the scientific input.

Ed Goldberg has been involved in establishing something called a mussel watch program. This is simply a certain kind of mussel that is located in coastal areas. And what they do is at various stations, they take the mussel, they dissect it, and they determine what kind of pollutants have accumulated within that mussel.

And by observing certain stations over time throughout the country they can get a profile, by looking at the mussel as to things like cadmium—where is cadmium found—for example, they can do a very good profile right now of Narragansett Bay showing the mussel, where concentrations of certain pollutants are, and how they move down the bay in terms of intensity as they are picked up by the mussel. Now, this mussel watch program is an example of a kind of monitoring system that we are thinking about.

Mr. STUDDS. I appreciate that. Incidentally, do any of you here know whether or not long-range studies are being done? It is my understanding in the *Argo Merchant* incident that the scientists at the time had identified oil on micro-organisms, and at the time when we asked whether anybody was going to be able to monitor that over time, the answer was we don't think so, we don't think there are any funds

To your knowledge, is anybody monitoring that massive spill and its effects on the marine environment?

Mr. WALSH. In terms of the long-range effects, very little, I think.

MARINE RESOURCE MONITORING AND PREDICTION

Dr. ANGELOVIC. One of our (MARMAP) stations takes periodic samples of fish stocks out there and looks at them.

Mr. WALSH. We do have part of our marine resources assessment program, Congressman, that monitors certain stations in that area, and I am informed that we do pick up samples there as best we can.

But in terms of any kind of planned attempt, there are efforts—NOAA, as you know, was heavily involved in that. We expended a little over a million dollars, I believe, at the time to do a lot of short term analysis of the effects.

Mr. STUDDS. As I recall, your requests for funds for long-term studies were declined by OMB.

Mr. WALSH. We asked for additional funds—and, of course, looking at this kind of problem is the kind of thing we are going to look at in how we spend this money now. We never had the ability to follow up.

In fact, the impetus behind much of this legislation, as you remember, was the *Argo Merchant* situation where the agencies did show up. Since that time we have done, I think, a better job at sorting it out. We have now added a new aspect to the Coast Guard response team that goes on scene, a scientific team. And for marine incidents NOAA has been designated as the lead scientific coordi-

nator, so that our agency, whenever there is an oilspill, will now send a team to the site to coordinate the scientific activities to assess the short-term effects—at least the short term. In terms of the long term, again, that's more funds.

But we do now have a better coordinated method. We tried that out recently down in Puerto Rico with the tanker incident and it worked fairly well. We are beginning to sort that out.

Mr. STUDDS. I have exceeded my time, but let me just ask one thing in final pursuit of this. We do not now have any such long-term over-time study going on with respect to the *Argo*, and presumably we are not prepared to do so in the event of another similar incident anywhere else off our coasts.

Would that be the kind of a gap that you refer to in here that you would envision as your responsibility to see filled under this act?

Mr. WALSH. Yes, that's generally the kind of gap. We would, of course, make some kind of a priority decision about an *Argo Merchant* type of incident, or a kepone type of incident, which one is most threatening and therefore which one is of priority.

Kepone, as you know, is another unbelievable incident, where we have all that stuff now in the bottom of the James River, and the next big storm that comes along or the next big incident, all that stuff comes up and, of course, it is a synthetic organic and quite harmful.

Mr. STUDDS. Let me cut myself off; I'm over time. We are going to be very informal here, but I am going to attempt to recognize members in order of their seniority on the subcommittee and arrival. I think Mr. Lowry.

Mr. LOWRY. You allow me an opportunity to show my ignorance.

Mr. STUDDS. That's the purpose of the hearing, as you will soon discover.

Mr. LOWRY. Could it be part of this charge of the legislation to the coordinating committee to identify areas so that some of these duplicative agency functions could actually be eliminated? In other words, of these 11 different agencies in which various research is going on, could it be part of the charge of this authorization to identify where actually some of that could be eliminated?

Mr. WALSH. Well, I think what we are trying to do is to coordinate and make the most efficient use of our resources available. In terms of eliminating our existing program, or cutting it down, to some extent that might occur. But I think that in this area, we have to accept the fact that we know very, very little about the ocean.

If someone, for example, would ask us, as we have been asked, what is the effect of an oilspill on endangered whales that might be found in an area, and our answer would be we don't know. However, by law, if the whales were shown to be at risk by a refinery, for example, we would have to tell that refinery it could not construct there.

If we did know one way or the other, we might be in a better shape. The difficulty is in many situations, particularly under existing laws, such as the Endangered Species Act and the Marine Mammal Protection Act, if you don't know possible effects you can't allow actions to proceed.

What we are hoping to do is make sure that we know as much as we can under the circumstances. Therefore I think that this program right now, perhaps if anything, needs to be a bit larger to address the kinds of problems we are meeting in the ocean. We don't know very much about the ocean and what happens there.

But things might happen. For example, if it is believed that you can't dump municipal waste in the ocean, it will cost this Government \$10 billion to construct the necessary treatment facilities.

Now, it seems to us that a bit of research on the effects of municipal waste dumped in the ocean is probably money well spent in comparison to a \$10 billion investment in secondary treatment facilities.

Mr. LOWRY. But the function we are talking about here, though, is coordination. If the argument is to be made for research, well, of course, that argument should always be there.

But I kind of thought the function we are talking about here was the coordination between all of these different agencies within the Federal Government that address this. And if we are going to have efficiency, if we are going to use the word "efficiencies" as to the intent of this act for coordination, well, how are you going to have efficiencies and continue 11 different agencies all performing duplicative like functions?

Mr. WALSH. Well, that becomes a function of how you want to organize Government. Do you wish to organize it along the lines of doing research, or do you wish to organize it along the lines, for example, of getting oil and gas out or cutting timber? If you decide that you want to organize it as we have decided, around getting timber, then anything related to getting timber out, including pollution events, should be understood by those people that get the timber out.

If you try to organize it around the science, I think you could get a real tendency to have the science going in one direction and the activities like cutting timber going in the other direction.

You have raised, I think, a very significant reorganization question, and I can only tell you that's the way we are organized. What we try to do is work within that organization to make people use the resources they have.

Mr. LOWRY. Well, my only question—my time is up—is within the authorization of these dollars, could that be a charge of your function under this act?

Mr. WALSH. Reorganization?

Mr. LOWRY. Well, to identify places where efficiencies could be made, achieved.

Mr. WALSH. I sort of doubt it, Mr. Lowry, since there is already a major reorganization project in the Federal Government in the Office of Management and Budget. Before President Carter came, we did not have a President's reorganization project—and the budget function dominated the management function; we now have a much stronger management reorganization function.

Mr. LOWRY. Thank you.

Mr. STUDDS. Mr. Forsythe?

Mr. FORSYTHE. Thank you, Mr. Chairman. I think this is a very important effort. For instance, I would hope you have included

plans to make sure that all Federal, State, and private data is in some way coordinated and made available.

Mr. WALSH. Well, we are going to begin first with the Federal Government's data before we get to the other. We accumulate an enormous amount of data. It can overwhelm you very quickly.

We are starting just with the Federal program.

Mr. FORSYTHE. But clearly there is also going to be a vast amount of it also within those other two areas that are essential if you are really going to know where you are going down this road, and you are going to be duplicating data if you don't find a way to get this in.

Mr. WALSH. Well, that's true. For example, every time someone files a permit to get a national pollution discharge permit from EPA, they file an application. Within that application is a certain amount of data about the kinds of pollutants that they discharge.

At the present time it's extremely difficult to get all that data out of those printed applications and into a system so that we can sit down and say overall what is everybody doing here. We don't have a system for that—or making that information, for example, available to researchers. The researchers tend to have to go and do it and pull it out and work on it.

Mr. FORSYTHE. Which in a very real way means that you are researching a known quantity of—

Mr. WALSH. We are looking for ways in which data can be made available in a much more efficient manner and we don't duplicate getting the same data over and over again when it might be available.

Mr. FORSYTHE. Recently I was horrified to discover that there is no way of interchanging software within this Government so far as the multiplicity of computer operations are concerned.

So we are rewriting programs and duplicating that effort in agencies. But that impinges on your ability to handle just the thing I am talking about.

Mr. WALSH. That's exactly what we are trying to look at in the Data Subcommittee. It's trying to figure out not how to make one big computer storage of all information, but how to link existing information and storage capacities.

There is an enormous capability in the Federal Government that has not been linked adequately together.

Mr. FORSYTHE. There probably isn't the machinery to pull that all off, but it certainly would seem to me that with your very mission aimed in that direction, where will we find the right machinery to provide that capability for you.

Mr. WALSH. Yes, it is mostly a question of software, as you mentioned; it's putting together some kind of a program and a system whereby good data gets into the program and is made available. We want it to be accessed by the public as well. We don't want to have it just stored by the Federal Government. We want to have people to come off the street and be able to pay whatever the costs are to get it for their use.

Mr. FORSYTHE. There's no problem with that as far as the users are concerned, but for sure the Federal Government is running around blind without some increased capability in this area.

Are you going to be able within a reasonable time to start to rank in severity some of these harmful substances as far as their effects on food chains by categories of substance and so forth? Is that part of something to be produced early on or is that something that is going to have to wait?

Mr. WALSH. I think we have already gotten a pretty good idea of how to rank the ones that are known to us to be difficult—the synthetic organics, for example: DDT, PCB, kepone, are the ones that are of extreme concern, and we are focusing on those.

There is the other problem of not knowing what others might be in the environment. In other words, we didn't find out about DDT, PCB, or kepone until it got into the environment and it really made some destructive inroads into the environment itself.

What we need to do is also try to identify potential pollutants as well.

Mr. FORSYTHE. Now we are talking about the Toxic Substances Act, which is another whole series of ramifications of some real problems.

Mr. WALSH. We don't know what happens to a lot of those toxic chemicals once they get into the environment and once they begin to move through the ecosystem and are picked up by phytoplankton and then move along to other creatures, and eventually to fish and eventually to us. A lot of those pathways that they follow we don't know that much about.

Mr. FORSYTHE. I think one thing that distresses me a little bit—it may be the only way to go—is when you said when we don't know, we can't do. And, of course, there is a particular refinery which has the whale issue hung around it; and I think there is one thing we do know, that homo sapiens need energy, and you can't stop the world and wait for all this to catch up.

That is going to be, I think, where we have to face some real problems and need some balanced judgment.

Thank you, Mr. Chairman.

Mr. STUDDS. Mr. Stack?

Mr. STACK. May I apologize first for being late.

Mr. STUDDS. We are profoundly grateful for your being present.

Mr. STACK. It does not indicate my lack of interest in the subject matter. On the contrary, I represent the 12th Congressional District of Florida—some of you may have heard of Fort Lauderdale, where the boys are and where we also have a few girls—and let's say others ranging in between. Be that as it may, we have a deepwater port at Port Everglades and, of course, Florida has the longest coastline in the continental United States, I believe.

What I am suggesting is this: In my constituency, the pollution of the ocean is a matter of major magnitude, because our economy depends so largely upon our beaches—we are a resort area. And, among other things, we do have ocean outfall systems to discharge municipal waste, and in our port we handle principally petroleum products, so that it seems to me that the thrust of Public Law 95-273 and the coordination of the activities of the various Federal agencies involved in the implementation of this law, I suggest to Mr. Walsh this morning is very important to my district and to me. And while I certainly, if I may suggest, plead ignorance along with my friend, Mr. Lowry, I am here to be educated.

I have appreciated your remarks and those of the members of the committee and subcommittee and those of Mr. Walsh. I will read your statement with interest, and I will participate more actively in the work of this committee.

I thank you, Mr. Chairman

Mr. STUDDS. Thank you, sir. We look forward to it. I must say I am always delighted when we hear remarks like your own. We hear too much, I think, around here about the need to balance economic and environmental considerations.

If I understood you correctly, you just said that for those of us whose concern is the sea and the marine environment, the two are really the same. Certainly the economy of an area such as you represent, the economy of an area—Cape Cod, for example—is the environment. Those are altogether false and shortsighted distinctions.

Mr. Lent?

Mr. Lent. Thank you, Mr. Chairman. And while we are talking about areas—

Mr. STUDDS. I thought there were some I should have mentioned. I apologize.

Mr. LENT [continuing]. That depend on the oceans and the environment for their well-being, we cannot leave out my area of Long Island whose beaches have been visited on occasions by discharges from the various effluent plants of New York City and New Jersey, I think, and in some cases—

Mr. FORSYTHE. North Jersey?

Mr. STUDDS. North Jersey.

Mr. LENT. North Jersey. In some cases no plants even exist; they just flush right out into the Hudson Bay only to by force of wind and tide eventually wash up down at Jones Beach or one of the other beautiful sandy areas of my congressional district.

I would like to ask Mr. Walsh—with respect to this National Ocean Pollution Research and Development and Monitoring Planning Act, which is charged with the responsibility of providing for coordination of ocean pollution research and monitoring activities conducted by disparate agencies of the executive branch, whether he has run into any incidents of rivalry as between the various agencies—I think you numbered 11.

Are you at any junction met with rivalry as between the Interior Department or the EPA or NOAA or any of the other organizations that are deeply involved in ocean research?

Mr. WALSH. Oh, yes, I think that there is a fair amount of rivalry, but I don't look upon it as totally negative. There is a fair amount of rivalry in terms of who's got the best competence to handle a certain problem.

Mr. LENT. Do you see any unwillingness to share the fruits of the various research projects that have gone on before?

Mr. WALSH. I don't think there has been any lack of desire. It's just been a matter of no pressure to really put in place something. As I mentioned, each of those agencies has their own mission to conduct, and each of them must, of course, develop the understanding of what happens if you issue a permit or you don't issue a permit. And they have tended to be mission oriented and don't

always look at the kinds of economies that may come if you meet with other agencies.

But we in NOAA, for example, have begun a fairly major outreach program to develop improved coordination. For example, we have established a fairly routine working organization between us and the Environmental Protection Agency, and so we now sit down and avoid the kind of rivalry that results in fights and outright warfare sometimes. We are attempting to eliminate that. We also work closely with the Bureau of Land Management because we do research for them. There is a lot of that kind of thing going on.

Mr. LENT. Well, in other words, you are saying that there is a rivalry but it is basically a benevolent type of rivalry.

Mr. WALSH. Yes, I think that we have avoided any kind of malevolent rivalry. There are, of course, strong differences of opinion with regard to policy—that is, who gets to do the research or who makes decisions about what research is done, and that kind of thing. Every agency feels that they have their mission and they need their research to do their job.

Mr. LENT. I was struck by your response to Mr. Lowry about the question of duplication, that you have not really run into too much duplication in connection with some of these research projects.

Mr. WALSH. I don't know that I haven't run into any duplication. There is a certain amount of duplication in some areas. For example, some people may be collecting data for one research project that could be used in another research project.

Now, in another sense there is no duplication because they are researching a different issue but the data collection may be duplicative. For example, in the area of oil—various agencies are doing research on the effects of oil on the marine environment.

Now, in the scientific area you will get an argument from many scientists that there is duplication and it can be useful because scientists believe that it is good to come at a problem from several different directions.

Mr. LENT. I was struck by your statement that there is no one place where one can go to find out what research projects have already been completed or are about to commence so that the opportunity for a piggyback would arise.

Do you see your function to provide that one place?

Mr. WALSH. Well, we are trying to develop that information system. In addition, the law mandates that we use the Office of Management and Budget to coordinate certain activities.

Now, the way the Office of Management and Budget works is there are budget examiners for each of the departments. The budget examiners will get together and do what is called a crosscut—for example, this year we had a major crosscut on satellite spending—in which the examiners get together, and talk about what each of the agencies is doing. If that doesn't occur, each of the budget examiners is approving the agency's budget without an analysis of what the other agencies might be spending.

So we are trying to use that mechanism—for example, we did a very small crosscut through our Office of Management and Budget advisor who took our program and EPA's and did what he called a mini crosscut, to examine areas in what they were spending and

what we were spending and try to get some kind of a common budget.

Mr. LENT. Which leads me to my last question. If you would refer to page 9 of your testimony, where you discuss the reauthorization for Public Law 95-273. You indicate at the bottom of the page that the President's budget for fiscal year 1980 requests an appropriation to NOAA of \$4.3 million to carry out the act.

And then you go on to say that:

It is intended that approximately \$100,000 be expended on administrative expenses, \$450,000 on development and implementation of data and management information systems, and the remaining \$3.75 million be used to fund priority research * * *

Maybe you can straighten me out. Why would this organization be involved in more priority research if your charge is to coordinate the research that is already taking place?

Mr. WALSH. Well, the coordination is intended to do two things.

Mr. LENT. I am not talking about the coordination. I am talking about why are you spending \$3.75 million on priority research.

Mr. WALSH. Let me preface that. The purpose of the law is to not only identify places in which we might have duplication and overlap, and potentially eliminate that. But it is quite possible, given the overall pattern of Federal programs in this area, that we will have gaps.

Mr. Studds mentioned one of those, and that is that we may not be studying adequately the effects of events like *Argo Merchant*. The intention of this is to say that given the overall pattern of the Federal program, what are the priority programs and where are the national needs that we are not meeting? That is, is there a lack in our program that needs to be bolstered up? For example, do we need to know more about the effects of oil pollution on fisheries? And if it is decided at the completion of our plan, which will be shortly, that there should be additional research in this area, the purpose of these funds is that they would be made available to research that question, so that we don't let something slip by, so that we don't have an answer to a question that we consider is important to meet a national need—for example, protecting fisheries.

Mr. LENT. But aren't you making the mistake of confusing your functions? If your function is to provide for coordination of research, then by going out and getting involved in research yourself under this statute, are you not missing the point of what your function is?

Mr. WALSH. We believe that to be the intent of the statute, that it establishes—

Mr. LENT. In other words, in doing the coordination of existing, past, present, future research projects, you find that there are gaps in research—that you would stop at that point, stop the coordination effort, and fill that gap by performing research?

Mr. WALSH. We are trying to do both at the same time. Essentially what the intent of Congress, as we read it, was that we have a patchwork quilt of programs that are going on.

Mr. LENT. And you are making it even patchier.

Mr. WALSH. And the idea is to take a look at that in the comprehensive sense, and then decide: one, where we can eliminate dupli-

cation and overlap, and two, fill gaps of national needs that we are told to identify in the plan.

What we are saying is that something may be slipping through the cracks, and we may need to know more about it in order to use the ocean better. And that we are given authority in the act to provide funds for that purpose, if they are identified as being priority national needs.

That's the way we understand the law.

Mr. LENT. OK, I have no further questions.

Mr. STUDDS. It's clear that section 6 of the act charges them to do that.

Mr. STACK. Mr. Chairman, may I ask a question? If I understood the language, Mr. Walsh, you do not propose to spend \$3.75 million for research only; it's research, development, and monitoring needs.

Mr. WALSH. That's correct.

Mr. STACK. That's much different, I think, really. And I can see that there would be a need for that, considering the magnitude of the problem that you are addressing, as well as research in some instances; your thrust really is development and monitoring—"monitoring" being the key word to me—needs not presently being addressed.

That is the basic charge, I think, is it not?

Mr. WALSH. It may well be that one of our charges in the development area is to develop a device or certain scientific instruments to be used to monitor pollution levels. People may not be doing that, and it may save us a lot of money by doing that.

Mr. STACK. I simply want to point out that you are not proposing to spend \$3.75 million on research per se.

Mr. STUDDS. Mr. Hughes?

Mr. HUGHES. Thank you, Mr. Chairman. Thank you, Mr. Walsh.

We are working on legislation that will provide some \$5 million in authorization. Can you give us some idea of what your agency has sought from the administration for research, development and monitoring for fiscal year 1980?

Mr. WALSH. We got everything we asked for.

Mr. HUGHES. You sought \$5 million?

Mr. WALSH. If my memory is right—

Mr. STUDDS. The application came from the Department of Defense.

Mr. HUGHES. Better not let that word get out of here, because OMB will be cutting you back, if they find out that you got what you asked for.

I am interested in some specific projects; since everybody is just a little parochial today, just bear with me for a minute. I represent the second district which is where New York dumps much of their things that they don't want; we have a dump site off of Sandy Hook; we have a dump site off of my district, not very far from Long Beach Island—it seems that every time we seek a new dump site, they look in my direction, so I am naturally interested in dump sites.

In the Ocean Dumping Act we determined that some priority for selecting sites should be given to the shelf. We do have a 100-mile dump site, which is where we dump chemicals, among other things.

I wondered if you could tell me specifically whether anything has yet been done to determine the impact of dumping at that location on the marine environment.

Mr. WALSH. Well, let me preface that, and then turn it to Larry Swanson, who previously was in charge of our MESA New York Bight project—and he will probably be able to go into that in more depth.

But generally in this area, the Environmental Protection Agency, of course, is involved in selecting the site and issuing the permit. We do research with regard to the effects.

And with that why don't I just ask Larry to comment.

Commander SWANSON. Mr. Hughes, NOAA has been conducting research and characterization of the 106 site since about 1974 and there has been a great deal learned with respect to dumping of materials at that site. And, in addition to that, the complexities of using the ocean as a dispersive medium—for example, with our present technology we have great difficulty in even tracking material that is disposed of at 106 site. Part of that is probably related to the fact that it is a very dispersive environment. Another part of it is the fact that we don't even know where to look.

However, I do think that we have a relatively good handle on the types of materials that are being dumped there and what the fate and effect of those specific materials presently dumped at 106 might be.

Mr. HUGHES. What agencies are actually conducting research?

Commander SWANSON. It's being coordinated by NOAA's Ocean Dumping Office. We have a number of people both inside of NOAA and outside of NOAA under contract to examine specific portions of the marine environmental issue there.

I think basically, though, that NOAA is the only Federal group that's looking at the 106 site as far as environmental effects are concerned.

Mr. HUGHES. How about the old Philadelphia dumpsite that was closed down, I believe, back in the early seventies? Has there been any monitoring of that specific site to determine levels of cadmium, mercury, and other toxic substances?

Commander SWANSON. The EPA has looked specifically at the Philadelphia dumpsite, and I believe in greater detail at the new site used by Philadelphia. Their program is intended to wind down in the next year or so, and NOAA will be picking up the monitoring of that particular site.

Mr. HUGHES. And how about the New York bight area?

Commander SWANSON. The field research phase of the MESA project is due to be completed in September of 1979. The synthesis of the data and information will continue for another 2 years.

There will be a monitoring program continued in the new New York bight region to look at the dumpsites as well as some of the other environmental problems that we have in that area.

Mr. HUGHES. In the legislation that we passed in the last Congress, it called for NOAA to approve grants within 6 months of receipt of application information.

Have you found that provision workable?

Mr. WALSH. Well, let me say that we have informed anyone who is interested that we will not be receiving grant applications and

we will not be prepared to receive requests for grants until we have completed the 5-year plan. That plan, as was mentioned earlier, Mr. Hughes, is in the draft phase; it will be available in March and will be delivered to the Congress in May.

Once we have completed that plan, we will have identified those needs that really need to be addressed. Then we will be prepared to receive grant, applications but I can't really respond further at this time.

Mr. Hughes. You sought a 5-year funding cycle, multiyear cycle.

What specific problems are you going to experience if this committee doesn't grant you a multiyear authorization?

Mr. WALSH. What specific problems? Well, we would, of course, prefer to have that 5-year period, but I can't think of any real specific problems that that would cause us. We, of course, must justify each and every year our appropriations in any event, but we would just prefer not to have the—

Mr. HUGHES. We have been trying to get a 6-year term for Congressmen, too, but haven't been successful.

Mr. WALSH. Well, I used to work for the Congress, and I discovered that 1-year authorizations tend to pile up after a while. That caused me a lot of work when I worked for the Senate.

Mr. HUGHES. Well, I suspect the Committee might be more inclined to grant a multiyear budget once we see exactly how the legislation is being implemented.

Thank you.

Mr. STUDDS. I understand that in the first year of your operation, you have had no funds appropriated, is that correct?

Mr. WALSH. That's correct, we have not had an appropriation under this legislation. Of course, we do have general statutory authority in this area, and we have reprogrammed funds and made them available in order to support our effort.

Mr. STUDDS. You couldn't continue on that way with respect to the administrative costs?

Mr. WALSH. In terms of administrative costs it's going to be tough, because, you know, we have taken it away from other programs and put them on the backburner for a while.

Mr. STUDDS. You ask for \$100,000 in administrative expenses. Is that for salaries of personnel or what?

Mr. WALSH. That will be generally the salaries of the people who are assigned to that as well as the cost of the secretarial work of typing up the plan, of getting it prepared, of developing the information; there will be some costs related to putting this material into the computer, for example; there will be costs of printing and distribution of the plan itself.

Mr. STUDDS. With respect to that part of it which will be salaries will there be a person or persons detailed from NOAA to run this program?

Mr. WALSH. Well, there are two parts of the program. First, there is the interagency program and then there is the so-called NOAA program, which is the in-house effort. In terms of the interagency effort, presently I am the chairman; I have one individual who is in the Office of Policy and Planning in NOAA who serves as the executive director of the interagency committee. His name is Lowell Martin—he is right here in the audience.

In addition, we have detailed from Coastal Zone Management, Dr. Dale Brown who is in charge of putting together the plan itself, and then we have secretaries.

In addition, as part of our overall interagency task force, we have people assigned from each of the agencies, the key agencies involved, to help us write it.

By and large we are doing it on borrowed time; people who are assigned in this general area are spending time helping us to do this.

Mr. STUDDS. Well, what's going to happen when you get functioning, assuming you get the funds you've requested? What kind of person's salaries would come out of this appropriation?

Mr. WALSH. Principally, it will be the people who will be assigned to the interagency task force; it will be to pay the executive director of the interagency group, as well as the people that will be involved in collecting the information, analyzing the Federal program, and then doing the staff work for the committee.

Mr. STUDDS. Will those be new people you will go out and hire?

Mr. WALSH. We don't hire very many new people.

Mr. STUDDS. That's what I thought.

Mr. WALSH. We just make do.

Mr. STUDDS. I don't mean to be nit-picking, but if they are not new people why do you need new money?

Mr. WALSH. Well, it's simply an accounting procedure. If these people are not new, that means they are being paid by the appropriations for Coastal Zone Management, for example, and the appropriations for Coastal Zone Management by law say that you can only spend it on Coastal Zone Management purposes.

So we need to have the budget authority to spend the money, to ask for it—that's why.

Mr. STUDDS. More than you need the money itself.

Mr. WALSH. Yes, that's right; it's a budget exercise. Each part of our program must be legally authorized before we can spend the money, and if we don't have that we can't divert it away.

Mr. STUDDS. So you may not need the full appropriations under this authorization?

Mr. WALSH. We may not—what we have done here is the practice of the administration which requests an authorization equal to the appropriation request that we make. This was not done a few years ago. It's been initiated recently.

So our authorization request this year is identical to our appropriation request.

Mr. STUDDS. And the people in NOAA who will administer the research, development, and monitoring program, the almost \$4 million, will be people who are currently there, that is, they are not new folks, and they will be borrowed from various components of the agency?

Mr. WALSH. Well, what we have done is we have always had an Office of Environmental Assessment that has handled the numerous programs that we have. Joe Angelovic is from that office, he is in charge of it. We are simply focusing a lot more in NOAA on this aspect and putting together a more formal organization and attributing it more to this statute.

Mr. STUDDS. You give us an example on page 10—examples of the project categories you have in mind—prediction and modeling, and technology development.

What kind of technology do you have in mind there?

Mr. WALSH. Well, I think it probably relates to the scientific instruments that I mentioned.

Mr. STUDDS. Research technology, not, for example, cleanup technology or something like that.

Mr. WALSH. No it would be research and monitoring.

Mr. STUDDS. I hate to suggest another agency, but this subcommittee heard Ambassador Richardson earlier this week talk about the Law of the Sea Conference. At one point he said that if it were to succeed, it would probably be the greatest single accomplishment in terms of protecting the marine environment in this century.

Do you think the Department of State ought to be included in your interagency task force?

Mr. WALSH. It was suggested—I don't know why we didn't include it. Then we would have a new title: International and National Ocean Pollution Research, Development and Monitoring Planning Act.

Mr. STUDDS. However, it would be, I think, of some interest to your 11 component agencies if indeed the State Department is doing the single most important thing in this century for protecting the marine environment.

Mr. WALSH. We are going to do a special cut at international programs. There are innumerable international programs in fact. NOAA was just involved in the signing of an agreement with the Soviet Union with regard to a U.S.-U.S.S.R. scientific exchange—and pollution is one of the things that is addressed in that.

Mr. STUDDS. Mr. Forsythe, do you have a question?

Mr. FORSYTHE. Yes, thank you, Mr. Chairman. MESA was mentioned here. You are conducting similar marine ecosystem research projects in Puget Sound and in the New York Bight.

Is there any thought of getting into Chesapeake Bay? It seems to me that on the east coast in some ways this is perhaps the most critical area in terms of the environment that relates to fisheries, most particularly.

Mr. WALSH. In terms of Chesapeake Bay, NOAA does have a laboratory on Chesapeake Bay in which we do look at various kinds of questions, the effects of pollutants on fish. But the Environmental Protection Agency, as I understand, has been supporting—and I am not certain whether they are going to continue to support it—an effort to bring together the various Federal agencies and State agencies involved in Chesapeake Bay.

We testified before a hearing conducted by Senator Mathias a few weeks ago, addressing this very issue. There is a body attempting to do that.

But by and large NOAA's activities have been marine and Great Lakes related. We have a major Great Lakes program.

Mr. FORSYTHE. I just again have to come back to the whole ocean dumping issue.

Really the principal problem again is outfalls and land-generated effluent rather than sludge dumping. In terms of all of the prob-

lems that Mr. Hughes and Mr. Lent have raised and so far as my area of the beach is concerned—that's where our real problem really is.

Commander SWANSON. In the case of New York, that's correct.

Mr. FORSYTHE. The whole New York Bight area.

Commander SWANSON. Correct.

Mr. FORSYTHE. And really it is not totally fair to say New York, because New Jersey is contributing about half of the Hudson Bay flow, plus materials coming off of our North Jersey beaches where we have got the same problem.

And, Mr. Walsh, you mentioned the problem of investment in secondary treatment. I sure hope we aren't going to try and reverse course and go back to a long parade where we assume a course of never attempting to stop what's going into the ocean.

Mr. WALSH. Well, Larry had mentioned earlier the enormity of the problem and the difficulty of dealing with it. It's all that stuff that comes out of the sewers. For example, dentists in New York City dispose of a little bit of mercury and it goes down the drain. And pretty soon it goes guess where. All kinds of effluent of this kind are getting into the system and into the environment. It's people doing things and it's washing off the streets in a big rain. When you change the oil—have you ever wondered where the oil went? It goes right out to the environment. In fact, over 50 percent of the oil considered to be in the environment comes from land-based sources, and much of it is from that crankcase oil that is poured down the sewer at your gas station.

That's an enormous problem to deal with.

Mr. FORSYTHE. I think I am well aware of most of these factors involved. You realize that, along with my colleagues from South Jersey and from Long Island, I have been much involved in this issue for quite a while, and it is massive.

But I am not sure, you know, that the time for just study in terms of what we do about it is sufficient. We are on a short fuse on this because of the impact in that New York bight environment, which includes the second major industry in New Jersey and economic survival on the beaches of Long Island and so on.

So these are very, very serious problems.

Thank you.

Mr. STUDDS. Thank you very much.

Mr. WALSH. Thank you, Mr. Chairman.

[The subcommittee adjourned at 11:25 p.m.]



