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RECORD OF THE FIRST ANNUAL REVIEW CONFERENCE ON MARINE RESOURCES DEVELOPMENT

DECEMBER 7-8, 1978

CHARLESTON, SOUTH CAROLINA

Coastal Plains Center for Marine Development Services

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FOREWORD

In 1968 the Coastal Plains Regional Commission, with the assistance of the Marine Resources Advisory Committee, began making plans for a marine resources development program. These plans have been guiding the program for over ten years, during which significant changes have taken place in the marine-related economy. Goals and objectives that were established ten years ago may no longer be appropriate. Opportunities now exist in some industries that were not envisioned at that time, and new industries have emerged. It recently became clear that a total review and a new assessment were in order.

Accordingly, the aims of this conference were to assess the needs and opportunities involved in the development of the marine resources of Virginia, North Carolina, South Carolina, Georgia, and Florida; and to determine the priorities which should be followed not only by the Coastal Plains Regional Commission, but also by the Federal Government, the State Governments, local governments, and the private sector in the allocation of funds available for this purpose. The conference brought together distinguished and highly qualified leaders in marine fields from both inside and outside the five-State area and having many different backgrounds and approaches to the problems addressed.

The conference considered the following marine resources program areas: Research and Development, Marine Transportation, Mineral and Chemical Industries, Marine Structures, and Recreational and Commercial Fishing. Assessment presentations in each area were made during the opening general session and covered the problems, needs, and opportunities involved. These presentations provided the basis for discussions in subsequent concurrent workshops, during which guidelines and priorities for future investment were developed. Each workshop presented a summary of its recommendations during the closing general session.

This publication is the record of the conference. It includes the assessment presentations and the workshop reports in the various program areas. It is hoped that it will be useful in producing other documents which will set directions and guide investments in the future development of marine resources.

BEVERLY C. SNOW, JR.
Executive Director
Coastal Plains Center for
Marine Development Services

January 31, 1979

PROGRAM

Thursday Morning, December 7

Opening General Session
Charleston Room

Presiding: James W. Butler
Executive Director
Coastal Plains Regional Commission

9:00-9:15
Call to Order
Beverly C. Snow, Jr.
Executive Director
Coastal Plains Marine Center

Opening Remarks
Claud Anderson
Federal Cochairman
Coastal Plains Regional Commission

Purpose and Format of the Conference
E. Walton Jones
Chairman, Marine Resources Advisory Committee
Coastal Plains Regional Commission

9:15-9:45
Research and Development—Program Area Assessment
Edward Chin
Director, Marine Sciences Program
University of Georgia

9:45-10:15
Marine Transportation—Program Area Assessment
W. Don Welch
Executive Director
South Carolina State Ports Authority

10:15-10:45
Mineral and Chemical Industries—Program Area Assessment
Richard J. Fox
Washington Representative
Standard Oil Company (Indiana)

10:45-11:00
Coffee Break

11:00-11:30
Marine Structures—Program Area Assessment
L. Jay Langfelder
Head, Department of Marine Science and Engineering
North Carolina State University

11:30-12:00
Recreational Fishing—Program Area Assessment
Kenneth Hinman
Assistant to the President
National Coalition for Marine Conservation

12:00-12:30
Commercial Fishing—Program Area Assessment
Roger D. Anderson
Executive Director
Gulf and South Atlantic Fisheries Development Foundation, Inc.

Thursday Afternoon, December 7

12:30-1:45
Lunch Hour

Concurrent Workshops

1:45-3:15
Five Concurrent Workshops
(Conference Attendees Free to Participate in One or More Meetings as Desired)

Research and Development . . . Terrace Room
Presiding: William J. Hargis, Jr.
Director
Virginia Institute of Marine Science

Marine Transportation ..... Suite C
Presiding: Julius Kurens
Deputy Director, Eastern Region
U.S. Maritime Administration

Mineral and Chemical
Industries ..... Directors Room
Presiding: Norman K. Olson
State Geologist
S.C. State Development Board

Marine Structures ..... Suite D
Presiding: Billy L. Edge
Professor of Civil Engineering
Clemson University

Recreational Fishing and Commercial Fishing
(joint workshop) ..... Charleston Room
Presiding: Margaret M. Stamey
Member, South Atlantic
Fishery Management Council

3:15-3:30
Coffee Break

3:30-5:00
Workshops Continue Discussions
(Conference Attendees Free to Participate
in One or More Meetings as Desired)

Thursday Evening, December 7

6:30-8:00
Social Hour ..... Outside Charleston Room

8:00-9:30
Conference Dinner ..... Charleston Room
Presiding: James A. Timmerman, Jr.
Executive Director
South Carolina Wildlife and
Marine Resources Department

Speaker: The Honorable James M. Waddell
State Senator and Chairman
South Carolina Coastal Council

Friday Morning, December 8

Concurrent Workshops

9:00-10:30
Workshops Conclude Discussions
(Conference Attendees Free to Participate
in One or More Meetings as Desired)

10:30-10:45
Coffee Break

Closing General Session

Charleston Room

Presiding: Joseph W. Grimsley
Secretary
N.C. Department of Administration

10:45-11:00
Workshop Report—Research and Development
William J. Hargis, Jr.

11:00-11:15
Workshop Report—Marine Transportation
Julius Kurens

11:15-11:30
Workshop Report—Mineral and Chemical
Industries
Norman K. Olson

11:30-11:45
Workshop Report—Marine Structures
Billy L. Edge

11:45-12:00
Workshop Report—Recreational Fishing
and Commercial Fishing
Margaret M. Stamey

12:00-12:15
Conference Follow-up Activities
E. Walton Jones

12:15
Adjournment

KEYNOTE ADDRESS

By JAMES M. WADDELL, JR.
Chairman, South Carolina Coastal Council

It is a pleasure to address a group that is charged with development of a resource of which I am so very fond—the marine resources of our Region.

I saw an interesting television commercial recently which gave me some food for thought concerning my discussion with you tonight. The advertisement touted the fine job full-service banks were doing for the Nation. Some of you may have seen it.

The major theme of this particular ad was that one man had a vision and a dream of growing lush crops in a rather barren, desert area. The only thing which stood between him and realization of that dream was that life-giving liquid—water. The ad shows how a banker was finally convinced to finance the drilling of several very deep wells to provide the needed water. That barren area is today one of the most productive agricultural areas in this country—the San Joaquin Valley of California.

We in the Coastal Plains States are faced with much the same type of problem today, except that the factors for success are a little different. The 200-mile extended jurisdiction under the Fishery Conservation and Management Act of 1976 has afforded us vast new acreage which has not heretofore been subject to development and management for the benefit of the American people. Enhancing the productivity of these offshore marine resources would, of course, be of special economic value to residents of adjacent coastal areas which provide onshore facilities and services that support or are based upon offshore commercial and recreational activities.

My comparison of the continental shelf with what was once a California desert is not intended to imply that I think imaginative and far-sighted fishermen and bankers can be expected to take the initiative in developing the economic potential of offshore marine resources. The characteristics of the resources involved, and also our system of property rights, require that government, especially the Federal government, play a much larger and more critical role in the development and utilization of offshore marine resources than in the development of inland land and water resources.

State and local governments can and should have a prominent role in the management of inshore marshes and estuaries, and of seashore and nearshore resources and activities. Such is provided for in the Federal Coastal Zone Management Act of 1972 and by various state laws and regulations that have been enacted since 1972—including the South Carolina Coastal Zone Management Act of 1977. But even though they lack any legal jurisdiction over seacoast offshore land and water resources situated between 3 miles and 200 miles from the seacoast, state and local governments in coastal states have a strong and urgent interest in having these resources developed and/or managed in ways that will increase their production of commercial and recreational goods and services within a framework of resource conservation and environmental protection. A large proportion of both the beneficial and the adverse effects of offshore activities, including fisheries, occur in adjacent coastal areas and communities. That is why those of us who are concerned with the management of coastal zone resources and the welfare of the people living in the coastal zone have a strong interest in what is going on out beyond the 3-mile limit, and a strong desire to see that area produce more goods and services, and more economic and recreational opportunities for the general public.

Although I have not had time to work up anything resembling a systematic and comprehensive program for research, development, and dissemination of information pertaining to offshore marine resources, I have several ideas and suggestions which I think are worth serious consideration by those who are involved in decisions regarding the development, adoption, and funding of marine resource policies and programs.

Federally-funded research on the biological and ecological nature and problems of various offshore fisheries, including factors limiting or improving the expansion of such fisheries, should be continued and expanded. The expansion of this research should include a substantial expansion of the Sea Grant program, through which the coastal states are able to work on problems that are of special importance or concern to them. A great deal of the amazing increase in the productivity of American agriculture during the past 50 years grew out of research at Federal-State cooperative agricultural research and extension facilities located in and operated by the various states. Not only is the research at these facilities closely related to the problems and needs of the various geographic

areas of the Nation; it also provides for a wide geographic distribution of scientific personnel, which has two important beneficial side effects. One such side effect has been to make it much easier for farmers and members of the general public to communicate with agricultural scientists, and the other beneficial side effect has been to provide a National corps of agricultural scientists with a broad knowledge of local conditions as well as technical aspects of their respective professional disciplines.

I think we should follow the same pattern with respect to marine resources—that is, increase substantially the Federal funding of long-range research and education in the various coastal states under the Sea Grant program.

Although additional research on the development of artificial habitat for fish is needed, we already know that structures such as sunken ships and artificial reefs attract fish. Whether or not they increase the total number of fish in the waters of large areas is perhaps a debatable question that is worthy of a considerable amount of research effort, but there is no doubt that they improve the quality of fishing in the immediate vicinity.

Experiments with old automobile tires have revealed that they constitute an excellent material for making effective and durable artificial reefs. Disposal of old worn-out motor vehicle tires constitutes a major environmental problem in the United States, especially in thickly-populated areas such as exist throughout much of the Southeast. Those that are thrown away clog our streams and deface our landscape, those that are burned pollute the air, and those that go into landfills add to the solid-waste disposal expenses of municipal and county governments. Here, it seems to me, is an opportunity to convert a social liability into a social asset by using large numbers of these old tires to create habitat for fish and other marine organisms in the waters of the continental shelf.

The general public is interested enough in re-use of materials to bring cans, bottles, and old newspapers to "recycling centers" even though they receive no payment for them, and there is no reason to think that the attitude toward old tires would be different. Large numbers in economical-size concentrations should be available at a comparatively low cost of acquisition and transportation. I would like to see this idea tried out on a fairly large scale within a comparatively limited geographical area, with the artificial reefs being close enough together, but with sufficient variation in depth and physical features of the bottom, to provide valuable biological data and also economic data on the management of artificial reef systems.

Whatever policies and programs various government agencies may apply to the development, management, and utilization of the marine resources of the continental shelf, they should plan for as much participation by the private sector of the economy as the natures of the resources and the activities permit. To achieve this highly desirable objective it is necessary to provide for a reasonable stability of expectations on the part of those who may wish to invest in marine-related recreational and commercial facilities, or who may make financial and other commitments in anticipation of having access to particular marine resources. I am convinced that businessmen can find a way to live with almost any set of rules and regulations, provided the meaning of the rules is reasonably clear, they are enforced fairly and impartially, and the same rules are expected to remain in effect for a substantial period of time.

Marine resource management policy, therefore, should seek a balance between the flexibility requirements generated by changing conditions and the changing status of knowledge, and the stability required for recovery of substantial investments in physical facilities and market development. This has been the policy of the South Carolina Coastal Council during the past 15 months as it has developed a comprehensive plan for the management of the coastal resources of this State. I urge such a policy upon all government agencies, and especially upon those involved in exploring and developing the marine resources between the 3-mile limit and the 200-mile limit of Federal jurisdiction.

RESEARCH
AND DEVELOPMENT

RESEARCH AND DEVELOPMENT PROGRAM AREA ASSESSMENT

By EDWARD CHIN
Director
Marine Sciences Program
University of Georgia

Shortly after the Coastal Plains Regional Commission was established in 1967, it identified a number of problem areas which were considered to be of primary importance to the Region. Marine resources was included as one of these areas, and research and development was noted as a subject for consideration. Subsequently, the Commission held a series of meetings to establish priorities in its marine resources program, and in July 1968, it contracted with Lockheed Missiles and Space Company to conduct a study to determine if there was a need for research and development centers in the Region and to identify advantages of establishing such centers.

In December 1968, the Commission adopted a number of resolutions including one that called for a study by each of the three member States at that time (North Carolina, South Carolina, and Georgia) to formulate a comprehensive plan for developing its marine resources and to assess its research and development capabilities. In early 1969, the Commission contracted with an agency in each State (1) to conduct a survey of the marine facilities, staff, and programs in its respective State, and (2) to make recommendations regarding the improvement and expansion of these facilities and programs. These studies were carried out in North Carolina under the direction of John Lyman at the University of North Carolina, in South Carolina under Charles M. Bearden in the South Carolina Wildlife Resources Department, and in Georgia under Gene A. Bramlett at the University of Georgia.

Both the Lockheed study and the independent studies carried out by the three States indicated that marine research activities were largely uncoordinated and widely scattered, and that marine extension services were almost non-existent.

These studies concluded that research and development capabilities and marine extension activities needed to be improved significantly. They further recommended that the Commission assist the States to build and equip coastal laboratories and marine extension centers in order to increase the Region's capabilities for conducting research and disseminating results to the public and private sectors. It was felt that such assistance would enable the Region to be in a better position to compete for marine research and development contracts and grants. These, in turn, would contribute to a better understanding about marine resources in the Southeast, their distribution and abundance, the environment in which they are found, and the problems associated with their utilization.

Accordingly, the Coastal Plains Regional Commission initiated a program to assist in the construction of marine research and extension facilities. Since 1969, such facilities have been initiated or established in Dare, Carteret, and New Hanover Counties in North Carolina; in Charleston, South Carolina; and in Savannah and Brunswick, Georgia. Although all of these units are not completely operational yet, the purpose of this presentation is to make a preliminary assessment of this aspect of the Commission's program to see if it has made adequate progress towards the original goals established by the Commission.

In considering the extension service and research programs that have become established in the Southeast in the last 10 years, we are well aware that some of these efforts would have been initiated regardless of the assistance provided by the Coastal Plains Regional Commission. For example, North Carolina began its participation in the National Sea Grant Program in 1970, Georgia in 1971, and South Carolina in 1972. Many of the Sea Grant projects were carried out on the various campuses and did not require the use of coastal facilities. Nevertheless, there is general agreement that the Coastal Plains Regional Commission, by assisting the Region to establish centers for marine research and extension services, catalyzed the States to develop a more coordinated approach to marine problems and to provide a continuing base of financial support for these centers and their activities. Moreover, it focused the attention of State and Federal agencies on the Region's efforts to develop and utilize its marine resources.

To determine if the Commission's assistance in establishing marine research and extension facilities has had the effect as originally intended,

we examined the financial base and activities of the marine programs from 1969 to 1978 in Georgia and South Carolina, two States for which comparable data were available. In 1969, the University of Georgia's Marine Institute on Sapelo Island was the only major marine laboratory of long standing that was operational in the two States. The Bears Bluff Laboratory in South Carolina was in the process of being phased out, and the Marine Resources Center at Fort Johnson was not yet in existence. In Georgia, the Marine Science Center on Skidaway Island had just barely been established.

If we disregard the research support associated with the Marine Institute on Sapelo Island, we can get a relatively uncluttered view of marine program funding obtained by South Carolina and Georgia after the Commission had initiated its effort to help build up the Region's research and extension capabilities. Therefore, the following analysis is based almost entirely on programs that have developed at South Carolina's Marine Resources Center at Fort Johnson and at Georgia's Marine Science Center on Skidaway Island and Fisheries Extension Station at Brunswick, units which were established with major assistance from the Coastal Plains Regional Commission.

An examination of the funding obtained for marine research and extension services in South Carolina and Georgia (exclusive of the Marine Institute) over the last 10 years points out that the Commission's objectives in establishing marine centers clearly are being met. (Fig. 1). During the first two years, which can be considered as transitional years, outside support amounted to approximately $160,000 per year. In the eight years that followed, outside funding rose dramatically, and for the last three years it has been well over $3 million per year.

During this period, State support, exclusive of capital construction funds, rose from approximately $475,000 per year during the first two years to well over $2 million per year currently. Thus, in the last eight years, support for marine research and extension services has increased five-fold in terms of State funds and more than twenty-fold in terms of outside funds.

Total outside funding for marine research and extension services in South Carolina and Georgia over the last 10 years has amounted to well over $20 million, with over 98.5% of this support coming in the last eight years. (Fig. 2). The main sources of this support have been the National Sea Grant Program, the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, the National Science Foundation, and the Energy Research and Development Administration (now part of the U.S. Department of Energy).

Research supported by these agencies has been concerned with the oceanography of the continental shelf, effect of pollutants on marine organisms, geochemistry of heavy metals, geology and geophysics of the barrier islands and continental shelf, beach erosion, offshore phosphate resources, marsh ecology, regional assessment of living marine resources, development of offshore fisheries, development of products from underutilized fishes, aquaculture, coastal zone studies, and other areas. Extension services have provided advisory assistance to State agencies, commercial and recreational fishermen, seafood processors, marina operators, and other involved with the sea. The development of a twin-trawl system has increased the efficiency of shrimp fishermen significantly. In the last five years, the twin-trawl system has been adopted for use on more than 80 boats in Georgia and on boats in North and South Carolina and in the Gulf of Mexico.

It is amply clear that the establishment of marine research and extension centers, in which the Commission has played a major role, has led to significant improvement in the capability of the Region to tackle the myriad of problems involved in coastal resources. Yet this is not the time to sit back and bask in the glow of our accomplishments. Programs are obviously limited in size and scope by the amount of funds available. An equally important limiting factor, often overlooked, is the amount and kind of space available to house the people needed to work on those programs. Both State and outside funding have essentially leveled off during the last three years. This is due in part to the fiscal austerity that has prevailed in recent years, but is equally attributable to the fact that the facilities in South Carolina and Georgia are operating at capacity.

As new problems emerge, institutions must be able to respond, and accordingly, the Commission must retain its flexibility and capability to continue assisting the Region to upgrade and expand its marine research and extension facilities. In light of recent development, the Southeast is having to face major problems of wider scope and greater complexity than ever before.

To cite a few examples, the Fishery Conservation and Management Act of 1976 extends U.S. jurisdiction over offshore fisheries within 200 miles of its coastline. The Act requires the development of management plans for various species, which in turn requires knowledge of our offshore fishes—what species we have, how abundant they are, where they move from season to season, how fast they grow, and other basic biological information.

Offshore oil exploration is another major development which the Region is facing. This year, leases were let for exploration in blocks east of Savannah and east and southeast of Brunswick, Georgia. Drilling is anticipated to start in the spring of 1979. Questions regarding the effect of these operations on the environment and its living resources are bound to be raised.

The presence of offshore phosphate deposits on the sea bottom off the South Carolina-Georgia border was indicated by surveys of the seabed surface. Significant concentrations were found from about 15 miles to 25 miles out, covering an area of approximately 500 square miles. Before final assessment can be made about these deposits, coring operations need to be carried out to determine their vertical extent. Any move to utilize these resources will also stimulate environmental concerns.

These and other activities, some imminent and some potential, will require that we continue to upgrade our research capabilities in terms of facilities and staff (the two go together) in order that we will be able to address the problems and questions that will certainly arise.

We should not restrict our thinking to shoreside laboratories. One of the most striking deficiencies in the Southeast is the lack of research vessels capable of operating efficiently and effectively on the continental shelf for a period of at least two weeks at a time and capable of carrying out biological, physical, chemical, geological, and fisheries investigations. The only ship in the Region with these capabilities is the 118-foot R/V Eastward operated by the Duke University Marine Laboratory at Beaufort, North Carolina. The Eastward, however is supported substantially by the National Science Foundation to carry out National Science Foundation-funded projects and is not generally available.

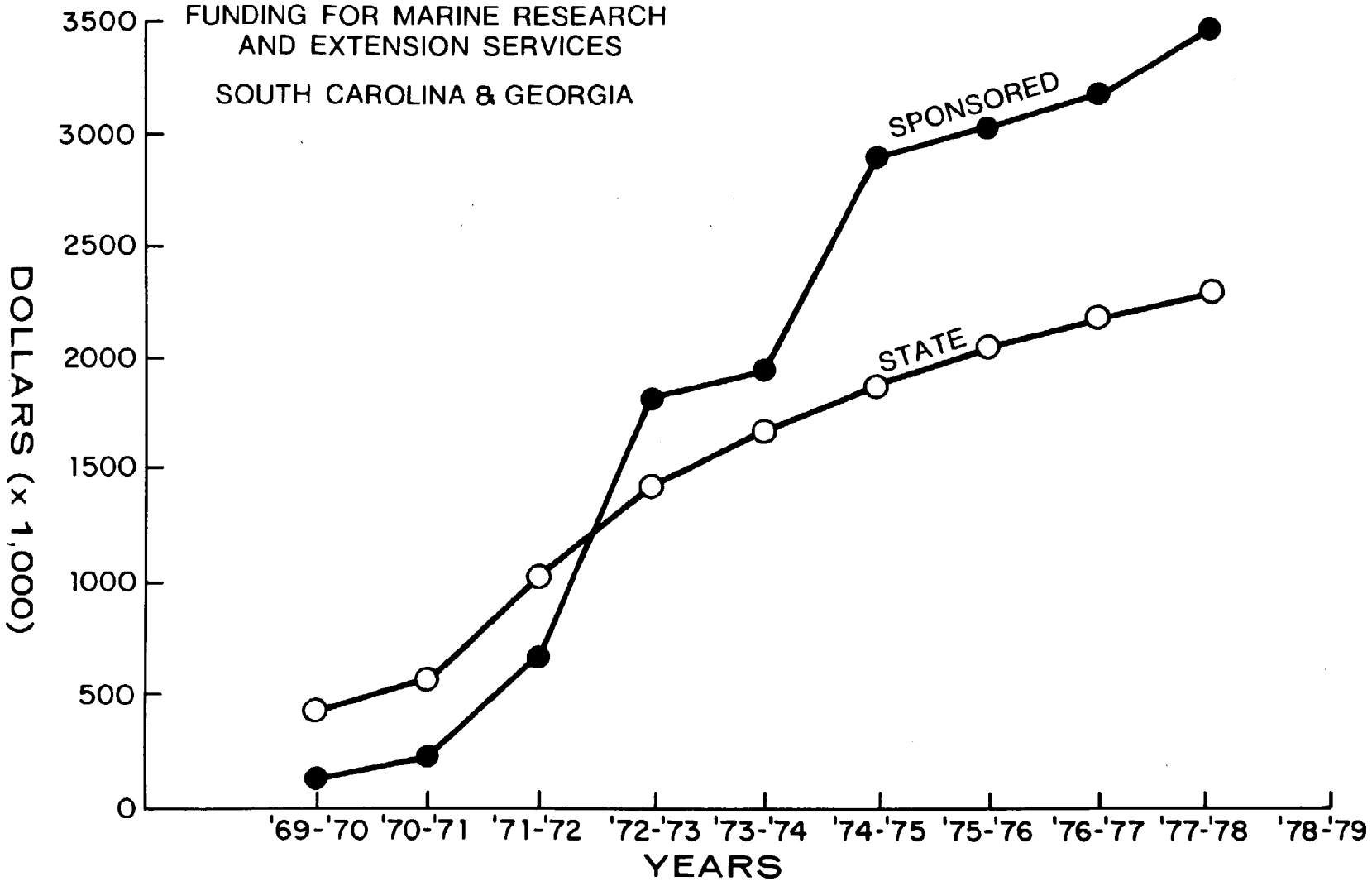
South Carolina's Marine Resources Center operates the 107-foot Dolphin, a 25-year-old converted Army coastal tugboat, and Georgia's Marine Science Center operates the 75-foot Bluefin, a converted shrimp boat, and the 57-foot Captain Gene, a shrimp boat used for gear research and extension services. None of these boats really fits the needs of the Region, and it is time for the Commission to convene scientists in the Southeast to identify and define future problems and to examine carefully the feasibility of a Regional research vessel to meed anticipated needs.

Whether or not the Region can meet the challenges that lie ahead in the marine field will depend to a large extent on whether the Commission maintains the momentum created in large part because of its assistance in developing facilities for marine research and extension services.

(See Charts on Following Pages)

FIGURE 1.
FUNDING FOR MARINE RESEARCH
AND EXTENSION SERVICES

SOUTH CAROLINA & GEORGIA



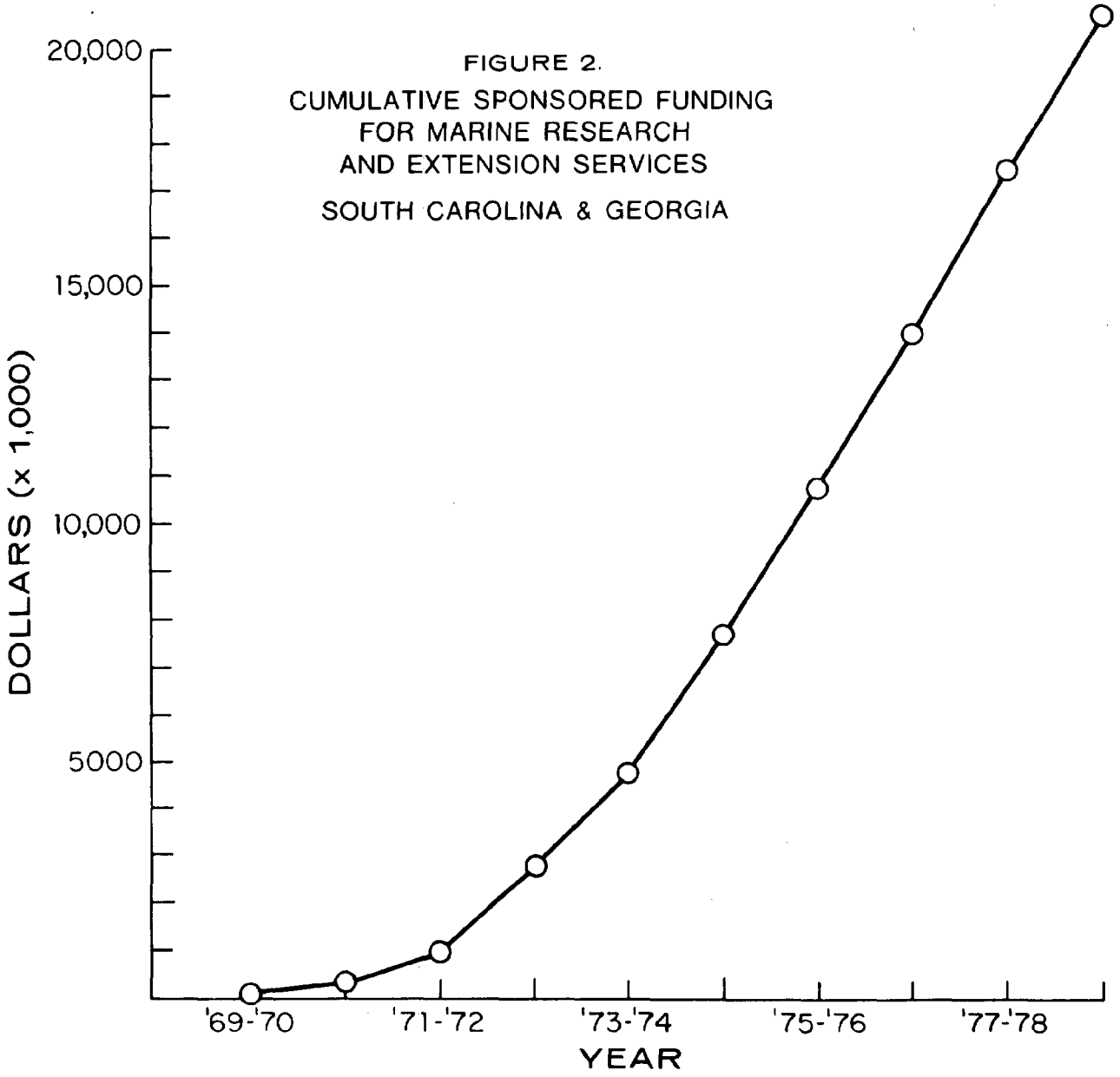


FIGURE 2.
CUMULATIVE SPONSORED FUNDING
FOR MARINE RESEARCH
AND EXTENSION SERVICES
SOUTH CAROLINA & GEORGIA
20,000
15,000
10,000
5000
DOLLARS (x 1,000)
'69-'70
'71-'72
'73-'74
'75-'76
'77-'78
YEAR

RESEARCH AND DEVELOPMENT WORKSHOP REPORT

Presiding: William J. Hargis, Jr.
Director
Virginia Institute of Marine Science

Rapporteur: John B. Pleasants
Executive Assistant
Virginia Institute of Marine Science

Research and Development (R and D) is unique among the subjects discussed at this conference since it pervades and forms a basic part of every other discussion subject. Fisheries, transportation, industries, and structures are all dependent to some degree upon R and D. An excellent example of this was provided in the assessment paper presented to this conference by Mr. W. Don Welch, which refers to the difficulties faced by port authorities and caused by inadequate information of an environmental nature, leading to over-regulation.

DISCUSSION AND RECOMMENDATIONS

Coastal Plains Regional Commission funds are limited, especially for R and D. The workshop felt that it is important to use these funds only where there are no others available to fulfill the same function. It was agreed therefore that R and D funds should be employed as follows:

1. To support the continuation of the program to establish marine facilities. Such facilities, once established, enable the attraction of marine scientists and outside funds to solve or at least address individual problems in fisheries, pollution, erosion, waste disposal, transportation, and other areas. Facilities are the sine qua non. In the past, Coastal Plains Regional Commission funds have been used to establish facilities in North Carolina, South Carolina, and Georgia, the three original member States of the Commission. To date, Virginia and Florida have not been so aided.

2. To support the expansion of research facilities in the three original member States, where a near-saturation situation exists. In some of the more remote areas where there currently are facilities, there is a need for some housing for visiting scientists.

3. To support projects developed to communicate results derived from R and D to area users and among area scientists. This communciation can take several forms, with workshops and demonstration projects on specific subjects being among the most useful. Close coordination must be established with the advisory services funded by the National Sea Grant Program to avoid duplication. Marketing of area seafood products, both in our own country and abroad, offers enormous possibilities, as has been well demonstrated by recent activities in the Midwest and on the African continent. Further to the question of communication, the workshop believes that the Coastal Plains Marine Center is currently providing an extremely useful linkage among area scientists and resource users, and should therefore, continue to be supported.

4. To support Regionally-significant, economically relevant projects that have been properly reviewed. Coastal Plains funds should be provided as seed money, start-up money, follow-on money, completion money, or add-on money.

There are two major problem areas developing which will require attention from R and D. These are:

1. The Fishery Conservation and Management Act of 1976.
2. The exploration for and exploitation of oil and gas, both in the southern end of the Baltimore Canyon off Virginia, and in the Southeast Georgia Embayment.

Obviously, both of these areas contain several subsets of problems. The workshop felt the Coastal Plains States should undertake joint programs to explore common problems. As an example, there is currently little knowledge of fishery stocks on the shelf. A cooperative investigation could provide the data needed for rational management and thus prevent unwise investments in harvesting, processing, and distribution systems. An additional advantage of this approach is that it encourages the sharing of expensive equipment and ship time, both of which are scarce in the Coastal Plains Region.

There is also one overall common, almost philosophical problem which, although not unique

to the area, is worthy of mention. This problem is our lack of ability to predict with any accuracy the results of many actions that may be taken in the marine environment. We are unable to tell, in many instances, what will happen, and therefore we must exercise extreme caution. This leads to delays and often regulatory overkill. Obviously, this is a long-range problem and one which points out the need for continuing basic research. Our predictive capability simply must be improved.

Finally, the workshop would like to state the following as an overall philosophy for R and D in the marine environment of the Coastal Plains Region: R and D must be used to collect, collate, and communicate the knowledge required for wise management of our marine resources. When alterations to the marine environment are required, these alterations must be made with the least possible impact and at the least possible cost.

MARINE TRANSPORTATION

MARINE TRANSPORTATION PROGRAM AREA ASSESSMENT

By W. DON WELCH
Executive Director
South Carolina State Ports Authority

We need to focus today on the needs, problems, and opportunities of marine transportation in our Coastal Plains Region. In my view, every need and every problem presents an opportunity. With our attention on the social and ecomomic aspects of our coastal resources, we are directed toward financial investments aimed at increasing the productive use of these resources. This use should be tempered by a sense of wise stewardship that recognizes the importance of environmental protection and conservation, especially for future generations. A conference like this should strive to set the scale for a workable, healthy economic balance between government control and spending, and private enterprise development and investment. This balance can assure endeavors which produce a minimum of controversy.

To start with, we need a definition of marine transportation. In general, it can be defined as the conveyance of commodities and people via navigable waters as a commercial enterprise operating from and to appropriate shoreside facilities. Our prime focus today, however, will be on waterborne international commerce which uses a variety of transport modes for moving cargo, including conventional break-bulk freighters, containerships, barge carriers (LASH vessels), liquid and dry bulk ships, neo-bulk carriers, and roll-on/roll-off and combination vessels. This definition is very close to the definition adopted by an important recent Maritime Administration study on the economic impact of the U.S. port industry. That study defined the port industry as "any economic activity that is directly needed in the movement of waterborne cargo." The definition was based on a new system concept which took into account the total function of ports as providers of specific services in the movement of waterborne cargo. In effect, it includes all activity directly tied to waterborne services, even activities that take place beyond the piers. For example, this includes cargo documentation, cargo insurance, banking, warehousing, and land and water transport.

The infrastructure for port activity involves tremendous capital investment such as for docks, giant cranes, rail tracks, roadways, transit sheds, warehouses, paved open-storage areas, fencing, lighting, sewage disposal systems, inspection and security facilities, and a large and varied quantity of wheeled equipment. A broad range of services clusters around a port operation, adding thousands of workers and millions of dollars to an area's economy. These include steamship agents, freight forwarders, customs house brokers, marine and cargo surveyors, marine insurance, rail and motor freight, warehousing, tug boat and harbor pilot operations, dredging, construction and repair, ship supplies, international banking, stevedoring, and government inspection and regulation.

The port industry's services to the economy in terms of sales, purchases, income, jobs, and taxes are on a par with those of other major industries. The analysis by the Maritime Administration study, using an input-output model, showed that port industry operations in the base year of study (1970) were responsible in the National economy, directly and indirectly for:

1. Gross sales within the economy of $28 billion.
2. A $15 billion contribution to the Gross National Product (GNP).
3. 1,046,800 jobs.
4. Personal income of $9.6 billion.
5. Business income totaling $3.7 billion.
6. Federal taxes totaling $5.2 billion.
7. State and local taxes amounting to $2 billion.

The study showed that the movement of each ton of waterborne cargo in U.S. foreign trade generated direct port industry revenues of $34. Every million-dollar increase in the Nation's imports brings about an average increase of $229,400 in demand for port services. Each million-dollar increase in exports required an average increase of $160,000. Because the data base for the study was limited to 1970, and the GNP has more than doubled since then, these impact figures should be doubled to express the findings in current terms.

While the Maritime Administration study was not broken down by region, it is possible to draw some comparisons about the level of marine transport in the Coastal Plains Region. One significant measure of port activity is the dollar value of cargo moved in international trade. That figure for 1976 for the Southeastern States was $20.4 billion. The U.S. total for 170 ports was $151.6

billion. Conservatively estimated, port-related jobs in the Southeast total 150,000-200,000.

While the level of these port-related impacts might appear to many to be startlingly high, they are actually on the very low side when compared to the rest of the industrialized world. Port impacts contributed slightly less than two percent to the GNP in 1977. In many other industrialized nations which have historically been more trade-dependent, this percentage ranges from 20 to 60 percent. In the light of current world economic developments, it seems reasonable to anticipate an increase in the port-related share of the GNP to six percent. The dramatic economic shifts produced by the price increases in petroleum will independently produce part of this change. Coupled to this will be the increased ability of the petroleum exporting countries to buy American goods and the increased National need to export in an attempt to equalize the balance of payments. A visit to a port is likely to disclose evidence of this development, as cargoes for the oil-rich nations are staged for export. Dealing with these developments, the National policy, as outlined in President Carter's recent export message, can be expected to tilt the economy more to exporting and to produce increased port-related activity.

Some of the most significant impacts of the growth in trade have been highlighted in another recent Maritime Administration study completed by the consulting firm of Temple, Barber, and Sloan. The study projected a world trade increase of 130 percent for the U.S. between now and the year 2000. The study relates cargo trends to the number, type, and sizes of ships, which can be expected to impact the development of ports.

Specific findings regarding the world fleet include:

1. While the forecast indicates that trade will increase over 130 percent, it will be carried by a world fleet only 10 per cent larger, based on the number of vessels, than the 1975 fleet serving U.S. foreign trade.
2. There will be an increasing reliance upon more sophisticated liner type vessels in the future. During the next 25 years the number of partial containerships will increase nearly sevenfold while the number of full containerships will triple. The number of general cargo ships is projected to decrease over the same period by 60 percent.
3. Because of the reliance on super tankers as offshore terminals become available, the total number of tankers required to serve the U.S. foreign trade actually decreases 15 percent over the forecast period. At the same time, the annual capacity of the tanker fleet more than doubles.
4. These shifts toward more sophisticated vessels result in significant changes in the composition of the world fleet.
5. In every ship type, increasingly larger vessels will be built. The largest increases occur in liquefied natural gas carriers and tankers which increase in average size by 133 percent and 113 percent, respectively. The smallest increase, 14 percent, occurs in barge carriers. The average increase in deadweight per vessel for the whole fleet is 71 percent.
6. The average deadweight of new construction for the world fleet will continue to increase, consistent with recent historical growth. One exception is tankers, where replacement requirements for large numbers of small vessels will cause the average size of tanker construction to drop significantly after 1985.

The consistent trend toward larger ships and toward technologically-advanced ships has obvious significance and impacts for marine transport in the coastal zone. As a first point, we should not expect to see another revolution in shipping modes, as we saw in the 1960's in the development of containerization. Rather, through the end of the century, we will likely see a continuing evolution of existing concepts, with the changes coming mainly in increases of scale and in some of the related onshore systems. To keep pace with this evolution, the Coastal Plains Region will have a continuous need, over the next two decades, for capital development for the port infrastructure to serve the new generation of ships, and for physical improvements in channels, harbors, and turning basins. Important channel development projects are underway in every Coastal Plains State. In addition, the maintenance of existing projects becomes increasingly important as the draft of ships dominates as a controlling factor in vessel access.

In this century, capital formation for marine facilities has resulted from a partnership between the private sector (shipping companies and terminal operators), local and state governments (port authorities), and the Federal Government. With intensifying needs for capital for sophisticated port improvements, and intensifying competition for capital in the public and private sectors, planned and careful application of funds will be essential.

In addition to physical improvements, further developments should see the refinement of technology, especially computerization, for port and ship activities. Computer systems can become increasingly important for ships for communication and navigation. Computerization continues to be

refined in its application to shoreside functions to expedite the movement of cargoes and to speed documentation. It will also grow in significance in trade projections and marketing.

Other specialized trends, particularly in relation to petroleum movements, highlight the need in port areas for more drydocking facilities for large ships; oil refinery and pipeline operations; massive frozen food installations for large-volume export movements; modernized seafood processing, packing, and distribution centers; and expanded private warehousing and distribution activities.

In manpower needs, trained personnel in ocean transportation, international trade, and marine technology are still in short supply. While much has been done over the past decade to encourage programs in marine science, little similar activity exists in marine transportation and economics. Until recently, the alternative has been drawn-out programs of on-the-job training in the private and public sector. The entire marine transport and trade industry could benefit from more programs like the Master's Program in International Business now offered at the University of South Carolina. This type of educational opportunity, especially in the technological area, could assure that a larger number of our most talented young people would seek out professional careers in marine transportation.

Development goals, particularly in marine-related facilities, are often blocked by substantial conflicts with environmental restrictions. In most cases, it seldom seems that valuable projects are abandoned due to environmental restrictions. Rather, extensive, severe delays hamper the productivity and effectiveness of these projects.

The South Atlantic and Caribbean Ports Association recently surveyed its member port authorities on the delay question. Eight ports in the Coastal Plains Region responded. Delays were reported in 15 improvement projects, ranging from one year to 15 years. Millions of dollars in non-productive costs and losses were attributed to the delays.

An opportunity for resolving these delays and conflicts exists in the developing coastal zone management programs in the Coastal Plains States. Coastal planning should be good for ports because it focuses public attention on the role of ports in the coastal zone. Nevertheless, many port officials throughout the Nation have expressed the fear that coastal zone management could foster a negative, highly protectionist stance that would threaten economic progress.

Recently, officials of the American Association of Port Authorities worked with the Federal Office of Coastal Zone Management to develop a list of the ten top problems encountered by ports in relation to coastal zone planning. They are:

1. Insensitivity to port planning.
2. Permit delays.
3. Unclear or inflexible policies on mitigation.
4. No-growth, Clean Air Act policies.
5. Inflexibility of endangered species measures.
6. Inconsistent coastal zone management policies from one state to another.
7. Costs associated with dredged material disposal.
8. Impacts of coastal zone management on land costs.
9. Safety and security concerns created by public access policies.
10. Lack of a National port policy.

In another related area, the marine transport industry bears to an exceptional extent the burden of extra costs mandated by Federal programs in environmental protection, employee health and safety, and cargo safety and security. On behalf of the American Association of Port Authorities, the Maritime Administration recently surveyed more than 100 local public port authorities on the subject of mandated costs. The ports responding detailed very substantial costs as a result of complying with Federally-imposed standards during the 1970-1976 period. For example, capital costs of complying with environmental protection standards totaled $97.7 million. Employee safety and health and cargo security cost $14.5 million and $24.9 million, respectively, in capital costs. These same Federal activities also cause annual operating costs for ports. The survey found that during the same periods, ports bore annual operating costs during the 1970-1976 period of $2.6 million for environmental protection, $1.4 million for employee safety and health, and $6 million for cargo security.

While new programs are prompting new burdens for the ports, the Federal commitment appears to be weakening in the important traditional area of the promotion of U.S.-flag shipping. With an increasing American dependence on world trade, the Nation needs a strengthened commitment to the U.S. Merchant Marine. Yet, what is happening? At the end of World War II, America held first place in the world's merchant fleet. The Soviet Union held a ranking of 23rd. In the years since, Russia has climbed to sixth place, and the U.S. has fallen to seventh, right behind Russia. While we have allowed the American Merchant Marine to enter a period of frightening decline, the communists have developed some of the fastest-growing cargo lines in the world.

How have the Soviets built up their strength?

Throughout the world, their policy has been price cutting and rate fixing. Even on trades that serve the United States, the Soviets' free-wheeling way of doing business has, until recently, gone unchallenged. The Federal Maritime Commission, earlier this year, moved against the practices of the Soviet shipping line, Baltatlantic, after it won an order to ship 70 German-built buses to Houston in a project financed by the Federal mass transit program. Investigation showed that Baltatlantic cut its tariff rate by at least $500,000 to land the business. America should recognize the challenge from Communist-flag shipping for what it really is, and recommit itself to the strengthening of the American Merchant Marine.

The Coastal Plains States have two strong traditions, dependence on the seas and experience with adversity. The heritage we have will help to chart the course for the future. Maritime commerce presents opportunities for important new growth. The port systems of the Coastal Plains States can contribute to the continued growth and economic strength of the Region. Despite the problems we have, despite the challenge we face, I frankly believe that the opportunities in marine transport represent one of the brightest prospects not only for our five-State Region, but for the entire Nation.

MARINE TRANSPORTATION WORKSHOP REPORT

Presiding: Julius Kurens
Deputy Director, Eastern Region
U.S. Maritime Administration

Rapporteur: David A. Harman
Editor
South Carolina State Ports Authority

Eighteen persons participated in the two sessions of the Marine Transportation Workshop. There was a stimulating and productive discussion of problems and opportunities identified in this segment of the marine resources of the Coastal Plains Region. At the outset it was suggested that the group direct its thinking toward maximizing assets and minimizing liabilities of the five-State Region.

DISCUSSION

Considerable attention was directed toward the energy problem—offshore moorings and onshore storage sites, pipelines, large and small tankers, difficulty in obtaining permits, need for refineries in the Southeast, and superior technology already available but not utilized.

Another area discussed was commercial fishing and its export potential, particularly to Nigeria. The new concept of consolidating seafood operations and combining them with central port facilities was described. A need was expressed to conduct a study of sources, types, and quantities of fish suitable for export.

Criticism was directed at what was termed a "negative press". It eagerly publicizes bad news about maritime activities such as oil spills, fish kills, and accidents, but frequently ignores requests to publish positive stories. The consensus was that the general public unfortunately is poorly informed about maritime activities, to include port operations, cargo transport, the fishing industry, and coastal zone management. A mass public information program should be developed, perhaps beginning with image studies to promote widespread awareness.

It was felt that the Coastal Plains Regional Commission (CPRC) should push development of seafood ports for export, not domestic purposes. A massive investment would be required both here and abroad. A study of the matter, however, should determine the resources which could be developed to aid both domestic and export trade.

Dredging also was identified as a problem area in the Coastal Plains Region. Channel depths are inadequate, and shoaling also creates a safety hazard. There is intense competition for funding of dredging projects, and the Corps of Engineers is severely hampered by lack of modern equipment. Environmental difficulties contribute to costly delays in implementing all types of waterfront construction and harbor improvements. Disposal of dredged spoil also poses long-term problems.

The CPRC and others could study the dredging issue with Corps and port management help. U.S. Customs collects billions of dollars annually as the result of port investment, but none of these funds are returned for port projects. The CPRC's five Governor members could carry substantial clout in creating an understanding of port problems by Federal officials and legislators and getting something done about them. Mass political and public awareness is sorely needed, particularly among those who live and work well inland from the coast.

Another problem is the writing of Federal regulations, which occurs below the Congressional level. Close monitoring of this process is needed, as many of the writers are not well-informed about their subject. This is particularly true in the issuance of coastal zone project permits and imposition of costly safety and health standards. One-stop permitting was proposed, with uniform practices developed for review and evaluation. That idea would have more credibility if the Regional influence of the CPRC is used in promoting it.

Finally, the group dealt with educational needs in marine transportion. No full-scale curriculum in the field exists in institutions in the Coastal Plains Region. There is a need for marine awareness programs and more academic and on-the-job training opportunities provided by institutions of

higher learning, including technical education centers.

Of all subjects discussed, six were deemed appropriate for project consideration at this time. They are as follows (not necessarily in order of importance):

RECOMMENDATIONS

1. Problem. In interpreting laws, Federal regulatory agencies are writing rules and regulations that are economically destructive to the marine industries.

Goal. To develop an organization and procedures whereby the Regional maritime industry can influence and educate the regulators as to industry needs and problems, thus minimizing the regulatory impact.

Method. To create a group whose function would be to monitor new laws which impose upon Federal regulatory agencies the responsibility of writing rules and regulations implementing those laws. The group would visit agencies prior to the printing of their rules and regulations in the Federal Register. The purpose of the visits would be to educate and persuade the bureaucracy as to the needs, problems, and economic impact of the industry before pen is put to paper.

Recommendation. That the CPRC or others form and fund, or buy, a service which will monitor and abstract new laws and the writing and rewriting of rules and regulations that relate to the maritime industry. Further, when necessary, that ad hoc groups of pertinent spokesmen be formed to visit regulatory agencies and lobby in behalf of the industry.

2. Problem. Ports and organizations involved with inland and coastal waterways often have to deal with multi-state and Federal agencies in order to obtain a permit allowing them to undertake a construction project.

Goal. To reduce and minimize the repetitive, time-consuming, and costly process necessary to obtain a permit and to increase the likelihood of receiving it.

Method. To develop a single source or one-stop permit for waterfront projects from Federal, State, and local authorities. The Coastal Zone Management Program offers a possible solution under the Federal consistency clause. The CPRC could provide, through its unbiased and objective centers, professional assistance in preparing necessary evaluations and serve as an accepted, creditable authority. A fee might be considered for this service.

Recommendation. That the CPRC or others authorize a study to develop a Regional, single-source organization that will deal with the public agencies and provide through professional institutions in the Region expertise in the evaluation process necessary to obtain a permit.

3. Problem. The mitigation process involving the permit grantee and the regulatory agency is unclear and inflexible and imposes upon the grantee harsh, uneconomical and, at times, untenable alternatives.

Goal. To expose and standardize the mitigation process so as to create a climate of fairness and quid pro quo negotiations that tends to enhance the public interest while providing private interests with a viable alternative.

Method. To undertake a study via questionnaires or other appropriate means to compile over a statistically-appropriate time frame a case history of the mitigation process in key areas of the coastal zone. The data should be analyzed to determine if the grantee has been economically disadvantaged by the regulatory agency. If so, the findings should be publicized and public pressure brought to bear for change.

Recommendation. That the CPRC or others create a study group to determine the appropriate methodology for the data collection, undertake the survey, and analyze and publish the data.

4. Problem. The serious and unfortunate lack of awareness of the general public as to the scope of the marine industry and its vast economic impact.

Goal. To mount a massive, coordinated public information campaign to produce better-informed citizens and political leaders as to the scope, significance, and needs of marine aspects of coastal activity.

Method. To prepare and analyze newspaper questionnaires, then implement educational efforts centered on newspaper and magazine articles. Such a questionnaire survey would determine where the lack of knowledge and awareness is most acute and also could be used to find out what people want and expect in marine transportaion and the operation of their ports.

Recommendation. That the CPRC or others produce a profile of public opinion which could be used to guide information and educational programs which would be prepared and distributed to appropriate news media over an extended period of time.

5. Problem. The lack of seafood industrial parks designed and operated for export trade.

Goal. To exploit the vast potential export market for frozen fish, particularly in Nigeria. Oceangoing vessels could transport the product, perhaps in containers, if sufficient tonnage can be accumulated in a central location, which need not be a major port

area. This would create more jobs and a new source of revenue.

Method. To survey all fishing villages and operators along the coast of the five-State Region to determine the volume of activity which one or more seafood parks could be expected to generate. Research, perhaps privately contracted, could be conducted into species of fish not marketed in the U.S. which might be exported at a low price and in large quantities. Such research would determine the types, location, and numbers of fish, as well as their nutritional value. Costs of the physical plant, production of various products, and transportation would be estimated. Data compiled would then be presented to industry and port operators in hopes of stimulating a joint capital venture, assisted by tax funds.

Recommendation. That the CPRC initially authorize a study of potential fish supply and a survey of fishing boat operators to determine their reaction to such a Regional program.

6. Problem. The need to reappraise the present approach to dredging operations, including the deepening of ship channels.

Goal. To use the influence of the Region's joint leadership in a campaign to open the eyes of Congress concerning the serious difficulties faced in dredging activities. Most seaports in the Coastal Plains Region require deeper and wider channels, but funds for such projects are provided at a frustratingly-slow pace. The Corps of Engineers can use CPRC support to obtain more funds and bigger and better dredges of the hopper type. The prohibition against purchasing and using the sophisticated equipment now operated in Europe must be removed or, in its stead, the embargo on domestic construction of new dredges must be lifted. Shoaling is not only an economic problem for ports but also a safety hazard with which the Corps cannot cope on a timely basis with present equipment and funds. In light of the billions of dollars collected by U.S. Customs associated with import trade, ports should receive additional funding and more prompt response from Congress for harbor improvements.

Method. To organize a task force of experts to advise appropriate Congressional committees about dredging problems and their solutions.

Recommendation. That the CPRC be the catalyst in forming a council of State Governors, steamship industry leaders, port operators, harbor pilots, and professional marine engineers to provide the Congress with an in-depth grasp of the dredging situation and to make recommendations toward resolving related problems.

MINERAL AND CHEMICAL INDUSTRIES

MINERAL AND CHEMICAL INDUSTRIES PROGRAM AREA ASSESSMENT

By RICHARD J. FOX
Washington Representative
Standard Oil Company (Indiana)

My purpose here today is not to quote myriad facts and figures on the production, revenues, or growth of the minerals and chemicals industries presently active in the Coastal Plains Region. If you want this kind of detail, I suggest that you refer to publications such as the U.S. Bureau of Mines State Mineral Profile (SMP) series.

What I would like to do today is to look at the reason for the growth of these industries and question the future growth prospects—what is needed for growth, what will the benefits and costs be, and what are the developing technologies and resources at which we should be looking. In short, we have a today with which we may or may not be happy. How can we use the experiences of these institutions to plan for tomorrow?

As any good planner or salesman knows, the first step in either planning or selling is knowing your product. Certain chemical and mining industries are already operating in the Coastal Plains Region. Why? Was it the availability of water-borne transportation facilities or the suitability of the land? Was it the local access to raw materials or skilled manpower? Was it favorable tax laws or streamlined permitting processes?

In most likelihood, it was a combination of factors, but one will never know the combination of factors, or the relative benefits of each, which contributed to the selection of the Coastal Plains Region unless an analysis of existing facilities is made. I can tell you from my experience in researching this paper that such information is sadly lacking and sorely needed. Such an analysis would be invaluable in establishing the leading criteria and attributes your States possess, and thus give you the sales tools needed to promote your own areas versus your competition.

Such an analysis may also turn up the less desirable aspects of these existing facilities and industries. There is no question that development, on almost any scale, produces change. The question you must ask yourselves and the citizens who rely on you to make these critical decisions is, "Are these changes of overall benefit to our community and are the costs acceptable in light of future benefit potential?"

Will the costs of providing schools, fire, and police services be offset by tax income or increased employment? Will the transportation systems carry the increased traffic loads? If improvements are necessary, will they benefit the entire community in the long run? Are the environmental trade-offs acceptable in light of overall community improvement?

As the answers to these questions begin to become apparent, we must perform one further evaluation—a time-frame analysis. I think it is apparent that as time passed, chemical and mineral industries have improved their operations and implemented environmental and social standards that have produced an overall benefit to their respective communities. We should look at these improvements to see if further refinements are necessary for future developments and their applicability to older installations. Once you have established this preliminary data, you can begin to make a comparative study of the resource needs of industry and those available. I think you will find that the resources in the Coastal Plains Region fall into three distinct categories each of which has various advantages and disadvantages when compared to other areas of the United States. These distinct categories would be raw materials, natural resources (land, water, etc.) and, for want of a better word, community resources (manpower, schools, etc.). I would like to just spend a few minutes looking at each of these resource areas and evaluate their relative importance to the Coastal Plains Region.

When we talk of raw materials we think of basic commodities such as iron ore, copper, aluminum, and similar metals. While some very small deposits of these materials are present in the Southeast, there are other lesser known resources available which are far more valuable to the Coastal Plains States.

Kaolin, a white clay used primarily in the paper industry, is present in abundant quantities in the Coastal Plains Region, particularly in Georgia and South Carolina. Large deposits of phosphate are also found in many areas of the Southeast. These deposits are intensively mined and make it possible for the Southeastern fertilizer manufacturers to be competitive throughout the Region.

The largest sector of the mining industry in terms

of volume output and employment in the Coastal Plains Region is involved in the extraction of sand, gravel, and rock. In South Carolina alone there are 116 companies operating 247 mines extracting aggregate minerals. The industry is very important to the continued growth of construction and beneficial in terms of competitive construction costs of new facilities, when compared to those sections of the Nation where such materials must be imported.

A relatively recent development in the minerals sector of the Coastal Plains Region's economy is the prospect of hydrocarbons (oil and natural gas) in the offshore domain. According to the Environmental Impact Statement prepared by the Bureau of Land Management for OCS Sale 43—The Southeast Georgia Embayment, there are possibly 280 million to 1.9 billion barrels of oil and from 1.9 to 6.8 trillion cubic feet of natural gas off the coasts of South Carolina, Georgia, and Florida. Add to this the possibilities that exist in the southern portion of the Baltimore Canyon off the Virginia and North Carolina coasts and you have a very real future potential. At this time there is really no way to assess the potential effects the development of these resources will have on the economy and the environment, but a number of offices have already been established by the petroleum industry and the Federal Government in the coastal regions.

As I mentioned in my opening remarks, I do not intend to, nor can I, give you answers to the many questions that must be answered to assure the most effective use of your resources, but with proper planning and cooperation, these hydrocarbon resources, if present, could play a vital role in assuring the Coastal Plains States the necessary energy to continue their economic expansion. I will discuss this subject in more detail later.

Now let us turn our attention to the resource which I consider to be most responsible for the growth of industry, particularly the chemical industry, in the Coastal Plains States—your natural resources encompassing land, transportation facilities, and water, both for transportation and processing.

There is no doubt that the availability of land, particularly that served by a diverse transportation system, is one of the main criteria used by a major manufacturing facility in selecting a plant location. It is also quite evident that all of the Coastal Plains States have these resources in sufficient abundance to cause various industrial customers to at least consider locating in the Southeast.

All of the member States have well-maintained deepwater harbors. This resource alone gives you an advantage over most other parts of the United States. Large chemical facilities must have deep water to receive raw materials in quantities large enough to make their manufacturing processes competitive. Waterborne movement of these large volumes is usually the cheapest and, in most cases, the most desirable mode of transportation.

In addition, there are instances where shipment of finished products can best be accomplished by ocean and coastal tankers or dry bulk carriers.

However, most finished products are shipped by overland transportation systems, and here again, the Coastal Plains Region is blessed with rail and road networks second to none in the Nation. Your rail system is one of the most efficient and best maintained in the United States. The State and Interstate highway systems are new by comparison and have incorporated many innovative construction and traffic management techniques.

As a testimony to this transportation system of water, rail, and road, consider the fact that a very large percentage of the tonnage entering the ports of Jacksonville, Brunswick, Savannah, Port Royal, Charleston, Georgetown, Wilmington, Morehead City, and Norfolk-Newport News is not destined for local consumption, but for trans-shipment to points as far away as Chicago. Why, with ports such as Baltimore, New York, and Boston, and with the St. Lawrence Seaway, would a shipper use your Southern ports were it not for the efficient cargo handling of these facilities and superb surface transportation links north and west! Add to this outstanding transportation network the availability of large tracts of land adjacent to deep water, and an abundant supply of fresh water for manufacturing processing, and you have a corporate facility planner's utopia.

The abundance of good-quality process water may play a leading role in the future. The U.S. Geological Survey has estimated that the Southeastern coastal area has the largest supply of good-quality, fresh water in the United States. With today's technology-oriented manufacturing processes, water is an invaluable natural resource. In fact, a modern chemical facility cannot operate without process water.

All of these natural resources give you a competitive edge. The land and water resources of your northern neighbors have long ago reached the critical stage.

I know that there are many people who are thinking, and many have said to me, "New York and New Jersey had sufficient land and water fifty years ago and look what happened to them. We do not want that kind of development here in the South." I do not think that development, whether it be industrial, residential, or recreational, must follow

the same course. To be fair to those people responsible for the industrial centers of the North, we must realize that most of this industrialization took place long before we really understood the effects of manufacturing processes on air quality or understood the relationship between water withdrawal and aquifer replenishment.

In fact, we can use these experiences to insure that similar situations do not exist fifty or a hundred years from now in this area. If there are those who do not think that things have changed, I suggest that they contact their State industrial development board for the names of recent developments and look for themselves. They may actually be proud of these new facilities.

Now let us take a quick look at the last classification of resources—community, including people and institutions. It is somewhat ironic that one of the Southeast's most valuable assets was also one of its most serious liabilities. I am talking about qualified workers. There are those that may take issue with me, but according to the Coastal Plains Regional Commission Economic Development Plan published in 1971, and I quote, "A high proportion of the workers in the Region and those who will enter the Region's labor force have less education and training than their counterparts in more industrialized regions of the country."

Let me say that I realize the statistics quoted in this development plan are old, and that great strides have been made in increasing the educational levels in the Southeast. However, this factor, lower educational attainment, may have played an important role in the industrial development in the Coastal Plains Region in the past five or six years for a couple of reasons. First of all, one of the prerequisites for locating an industrial facility is the availability of sufficient labor at a reasonable rate to operate your installation. It stands to reason that if your population, and therefore, your labor force, is not highly trained or skilled, they will not be demanding wages as high as those of other highly skilled industrial sectors. This lack of training can also be of benefit to the local community, if properly employed, which brings me to my second point.

Recognizing the lower comparative educational attainment of the general population, the Coastal Plains States have embarked on a program for specialty training through their technical training centers. This program has been a major asset in enticing industry to the Southeast. What industry can resist the opportunity of having the burden of training its employees and operators assumed by the community within which it is to locate?

These technical training centers point up another major community resource which in all too many cases is overlooked or ignored by many other states and geographic regions as well as by industrialists looking for new sites—namely, cooperation.

In many areas of our Nation, the State and local governments have created so many policies and procedures that it appears they are trying to discourage industrial development, even though they may actually be seeking new industries. The Coastal Plains States have long had a history of trying to accommodate new industrial citizens and to assist them in securing the necessary permits; and of helping them to plan facilities which will benefit both the developer and the community.

I have spent a great deal of time on resource assessment for a reason. Looking over the various topic discussions presented before mine and those to follow, this is the only presentation addressing industry in the Coastal Plains Region. There is no way to assess the mining and chemical industries without touching on industrial development in general.

Now, what has this rare combination of raw materials and natural and community resources done for the Coastal Plains States in terms of the mining, minerals, and chemical industries?

We know that the mining and minerals industry is very important to most of the member States, but it is difficult to assess their value to the Coastal Plains Region. All data are given in State terms. This, of course, spotlights my opening comments concerning an evaluation of what you have.

A couple of points can be made, however. In two of your States, Florida and Virginia, the value of total mineral production exceeds $1 billion annually. In Virginia, however, about 90% of this is in coal, which is not mined in the coastal areas. Fuels in the form of oil and natural gas account for approximately 30% of the total in Florida.

The most valuable mineral resource mined in the Coastal Plains Region, in dollar value, is phosphate rock, and the largest operating mines are in Northern Florida. In fact, Florida ranks first in the Nation in phosphate production. In a minute I will touch on the future prospects in this area. Florida also has commercial titanium deposits which are contributing to the State's mineral income.

Another very important mined resource in the Coastal Plains Region is kaolin, which I mentioned briefly during our discussion of raw materials. Georgia and South Carolina are the number one and two producers in the Nation. Kaolin accounts for approximately 50% of the total dollar mineral output in Georgia. It is also important to note that virtually all known kaolin deposits in the member States are located in those parts of these States

which are within the Coastal Plains Region.

By far the most widely mined minerals in the coastal areas are the aggregates of sand, gravel, stone, clay, and cement. In listing the top three dollar-volume minerals of each State, these will appear at least once in every State's list and in one State, South Carolina, they account for all three.

It is difficult to assess the employment impact of the mining industry because of its overlapping and interdependent nature. In 1971, the Coastal Plains Regional Commission's Economic Development Plan stated that there were 9,700 persons employed in the mining industry in the Region. According to the U.S. Bureau of Mines SMP-40 for the State of Georgia, there are 52,000 persons employed in the stone, clay, sand and gravel, and primary metals industries alone; however, no breakdown is given by product class or geographic location. This might be an area that should be addressed in your workshop session. I will return to a discussion of the future growth prospects for this industry, but first I would like to look at the chemical industry.

Growth and activity in the chemical industry are equally as difficult to document as those applicable to the mineral and mining industry, particularly if one is trying to isolate the Coastal Plains Region. There are, however, some data available State-wide which will at least give us a picture of the trends.

According to figures supplied by the various State development boards and departments, there have been approximately 350 new chemical plants of all types constructed in the Southeast in the past seven years at an investment cost of about $2 billion. These facilities have created jobs for about 18-20,000 people. These figures do not include the State of Florida since their data were not available in time for inclusion in this report.

I should also point out that the Standard Industrial Code (SIC) 2800, from which the above numbers were drawn, covers only a limited number of facilities in the chemicals industry. There are many others, such as plastics products manufacturers, rubber companies, fertilizer plants, petroleum facilities, dye manufacturers, and many more that are directly related to chemical operations or are covered by other SIC codes. If these facilities were included, I think that these growth figures would be at least doubled.

The same can also probably be said for the employment figures mentioned above, but even these numbers do not tell the full story. A very important aspect of the true benefit these jobs bring to the community is the higher wages, and thus economic stimulus to a community. According to the 1971 Economic Development Plan which I mentioned earlier, the chemical industry is ranked in the five highest average wage-paying industries Nationally. There is no question that these new chemical industries have improved the economic climate in the Coastal Plains Region.

I believe that the growth of the chemical industry has been significant and will continue this way for some time to come. One reason for this growth can probably be directly attributed to the outstanding resource base I mentioned earlier—the rare combination of land, water, transportation, and available labor. Another reason can really be found in the changing technology of one of the South's oldest industries—textiles. As man-made fibers were developed, they were readily adopted by the textile manufacturers. It was only natural that given the tremendous resource base and the local market conditions, chemical manufacturers would locate in the Southeast.

The question we must now address, and that which we hope you will attempt to resolve in your workshop session this afternoon, is "Where do we go from here?"

There have been a number of recent developments which I feel will have a definite effect on the mineral, mining, and chemical industries in the not too distant future. It is also rather ironic that some of these new developments in one industry may have a stimulative effect on another.

Let me use my remaining time to briefly outline some of these discoveries and events for your consideration. Aeromagnetic and aeroradioactivity surveys of the Coastal Plains Region were recently conducted by the U.S. Geological Survey under contract with the Coastal Plains Regional Commission. Those of you who attended last month's meeting in Atlanta are familiar with these surveys. The reults of these surveys are just beginning to be analyzed, but the preliminary data are interesting. Anomalies that appear to be heavy-mineral deposits, possibly titanium, have been identified in the Brunswick, Georgia, and Charleston, South Carolina, areas. Possible new large deposits of phosphates are evident just south of the operating Occidental mines in Northern Florida. Evidence of geothermal geologic structures around the Brunswick area have been identified. All of these discoveries could have a dramatic influence on the Coastal Plains Region in the next decade.

What will happen if these heavy-mineral deposits turn out to be commercial? Will an entire new mineral and mining industry develop? Will new companies be formed or will older companies relocate? What will be the job potential if the deposits are developed?

What of these new phosphate deposits? Technology is now being developed and tested to

extract uranium from phosphate ores. Phosphate uranium concentration from 200-1000 parts per million are known to exist throughout the Coastal Plains Region. If this extraction becomes a viable commercial operation, will new plants and mining techniques be needed? Will we see increased applications for nuclear generating stations? Will the Southeast become a major energy producer?

What of this possible geothermal area? The Virginia Polytechnic Institute is currently doing coring work along the Southeastern coast under a Federal contract. Will their work in the Brunswick area produce a new energy resource for you? What type of new industries will be needed to develop these geothermal resources should they exist? If this energy source puts the area in a surplus energy posture, will you want to seek new energy-intensive industries? These are questions you should be asking.

While doing some research for this paper, I came across a very interesting story in The Washington Post headed, "Peat Lobby Flourishing As High Oil Price Spurs Search for Other Fuels". The story tells of a company in North Carolina, First Colony Farms, that is in the process of developing 372,000 acres of peat for the Electric Membership Corporation, which intends to construct a peat-burning electric plant to produce 600,000 kilowatts of power. The United States has 120 billion tons of peat in the ground no deeper than 6 to 10 feet below the surface. That is equivalent to 240 billion barrels of oil—a 30-year supply.

What are the implications of this fuel development? What type of mining industry will develop? What will be the impact on the chemical industry if or when we develop the technology to produce synthetic gas (one of the primary raw materials of the chemical industry)? Again, the answers to these questions will help obviate areas of concern.

While on the subject of energy, I mentioned earlier the prospect of oil and/or natural gas off the coast of all Coastal Plains Regional Commission member States. With the recent discoveries of gas in the mid-Atlantic, the possibility of discovery in the Southeast Georgia Embayment looks somewhat brighter. The structures currently under lease to various companies were very vividly identified by an aeromagnetic survey as being extremely thick sedimentary basins of the type usually associated with oil and natural gas production.

If such a discovery occurs, will existing mining and chemical industries benefit? Will the cement companies move from construction products to oil field supply? Will the resultant hydrocarbon products spawn new chemical facilities? Will existing chemical plants have a competitive edge because of locally available raw materials? Or conversely, because of the similarity in many jobs in the mineral, chemical, and petroleum industries, will some established facilities be hurt as manpower moves to fill jobs in the offshore industry?

I do not have the answers, but we had better look for them.

I have been talking now for almost 30 mintues and have not even begun to consider actions by the Federal Government which not could, but will affect you. The U.S. Government is a participant in the Law of the Sea Conference which is addressing ocean mining. The U.S. Congress is drafting ocean mining legislation. The U.S. Forest Service is considering the withdrawal of certain areas studied in its Roadless Area Review and Evaluation Program. These areas would be designated "Wilderness" and thus be in a Class I clean air category which would affect all lands within a 50-mile radius of them.

The problems and possibilities which you must consider are almost infinite, but with the resource base you possess, with the experiences you have had, and with the proper desire and planning, I believe that the potential of the mineral, mining, and chemical as well as all other industries in the Coastal Plains Region is extremely bright and will produce the type of economic and social climate desired in this Region.

MINERAL AND CHEMICAL INDUSTRIES WORKSHOP REPORT

Presiding: Norman K. Olson
State Geologist
South Carolina State Development Board

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Members of the Mineral and Chemical Industries Workshop initiated their discussions after the program area assessment speaker, Richard J. Fox, had set the general theme. All five Coastal Plains Regional Commission (CPRC) member States were represented in the workshop. Individuals represented academia; local, State, and Federal Government; and private industry, to include transportation, mining and exploration, and chemicals. Disciplines represented were geology, geophysics, and oceanography.

DISCUSSION

Various significant items of concern were voiced by individual workshop members. There is a need to identify, locate, and evaluate mineral and fuel raw materials, not necessarily for immediate extraction, but at least as an inventory for future use. Increased financial assistance to State geological surveys is needed for geology and mineral resource assessment programs. The specific problems and needs are as follows:

1. Energy Issues. It is already evident that energy issues will continue to dominate our lifestyles during the 1980's, changing the Nation's attitudes which were focused on the social issues of the 1960's.

Energy alternatives include low-temperature geothermal energy development, peat exploration, and solar energy development, all of which may have favorable possibilities in the five Coastal Plains States.

2. Mineral Evaluation and Policy. Factual data is needed to counteract emotionalism relating to environmental issues. Predictions of the potential economic value of mineral raw materials are essential for proposed environmental assessment or land withdrawal covering sub-regional areas. The mining industry is not prepared to cope with massive land withdrawals, such as in Alaska, other Western States, and in the East, particularly in populated coastal areas. Environmental constraints, in some areas, effectively discourage any initial exploration attempts.

Present mineral exploration methods are generally confined to a depth of 100 meters. All available instrumentation should be utilized for investigations below this depth. Submerged areas within the coastal zone, including offshore from the Coastal Plains States, should be investigated for their mineral potential.

Our Nation's dependence upon foreign sources of minerals, both metallic and non-metallic, has increased significantly within the past decade. Funding should be encouraged for domestic exploration, both onshore and offshore, in the Coastal Plains States. Lead times of 5-10 years to develop known mineral resources are not uncommon. A comprehensive National minerals policy is vital to protect our citizens from the potentially disastrous effects of a cartel similar to that of the OPEC nations.

3. Public Information and Education. Private industry and the public sector have a responsibility to do a better job of educating the public, legislators, and environmentalists in an objective way concerning their activities. Schools need to require at least one course in basic earth science and geography with strong emphasis on the mineral resources, their occurrences, and their uses. Science teachers in the public schools need to undergo training to properly educate the students and to implement these programs. Positive public attitudes toward domestic mineral development need to be strengthened.

4. Joint Cooperation. Industry and government must work jointly at all levels to satisfy statutes and rules and regulations. Pre-planning of all potential impacts (economic, social, and environmental) are an essential part of any development program. In coastal areas the mineral industry might also be best served by informing and cooperating with other concerned private organizations to ensure future availability of the minerals present. Environmental statutes, such as

the Clean Air Act, severely inhibit economic development.

Federal and State land withdrawal programs are detrimental to exploration and development by the mineral industries. These programs lead to negative land-use planning, if carried too far. In addition to problems associated with land withdrawals, many valuable mineral deposits become totally inaccessible as a result of commercial and residential development.

5. Mineral Data Information System. Computerized storage and retrieval systems need to be designed and/or modified for mineral resources data in the Coastal Plains States. Systems should be standardized to ensure compatability and linked in a five-state network.

RECOMMENDATIONS

Workshop members developed a consensus on the various foregoing problems and recommended directions for future CPRC and other programs. Those recommendations are as follows:

1. Energy Resource Development. Peat, uranium. geothermal, and solar resources need to be investigated and evaluated.

2. Domestic Mineral Resource Development. Mineral and chemical raw materials in the CPRC States, both onshore and offshore, need to be evaluated and developed to offset dependence on foreign imports and to increase the economic growth in the area.

3. Public Information and Education. The general public, elected officials, and other decision makers need objective information on the benefits of the mineral and chemical industries in their lives.

MARINE STRUCTURES

MARINE STRUCTURES PROGRAM AREA ASSESSMENT

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INTRODUCTION

Marine structures are rarely a resource in and of themselves, but rather are used to either develop or protect a resource. They are an integral part of any harbor and many navigation improvements. Structures are often used to stabilize shorelines, thus protecting valuable property. Marine structures are also a major element in the development and transportation of offshore energy resources. This paper briefly discusses a number of marine-related structures and needs associated with improved design, construction, and utilization of these structures.

SHORELINE STRUCTURES

Introduction. Ocean and estuarine shorelines are subjected to erosive processes as a result of long-term rises in sea level, normal and storm-induced wave action, and longshore currents. In areas where property is valuable and/or buildings are located close to the beach-water interface, it is often necessary to resort to a structural system to protect the shoreline. As development continues in the coastal zone, vulnerability to financial loss will also increase. The damage potential from storm surge, flooding, and coastal erosion may eventually reach severe to catastrophic proportions. One method of minimizing these losses is to protect the shoreline with a marine structure.

There are basically three structural methods for protecting and/or stabilizing ocean and estuarine shorelines. These are:

1. Seawalls, bulkheads, and revetments.
2. Groins.
3. Offshore breakwaters.

Seawalls, Bulkheads, and Revetments. Seawalks, bulkheads, and revetments are structures constructed parallel, or nearly parallel, to the shoreline to prevent erosion and other damage due to wave action. There are no precise distinctions between the three structures, and often the same type of structure in different localities bears a different name. The structural profiles may be classified as vertical, or nearly vertical, sloping, convex curved, concave curved, reentrant, or stepped. Seawalls, bulkheads, and revetments are constructed of a wide variety of materials such as concrete, steel, and stone. Major considerations for selection of a structural type are:

1. Foundation conditions.
2. Exposure to wave action.
3. Availability of materials.
4. Costs.

Properly designed and constructed seawalls, bulkheads, and revetments are suitable for protecting an eroding shoreline under moderate wave action. Concrete and steel walls have been used for many years, and design and engineering data are available.

Vertical seawalls and bulkheads can cause severe erosion of the seaward beach. These structures reflect the incoming wave energy, which lowers the seaward beach profile. Vertical seawalls and bulkheads are susceptible to scour at the toe base due to breaking waves. Waves breaking on or near a vertical structure will remove the material at the toe unless protected with an energy-absorbing material. The revetment is a structure designed to absorb much of the incoming wave energy by the sloping shape, voids between armor units, and the relative roughness of the armor units. The stone revetment is very adaptable to the shoreline and can be easily designed to fit the existing shape and height of the shoreline.

Groins. A groin is a rigid structure constructed perpendicular to the shore to interrupt longshore sand movement for the purpose of accumulating or retarding sand losses from the shore. Groins are generally classed by their length, height, and permeability. Groins are usually constructed of

*Presented paper at Conference.

concrete, steel, rubble mound, or timber. The characteristics of the groin (height, length, and permeability) determine the areal pattern of sand accumulation and the volume of trapped sand. The sand accumulation, however, normally occurs at the expense of the downdrift shoreline. The placement of a groin or groin field does not, however, always guarantee sand accumulation along the shoreline, due to the variable nature of the marine environment.

Offshore Breakwaters. A breakwater is a structure constructed parallel to, and a distance from, the shore to absorb and/or dissipate wave energy. Breakwaters are constructed of a wide variety of materials. Breakwaters may be fixed or floating, shore-connected, or detached. The breakwater can decrease circulation, affect currents, and obstruct the longshore transport (littoral drift). Scour at the toe of the structure can cause local turbidity and damage.

Needs Associated with Shoreline Structures. Engineering design of shoreline structures is still largely based on past experiences and empirical results. Needs associated with the design and construction of shoreline structures are:

1. An improved capability to predict or forecast shoreline waves and currents.
2. An improved understanding of the interaction of the environment with the structure and the shoreline.
3. Prototype studies (large-scale studies) of wave and current forces on shoreline structures.
4. Development and utilization of probalistic methods in design of shoreline structures.

INLET STRUCTURES

Introduction. The primary inlet structure is the jetty, which is constructed to deepen and stablize an inlet channel. The jetty also protects the navigation entrance and prevents channel shoaling.

Jetties. Jetties are normally constructed of available materials such as stone, concrete, or steel, although the rubble-mound jetty is the most common. The structure is a mound of stones of different sizes and shapes, either dumped at random or placed in courses. The jetty is designed to dissipate wave energy. Rubble-mound jetties are adaptable to any depth of water and most foundation conditions. The structure normally settles, thus causing a readjustment of the armor units and increased stability. The rubble-mound jetty is an effective energy absorber. The jetty does, however, decrease circulation, affect tides and currents, and obstruct the longshore transport (littoral drift). Scour at the toe of the structure causes local turbidity and damage to the cover layer by slumping.

Needs Associated with Jetties. The engineering design of jetties is still largely based on past experiences and empirical results. Needs associated with jetties are:

1. An improved capability to predict or forecast inlet waves and currents.
2. An improved capability to predict the effects of the jetty on the shoreline.
3. Improved designs for bypassing the longshore transport (littoral drift) trapped by the jetty.
4. Prototype studies (large-scale studies) of wave and current forces on the jetty.
5. Development and utilization of probalistic methods in design of jetties.

RECREATIONAL PIERS

Introduction. Recreational piers are a major attraction to those who come to the coastal area to fish. There are hundreds of such piers in the Coastal Plains States, and they represent a major source of revenue to the Region.

General Design. Fishing piers may vary from light, almost temporary, to rather substantial structures. Piers vary in length, design, type of construction, and deck elevation. In some states they are not presently required to meet any building code requirements and, therefore, are not built to any standards. It is not uncommon for construction to take place without any professional engineering design.

A typical pier consists of driven or jetted piles used for support of the deck structure. The pile bent may be driven with some of the piles driven on a batter. The piles are normally cross-braced both in the longitudinal and perpendicular directions. The piles are protected against rot and marine borers by either creosote or chemical treatment. The piles are normally jetted and/or driven to a depth sufficient to resist the vertical and horizontal loads. In most instances an allowance is made for erosion of the bottom that will lead to a reduction in length of penetration.

The piles are normally joined at the top by wood girders. Wood stringers are then attached to the girders, and the decking is attached to the stringers. These elements are also treated to avoid rot. Connections of the elements are normally made with zinc-coated bolts and/or nails. The deck may be designed to break away in the event of extreme tide and wave conditions.

The height of the deck is usually fixed above an anticipated wave height with a 25-year or greater return frequency. The shape of the pier is usually

straight and perpendicular to the shoreline, although other shaped piers are also common. The length of the pier depends on the desired depth of water and the slope of the ocean bottom.

Needs Associated with Recreational Piers. Needs associated with the construction of fishing piers are:

1. It appears that little or no structural analysis or design is performed prior to construction. Therefore, this area appears to warrant major consideration. Specifically, the following areas should be examined: (a) estimates of horizontal forces for wave action; (b) wave heights for various return periods; (c) analysis of projected bottom erosion or accretion; (d) behavior of the entire system; (e) adequacy of pile penetration; and (f) detailed design of connections.
2. Research into improved methods to combat marine borers and the rate of decay.
3. Effects of a pier on the littoral drift and wave climate in the area.

HARBOR STRUCTURES

Introduction. Harbors represent a major coastal resource that benefits a large geographical region. An active port stimulates the economy through direct and indirect employment and by providing the vehicle for import and export. The Southeastern States have a number of major coastal ports, with Norfolk at the Northern boundary and Miami at the Southern boundary. These ports serve the five Coastal Plain States as well as a number of interior States.

There are a number of structures associated with any port, some of which are unique for a port facility and some of which are common in any industrial complex. Structures such as warehouses, transit sheds, office buildings, petroleum storage, bridges, roadway structures, cranes, etc. will not be discussed. Structures that are unique to a port are docking facilities and wave protection structures.

Docking Facilities. Docking facilities can be discussed under the categories of wharves that parallel the shoreline and piers that are normally perpendicular to the shoreline. Wharves may be either of the closed type that also acts as an earth-retaining structure or open type that allows the ship to moor alongside. A special case of an open wharf is a bulk-loading facility that consists essentially of dolphins with a minimal structure required to handle the product lines.

Closed wharves are most commonly used where deep water is required because the earth-retaining part of the structure will allow a considerable difference in elevation between the harbor depth and the ground surface. The design of earth-retaining structures is similar to the design of a normal earth-retaining structure with the exception that (a) a fluctuating tide will produce a cyclical pressure on the wall, (b) the possibility of toe scour must be considered in the design, and (c) the effects of corrosion must also be considered. The design of the tie-back system may also be unique for a wharf structure since it is possible to place piles in front of the wall (but beneath the deck).

Open wharves do not require a retaining structure, but they normally require some type of bank protection to reduce the erosion produced by wave action. The typical erosion-protection measure is to use rock rip-rap or a concrete slab. The major design factor for this type structure is the pier or pile support system. The support system must withstand the vertical loads, but perhaps more importantly, they must also be designed to withstand horizontal forces. These horizontal forces are produced by ship impact and forces produced by wind force acting on moored vessels. In many designs the impact is resisted by breasting dolphins that are designed to take this force.

Piers are very similar in design to open wharves and are generally designed in a similar way. They normally are designed to accommodate vessels on both sides, thus increasing the horizontal wind forces. Because they generally are not designed with relieving platforms, they must be designed to be structurally "stiffer".

Finally, bulk cargo is normally loaded and discharged at facilities that consist primarily of breasting and mooring dolphins with only a minimal structure. The key to good design is to assure adequate horizontal resistance during impact and wind/current-induced force on the moored vessels.

Wave Protection Structures. A harbor must be protected from wind and swell-generated wave action. Depending on the location and geometry of the harbor, various configurations are necessary to provide for external wave protection. On an exposed coastline, a single or double breakwater is usually constructed. The breakwater must be designed to withstand storm waves and, therefore, require that the rock in the interior of the section be covered with larger armor stone. The foundation support must be capable of supporting the breakwater without excessive settlement or sinkage of the rock into the underlying ground.

In river harbors it is usually not necessary to require breakwaters because the natural wave action is rarely severe enough to require protection. In some cases, however, shoreline protection for

internally generated ship waves is required. The design and construction of revetments for this purpose will follow practices similar to those used for beach erosion protection.

Needs Associated with Harbor Structures. Harbors have been designed and constructed since the beginning of waterborne commerce, and therefore the state of the art is well defined. Because the construction of a harbor is very costly, major engineering studies are always performed, and the construction is normally done by a major marine contractor. There appear to be no major needs associated with the successful design and construction of harbor structures. There are, however, areas for improvements in design and construction:

1. An improvement in the design of the earth-retaining structures is needed, particularly with regard to defining the earth and water pressures. The amount of toe scour that should be assumed in design is also an area of some uncertainty.
2. The design of a wharf or pier could be improved by considering the structure to act as a unit rather than isolated pile or pier elements. An improved method of determining the design lateral force would be beneficial.
3. Improvements in construction techniques that would reduce cost in penetrating difficult ground with piers and piles would be beneficial. Construction in areas where old rubble has been dumped or old construction exists below the water level has proven to be difficult and expensive.
4. Improved design for breakwater elements that utilize geometry rather than volume could lead to significant savings in initial as well as repair costs.
5. Finally, improvements in the internal geometry of the harbor that would minimize internal seiches, and therefore ship forces, would greatly reduce costs and improve ship loading and unloading operations.

OFFSHORE STRUCTURES

Introduction. The exploration and production of petroleum and natural gas and the exploration and mining of minerals require offshore support facilities such as fixed and mobile platforms and submarine platforms. Offshore facilities are subjected to hydrodynamic forces resulting from waves and currents. The wave and current-induced forces consist of inertial force, drag force, lift force, and under some conditions, eddy-induced forces. These structures are sometimes constructed in dynamic zones where the sea floor may not be stable because of crustal mobility and fault displacements. In addition, liquefaction of soils during earthquakes and storm conditions may lead to massive lateral movements.

Platforms. Exploration and production of petroleum and natural gas have resulted in the installation of platforms in the ocean. Platforms have been designed and constructed of steel and concrete for water depths up to 1000 feet. The offshore platform is normally supported by cylindrical piles inside a jacket. The drilling tower is erected on the pile jacket. Over 3500 structures have been constructed in the ocean and represent an investment of over $50 billion.

Platforms in the ocean are subject to environmental hazards. Structural and foundation failures have occurred during extreme events such as catastrophic hurricanes and earthquakes. Hurricanes cause excessive horizontal and vertical loads on a structure due to winds, waves, and currents. Hurricanes may trigger underwater soil movement, slumping, or sliding. Cyclical loads of the bottom may cause excess hydrostatic pore-water pressures and create soil instability.

Pipelines. Petroleum and natural gas are normally transported from the ocean to the shore by marine pipelines. Approximately 90 offshore pipeline projects are in progress, planned, or under study. These projects crisscross 5,949 kilometers (3,414 miles) of sea floor and represent an investment of over $3.5 billion.

Pipelines in the ocean are subject to environmental hazards. Pipelines have been completely destroyed and others seriously damaged by environmental factors, sea floor conditions, or mass movement due to sediment. Failures have resulted from environmental forces, soil mass movement, and corrosion.

Pipelines in the nearshore zone are buried to avoid the environmental and man-related hazards. Failures have resulted from movement of trench walls and by flotation.

Needs Associated with Offshore Structures. Offshore platforms are exposed to the destructive forces of the ocean. The needs associated with these structures are:

1. Large-scale experiments to study the wind, wave, and current loading on fixed and floating offshore structures.
2. Studies of wave-slamming loads on horizontal members, wave forces on pile groups, effects of marine growth on wave and current loading, and effects of long-term wave loading.
3. Studies of the fundamental mechanisms of material corrosion and the influence of environment, stress, and materials on corro-

sion of reinforcement in concrete for engineering design. Engineering design is still largely based on deterministic methods instead of probabilistic methods. Analytical studies, laboratory investigations, and large-scale experiments of both fixed and floating platforms are needed.

Marine pipelines are exposed to the destructive forces of waves and currents. Hurricane waves induce significant bottom fluid velocities and cause movement and damage when pipelines are unburied. Buried pipelines are partly protected from environmental forces. Pipeline burial involves a three-way interaction between the pipe, the surrounding sediments, and the hydrodynamic forces produced by surface waves.

Engineers have been unable to define a complete mechanistic picture of what actually happens when a pipeline fails. Engineering design of marine pipelines is still largely based on empirical results and experiences. As pipeline burial is expensive and pipeline failures require costly repairs and production losses, it is important to develop a rational design procedure to predict the stability of buried pipelines in the ocean.

TERRESTRIAL STRUCTURES

Introduction. Terrestrial structures that are built along the beach or close to it have special problems because of their location in these areas. These problems are related to the environmental factors that are unique to the area. In many cases no special provisions are made for these conditions, and problems therefore, arise during, or subsequent to, construction. Two general categories of structures are roadways and buildings.

Roadways. The subsurface conditions for coastal roadways will usually consist of cohesionless soils that are reasonably loose. These soils can provide a good subgrade provided that they are adequately compacted. In areas where organic soils exist, considerable effort will be required to remove this material since it is an unacceptable subgrade material.

Location of coastal roadways may also be a problem where the roadway needs to be close to the ocean. Erosion of the shoreline, particularly during storm periods, has many times destroyed sections of these roads. In addition, problems with windblown sand covering the roadway leads to a continuous maintenance problem in areas where there are persistent winds and a source of sand.

Buildings. There are several problems associated with these structures in the coastal area. Special care must be taken to insure that an adequate foundation is provided. Unless special care is taken, slab-on-grade construction will often lead to settlement cracks in the structure. This type of foundation is also very susceptible to damage owing to loss of ground due to erosion or overwash. Where it is anticipated that erosion is likely, a deep foundation (piers or piles) should be used even though this type of foundation is not required from a load-carrying standpoint.

The design wind conditions in the coastal zone may also be more severe than for inland locations. In general, structures should be designed to withstand hurricane-force winds. This will require additional wind bracing and connection devices.

The elevation of the structures should be such that coastal flooding is anticipated. The structures should normally be designed so that the finished grade is above the 100-year predicted flooding level. Although this will not guarantee that flooding will not damage the structures and its contents, it will certainly minimize the possibility of damage.

Needs Associated with Terrestrial Structures. The following needs appear to be most important to improving the utilization of these structures:

1. Development of set-back lines and minimal floor elevations to minimize property loss caused by beach erosion, overwash, and coastal flooding.
2. Modifications to state building codes that take account of the unique environment in the coastal zone.

GENERAL SUMMARY

The purpose of this paper is to consider where additional effort is needed to improve the coastal resources by better utilizing structural considerations. The preceding sections of the paper have discussed a number of coastal-related resources where marine structures play an important role. Within these sections the structures were briefly discussed, and problems related either to the design, construction, or location of these structures were presented. Although each of these individual items is probably worthy of discussion during the workshop session, they might be best considered as examples of various areas of concern and the following more general questions might be posed:

1. Are improvements needed in design? Are design procedures that are now commonly used by design engineers satisfactory from both cost and safety standpoints? Is it possible that, by using more sophisticated analyses, less costly sturctures could be used that could provide the same factors of safety? In

conjunction with design improvements, are there areas where the forces and stresses being used for design are poorly known and therefore lead to the selection of higher values because of our lack of knowledge in this area?

2. Where design of the various structures appears to need improvement, is it because additional research is needed? In which of the following areas is research most important: (a) wave and current forces, (b) wind stresses, (c) structural analysis, (d) foundation conditions, (e) sedimentation and erosion, (f) material selection, (g) structural connections, or (h) corrosion problems?
3. Is it likely that considerable improvement in the utilization of structures could be effected by using the technology that now is available in advance design groups? That is, should efforts be undertaken to upgrade the design profession and make existing knowledge available to those engaged in marine-related design? There is no doubt that there are tremendous variations in the level of sophistication that is used in both design and construction, depending upon the consulting firms involved and the size of the project.
4. Have the improvements in construction techniques that have taken place during the past several years been applied to marine-related projects? Among these improvements are procedures for densifying foundation materials, prefabricating sections of a structural configuration, improved material-handling procedures, use of new high-strength material, and procedures for joining various elements of the final design. Could our ability to design, construct, and utilize coastal structures be improved by bringing these improvements in construction technology to the construction industry?
5. Finally, is the recognition of the need for a structural solution to solve resource problems a critical question? In the past a significant loss of resources has taken place because of the failure to recognize the need for a structural solution to deal with problems such as inlet instability, beach erosion, etc. The opportunity to better utilize our coastal resources by use of structural systems should be well recognized. It should also be noted that the use of structural systems for development of marine resources does not necessarily produce a solution that is incompatible with environmental concern. Present-day design practices commonly consider the environmental effects of these type structures and attempt to maximize the beneficial and minimize the detrimental effects of such projects.

MARINE STRUCTURES WORKSHOP REPORT

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The Marine Structures Workshop reviewed a broad spectrum of questions within the general subject area. This effort made substantial use of the excellent review provided by Dr. Jay Langfelder in his address to the general meeting. After a thorough review of his comments as well as those of the workshop members, a number of specific recommendations have been offered, separated into three categories: 1) technology transfer, 2) research and development, and 3) general.

DISCUSSION AND RECOMMENDATIONS

1. Technology Transfer. In this review, technology transfer is meant to include reprinting and distribution of pamphlets and literature developed by others; sponsoring of seminars and workshops; and public media promotions, advertisements, etc.

a. Low-Cost Shore Protection.

The continuing problem of widespread shoreline erosion combined with the growing number of private homes on these shorelines necessitates a program to explain the problem and the alternatives. These homeowners as well as the contractors attempting to help them need easily understandable guidelines for possible protection. The Corps of Engineers has developed one such pamphlet, and others may be available as well. Items to be included should cover design ideas for groins, bulkheads, revetments, etc.

b. Commercial Fishing Piers.

While these piers are relatively few in number, they represent a substantial tourist attraction in some states. Surprisingly, there does not appear to be a generally accepted set of design criteria for these structures available to the potential owner and contractor. Such design information can be developed from the marine structures literature used in present engineering practice.

c. Source Book for Coastal Data.

This digest or catalog, "Mother Ocean Catalog", would provide an important function for both private individuals as well as engineering and design firms and other groups working in the marine environment. This catalog should provide the user with a list of available data and the specific location where it can be obtained. The catalog should include:

(1) Tidal height and currents.
(2) Wave climate.
(3) Wind, temperature, etc.
(4) Extratropical storm climate.
(5) Hurricane frequency and surge data.

There is no doubt that other parameters will also be found as the catalog is compiled.

d. Small Craft Harbor Design.

While there are a number of design manuals for small marinas, they are somewhat dated and do not include relatively recent engineering advances or environmental concerns. A new manual is needed which includes an evaluation of floating breakwaters, non-vertical bulkheads, and commercially available pier modules. In addition, information is needed pertaining to the flushing problems and overall water quality in these harbors. This manual should be developed for use by both the design engineer as well as the owner-operator.

e. State Marine Advisory Services.

While most of the Coastal Plains States have marine extension agents (often Sea Grant-supported), there does not appear to be a great deal of coordination and cooperation of their activities in coastal and marine engineering. A program of mutual assistance and interaction is recommended, including the sponsorship of joint workshops, seminars, etc.

2. Research and Development. As with most aspects of marine resources, additional research and development is needed over the range of subjects within the area of marine structures. The

items listed are deemed worthy of immediate concern in the context of anticipated needs for development of the Region. While some of these topics may be appropriate for funding by the Coastal Plains Regional Commission (CPRC), it will be of significant help if the others can be endorsed by CPRC as they are proposed to other research programs. Such a policy of documented endorsements can prove to be of major importance in the justification of new research.

a. Winds, Waves, and Currents.

The prediction of forces on marine structures depends upon proper estimating of wind, wave, and current parameters. Better techniques are needed in making these estimates at specific sites, both nearshore and offshore. The recent advances in this area do not adequately address this problem of transferring regional hindcasts to specific sites.

b. Marine Pipeline Systems.

The accelerating use of large marine pipeline systems has outpaced our development of advanced design techniques. Research is needed in the areas of pipe design, placement and stability, and protection. In addition, the impact of these pipelines on their local environment needs considerable study.

c. Harbor Pollution and Siltation.

Both from a water quality as well as a shoaling concern, applied research is needed in predicting water circulation patterns in harbors. The flushing characteristics of complex port facilities are not readily predictable from the present state of the art of hydrodynamic modeling. The related problem of predicting the patterns and rates of siltation in these harbors is equally in need of further study.

d. Port and Harbor Construction.

Recent advances in construction technology and foundation engineering in particular have not been extended to marine structures. A combination of research and technology transfer is needed in order to reduce the cost and time for construction of large port and harbor structures.

e. Design of Coastal Structures.

Within the general category of coastal structures there are a number of problems which deserve immediate research and development. These needs are a direct result of present design considerations for existing and planned projects. This research should be directed towards improving the design criteria for:

(1) Large rubblemound structures subject to extreme deepwater waves.
(2) Nearshore structures including jetties, with particular attention on the interaction of the structure on the adjacent shoreline and channel alignment.
(3) Low-cost artificial reefs for both bottom and mid-depth placement.

The latter item should be viewed as an opportunity to establish a close working relationship between the engineer and commercial and sport fisheries researchers.

3. General Recommendations. The workshop made the following additional recommendations of a general nature:

a. The CPRC should take the initiative in encouraging the Coastal Plains States to install a greatly simplified and accelerated method for the permitting of marine structures by State and Federal agencies.

b. A program should be sponsored by CPRC to encourage the engineering and design community to recognize the importance of the aesthetic design of coastal and marine structures.

RECREATIONAL AND COMMERCIAL FISHING

RECREATIONAL FISHING PROGRAM AREA ASSESSMENT

By KENNETH A. HINMAN
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INTRODUCTION

Marine recreational fishing in the Southeast region is a particular challenge to coastal planners. This is among the fastest growing areas in the United States, both in terms of population, and recreational and industrial development to meet the needs of this population influx. At the same time, this region is seen as having the largest potential for future development of sport fishing. The Southeast, from North Carolina to Florida, boasts the largest number of recreational fishing participants, and with the number of anglers increasing at a rate estimated to be twice the National population rate, the demand for space on the South Atlantic shoreline is going to be ever more tremendous. Not only will anglers be competing with one another, but also with commercial fishermen expanding their activities to satisfy the growing demand for seafood protein, with other forms of recreation, and with commercial and residential developers, because the majority of the population continues to locate in the fragile coastal zone.

This scenario raises a number of serious concerns. Without planning in this area, the potential for recreational fishing development could be reduced to more fishermen with less fishing opportunity. Funding the sinking of an artificial reef here, or construction of a fishing pier there, may temporarily mollify some saltwater fishermen, but it is not the answer. Conducted under a comprehensive marine resources planning and management program, however, these actions and others can help to increase recreational fishing opportunities, facilitate the development of the Coastal Plains Region's fisheries, and create a positive economic impact on the Region.

RECREATIONAL FISHING PROBLEMS AND NEEDS

Perhaps the most visible problem created by a rapidly shrinking coastline, and one that gets a lot of attention from anglers, is that of public access to the fisheries. It is obviously a serious one and cannot be overlooked. Access is not only a concern of fishermen, it is a public right, and a concern of all citizens whose enjoyment of the marine environment is impaired because of limited beach access. State-owned lands should provide more boat launching and ramp facilities, as well as adequate parking areas. Where private property rights restrict public passage to shore or bay waters, free access routes should be acquired and maintained.

Despite the obvious benefits of increased access to saltwater fishermen, it all remains irrelevant without the fish, and so this becomes our greatest concern, the resource itself. With industrial and recreational development on the coast come a number of adverse impacts on the fisheries. In addition to denying access in a number of areas, it means increased pollution of estuarine waters, and the destruction and degradation of vital fish habitat. According to a Symposium on the Biological Significance of Estuaries, sponsored by the Sport Fishing Institute several years ago, marine pollution and alteration of the coastal environment are the biggest threats to coastal resources. Many of the species fished by anglers are dependent on the estuaries for all, or part, of their life span. Most recreationally important fish are found within state waters.[1] These two areas, the estuaries and the inshore waters, suffer the most devastating effects of coastal development and its resulting marine pollution.

It is difficult to measure the impact of pollution on the coastal fisheries, but we know it can be pervasive. Toxic substances slow down and distort the life processes of marine organisms. Damages to prey species affect their predators and cause repercussions throughout the entire ecosystem.

To realize the impact of coastal pollution in a more tangible way, consider the sport fishery for billfish in the Coastal Plains Region. Now here is much of the potential for development we have been talking about, and yet pollution poses a problem in a very elementary way. The volume of sewage disposed, the silt run-off from dredge-and-fill projects, and offshore concentrations of hydrocarbons (oil and tar) and plastics increase the turbidity of the water and can prevent the billfish from seeing the fishermen's baited hook. Consequently, anglers must travel further offshore to less polluted waters, which increases their expenditure of money and

time. Unfortunately, in 1973 the National Oceanic and Atmosphere Administration reported that 50% of a survey area off the Atlantic Coast was contaminated by oil and bits of plastic.

Still a problem concerning recreational fishing in all regions is the serious lack of data, both participatory (catch and effort) and biological. Not only do we need direct measurement of recreational fishing participation on the state and regional levels, but also we need to obtain reliable information on the socio-economic factors necessary to determine optimum use of marine resources. In fisheries management, consideration must be given to both commercial and recreational impacts on the economy of the region, the social fabric, and the fishery resource. We may safely conjecture that marine recreational fishing is of great economic importance to the Coastal Plains Region. Nationally, sport fishing, including its complementary industries, is estimated to provide twice the benefits (employment and service) and 40% of the food for human consumption as do the domestic commercial fisheries.[2] It is thought to be a leading motivator behind many other outdoor recreational activities as well. In some fisheries, the North Carolina king mackerel fishery for instance, the recreational catch is estimated to be somewhere between two and ten times the commercial catch. Nevertheless, estimates do not carry the weight of statistically reliable survey results, and furthermore, estimates cannot be broken down by state or region, only into smaller estimates.

Biological data are similarly inadequate. While we know that catches of king mackerel in North Carolina were up this year, catches of Spanish mackerel were down, and both were comparatively small in South Carolina and Georgia. The conditions of these stocks are still unknown. Specifically, work needs to be done to analyze and identify the populations of these pelagic species and others. Is there a North Carolina population of mackerel? Is there a Florida population? If so, what are their seasonal movements and how do they differ? Independent populations require separate consideration for management and conservation. To obtain this kind of information, extensive tagging is required. We also need to know more about the life histories of these fish. The mackerel are short-lived and cover a large geographical range, making them better able to withstand the higher fishing pressures to which they are subjected. Their potential resource production would seem to be high, but without further studies, this potential cannot be safely approached.

On the other hand, certain bottom-fish, such as the snappers and groupers, do not share this ability to recover quickly from heavy fishing pressure, and while recreational catch information in this fishery is somewhat better, a similar lack of biological data exists.

Another problem which is directly connected to a need for statistical information on recreational participation and the game fish stocks themselves is that of domestic commercial fishermen entering or expanding into traditionally recreational fisheries for so-called "under-utilized" species. To many persons in the sportfishing community, it is a wonder how certain species of game fish, such as the Spanish and king mackerel and the bluefish, ever came to be considered under-utilized, but the answer is simple: the available information on these species does not show otherwise. It does not make sense for species to be classified on the basis of the best available data when those data are insufficient for such a conclusion. We should at least make an effort to obtain this information so that responsible decisions can be made.

As it stands today, no commercial expansion in the mackerel fishery is in evidence, according to state officials, nor in the bluefish fishery, where commercial activity is more significant; but the idea behind the under-utilized species concept is to promote activity in certain fisheries and thus remove pressure from others that are overfished. The obvious concern for the sportfishing community is that commercial fishing not be encouraged in those fisheries that may already be fully or over-utilized. Again, it is statistical information that is needed to make these determinations, as well as a system for reviewing the recreational and ecological value of individual species.

The various state artificial reef programs have been a positive effort to enhance saltwater fishing; but these efforts have not received the support they deserve. The situation in North Carolina is typical of the inattention paid to recreational fisheries needs by state government. North Carolina initiated a reef project in 1973, funded by a gasoline tax rebate of ⅛ of 1%. In June of this year, a State legislative committee killed funding for the project. Funds were subsequently reinstated out of the general fund, but the $90,000 allocated is not even close to what is needed to continue an effective reef program.

In Georgia, funding of $40,000 yearly from the Coastal Plains Regional Commission is matched by the State. But while the reef program needs to be expanded, and there is room to do this because there is not much natural habitat and the water quality is adequate for reef communities, there is a feeling that the Coastal Plains Regional Commission may withdraw these funds in the future.

MANAGEMENT OBJECTIVES

The physical problems of public access, pollution, and overfishing, and the problems that can be associated with a lack of research and information, have not changed in recent years; they have only intensified. Present and past management schemes to deal with these problems have failed, and this is where our attention should be directed. How the fishery resource is managed in the near future will do the most to determine how many fish there will be.

It was pointed out above, in connection with the effects of pollution and environmental degradation on coastal resources, that the large majority of game fish species are found, at least for part of their lives, within the inshore, or state, waters. The prerogative for management rests with the states. They are closer to the problems and get more feedback on local anglers' concerns. Yet effective management cannot be realized solely on the state level for several reasons. State management of inshore game fish, as a rule, has never been effective, and has in many instances been non-existent. This situation was not wholly remedied by the Fishery Conservation and Management Act of 1976, which excludes fish in territorial waters, even though, like the anadramous striped bass, they may migrate from state to state, or between state waters and the Federal Fishery Conservation Zone, and in the process elude management altogether. It was thought that the opportunities for state participation in management created by the establishment of Regional Fishery Management Councils would stimulate the development of state management initiatives, but this has not been the case. Management in the past has been unsuccessful also largely due to state systems functioning in isolation, without interstate and state/Federal cooperation.

Modern fishery conservationists recognize that the previous course of concentrating attention on a few endangered species, or on only those of interest to sport fishermen, is incomplete and can as easily lead to disaster as doing nothing at all. A comprehensive approach to marine conservation and fisheries management, with a goal toward establishing and protecting complete and stable ecosystems, is necessary. This means that not only are the game fish important, but so are the estuaries that serve as breeding and nursing grounds for fish that may ultimately be captured hundreds of miles distant; the quality of the water which is affected by the activities of all coastal states; and the intricate biological relationships throughout the ecosystem.

Conservation and management initiatives must not be restrictive in scope, and a regional approach is the most practicable and efficient. Any regional management plan should incorporate two elements: a regional management scheme with state authority for implementation, and some kind of system of self-support, i.e., the system should pay for itself.

From an environmental and political standpoint, regional management makes sense. The framework already exists in the interstate compacts, as well as in the regional fishery management councils. Admittedly the Atlantic States Marine Fisheries Commission has not made a great deal of progress in solving regional problems to date, but the tools for implementing a management program are there, and the method of using existing state and Federal agencies in cooperation on matters of regional concern is a good one. Regional coordination among the states and the Federal Government should be exhibited in research and management: for example, the states supplying commissions with research data, then participating in planning and management decisions, and then carrying out the agreed upon plans in cooperation with neighboring states.

The link between the needed research and data and a self-supporting system is a marine recreational fishing license. A properly instituted license, such as a state license that gives reciprocal privileges among coastal states, or regional licenses for the Atlantic, Gulf, and Pacific Regions, can provide a statistically reliable source for the desperately needed information on the economic and social value of marine recreational fishing, the number of participants, and their impact on the resources—information that can be used in drawing up regional management plans.

FUNDING SOURCES

The license would also provide direct funding, along with Federal matching funds that would be made available through the Dingell-Johnson Act if a license were instituted, for biological research into such areas as life studies, predator-prey relationships, stock sizes, and population dynamics. In addition there would be money available for access facilities and artificial reef programs.

There are a number of additional ways of obtaining funds for state research and management that should be considered. U.S. Senate Bill 3094, which finished out the last Congressional session stalled in committee, would establish a Federal program for artificial reefs in the Atlantic and the Gulf of Mexico in the form of Federal grants to cover 75% of the cost of developing the reefs. Artificial reefs are a particularly attractive form of resource

management because they pay for themselves through improved offshore fishing. Hence such programs fit in well with the idea of a self-supporting system.

There have also been proposals to make available to the marine recreational fisheries a share of tax revenues that are unjustifiably withheld from this purpose. A portion of the gasoline tax revenues, for example, should go to fisheries management, and certainly more than ⅛ of 1%. Recreational boaters, as well as commercial fishing fleets, pay a measurable share of gasoline taxes, but these funds are channeled into the highway fund exclusively.

Another proposal is a 1% excise tax on the manufacture of boats, motors, and trailers as an extension of the Dingell-Johnson Act, which in 1950 established a 10% excise tax on fishing tackle to be used in fisheries programs. The average recreational boat (other than sailboats) is used more than 70% of the time for some kind of sport fishing, and is about as indispensable to many fishermen as the rod and reel.[3] It figures that recreational fishing is doing an awful lot for the boating industry, so the boating industry should carry its share of the costs to support the system, as the tackle manufacturers have been doing for years.

These proposals, in conjunction with the saltwater license, are methods of collecting money dedicated exclusively to marine recreational fishery management programs. They would not be popular, but they are not meant to be. They are meant to accomplish for sport fishing what we have been unable to do in the past. Dedicated funds have never been available in any way near what is required, and as long as the interests of the recreational fishing industries go largely unrecognized, competing interests will continue to dominate the coastal resources picture, to the detriment of the Coastal Plains Region.

CONCLUSION

The Coastal Plains States will continue to grow, and recreational development must expand and diversify with this growth. In planning for this, the recreational fishing community should not be thought of as just another special interest. In truth, its interest in the conservation and wise use of marine resources is common to all.

The immediate physical requirements of the sport fisheries in this Region, as elsewhere, are essentially a matter of funding and management. Although I may be wrong, I think that there is little disagreement on what needs to be done. Controversy really begins when we discuss where the funding should come from and how the management system should be constructed.

Comprehensive fisheries management planning on the State and Federal levels, highlighted by Regional cooperation, is the best alternative. A variety of funding sources have been suggested for the recreational fisheries aspect of management, with particular emphasis on a saltwater licensing program. There will doubtless be others heard today and tomorrow, but most importantly, we should not lose sight of the fact that if we continue to let planning opportunities go by the board, our funding and management alternatives will certainly diminish.

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COMMERCIAL FISHING PROGRAM AREA ASSESSMENT

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INTRODUCTION

On a global scale, interest in commercial fisheries has rapidly increased in recent years. In large part, this has resulted as coastal nations have come to appreciate fishery resources as a source of strategic food and income and, at the same time, have realized that the industry creates substantial new opportunities in economic development. The ensuing political, technical, economic, and social issues have, however, added immense burdens on government. As a result, many nations, including our own, have not yet decided how to deal with the opportunities posed.

BACKGROUND

Under the Law of the Sea single negotiating text for fisheries, responsibilities placed on each coastal state are clearly spelled out. For background purposes, it is interesting to study these responsibilities since they offer important insight on the division of functions between government agencies and other bodies set up to direct or promote commercial fisheries (Campbell, 1978).

The Law of the Sea negotiating text requires coastal countries to:

1. Determine the allowable catch in exclusive zones.
2. Ensure, through proper resource conservation and management, that the living resources are not endangered by exploitation.
3. Maintain populations of harvested species at levels which ensure maximum sustainable yields, providing that relevant environmental and economic factors are duly considered.
4. Take into account impact on associated species, i.e. by-catch.
5. Provide and exchange scientific, statistical, and other data with various organizations and other nations.
6. Promote the objective of optimum utilization, without prejudice to any of the foregoing responsibilities.
7. Determine the country's capacity to harvest the resources and, in cases where it does not have the capacity to harvest the total allowable catch, to give, after taking into account all present and future considerations, other nations an opportunity to harvest the remaining portion of the allowable catch.
8. Take into account, before allocating fishing rights to other nations, the following factors:
   a. The significance of the living resources of the area to the economy of the coastal state concerned and the country's other national interests.
   b. The rights of land-locked and geographically disadvantaged developing coastal states with no exclusive economic zones of their own.
   c. The requirements of developing countries, within the region, in harvesting part of the surplus.
   d. The need to minimize economic dislocation in nations whose nationals have habitually fished in a zone or which have made substantial efforts in research and in the identification of stocks (Campbell, 1978).

As apparent from the above, there is, among governments, a detailed recognition of the need for resource assessment, conservation, management, statistics, and data compilation. As such, these items have historically been considered a part of national fisheries programs. In fulfilling these recognized responsibilities, governments seek, and generally give serious consideration to, the views of the commercial industry. The implementation of these programs then allows government fishery agencies to draw up regulations to police, enforce, and adopt management devices to control the level of effort, to establish possible quotas, and to potentially control fishing methods (Ball, 1978).

While management receives considerable attention, development often goes unnoticed. Indeed, fishery development initiatives by government, while well-meaning, have seldom given due consideration to many of the crucial problems of business and economic development (Curlin, 1978). For example, on the domestic scene, there have been proposals for:(a) loans for purchase and repair of vessels;(b) loans and grants for economic dis-

asters;(c) manpower training programs; (d) market reports and information; (e) seafood sanitation programs; (f) market promotions; (g) technical assistance grants; and (h) support of fishermen's cooperatives (Curlin, 1978). Each of these initiatives, unfortunately, has often been aimed at a specific industry problem. This piecemeal approach may reflect an underlying failure of our Nation's government to recognize the role of industry as described in the Law of the Sea text.

By the same token, the commercial fishing industry suffers, in many regards, from a lack of imagination, perspective, and understanding of government's intentions. With the exception of the industrial fish processors, canners, and some of the companies owned by large food processors, much of the industry is no more than an array of harvesters, processors, importers, and marketers pursuing somewhat independent economic and business goals (Curlin, 1978). This will, however, change. As the industry follows the pattern of the other resource-based companies, a gradual shift toward vertical and horizontal integration can be expected. This will occur at different rates, depending on the species, markets, economic forces, labor, and sociological factors. While certain fisheries will remain isolated, others will become increasingly more integrated.

COMMERCIAL FISHING AND THE GOVERNMENT'S LABYRINTH

As described by Campbell (1978), many government departments, in the exercise of their responsibilities, have influence on the industry's future growth and prosperity. This array of agencies has tended to limit communication between government and industry. For example, government agencies which have an impact on fisheries include:

1. The operations of trade and customs departments which deal with the content of imports and exports, trade practices, prices, and tariffs.
2. Departments with responsibilities in the area of vessel safety and rules, surveys, and equipment specifications.
3. The communication agencies, especially ship-to-shore and ship-to-ship radio-transmission-related activities.
4. Health or sanitary departments which control hygiene and quality standards (Campbell, 1978).

Each of these units of government can, and does, exert control on the industry's present and future status. Additional government departments which, among others, can be expected to have impact include:

5. Those agencies responsible for industrial relations, training, and enforcement of safety.
6. The treasury and finance agencies which exercise an influence on credit conditions, financial controls, interest rates, grants, subsidies, and incentives.
7. The international departments through their dealings with foreign governments.
8. The defense agencies which maintain, in part, surveillance.
9. The agencies, concerned with environment, which are responsible for fishing gear, pollution control, shoreline use, etc. (Campbell, 1978).

In addition to some of the principal government agencies already noted, there often are various quasi-government bodies which have responsibilities that may affect the industry. These bodies can include:

1. Finance corporations and banks which make loans to the fisheries sector.
2. Port and harbor authorities that administer key facilities.
3. Urban and rural planning boards responsible for outlining use of resources.
4. Insurance companies that specialize in providing insurance to facilities for specific industries.
5. Import/export corporations concerned with foreign trade.
6. Import/export banks which provide finance for corporate operations (Campbell, 1978).

With this labyrinth of government rules and regulations, the industry's effort to expand and develop becomes difficult. Without strong government leadership and support, development is extremely difficult.

THE DOMESTIC SITUATION—MANAGEMENT

In the United States, user groups, concerned over allocations of existing domestic resources, are turning to the Fishery Management Councils for guidance. All is not, however, simple. While both sport and commercial interests can take satisfaction in the Council's efforts to interrelate the social, economic, and biological questions, there remains a partial void, particularly in regard to those resources that have enjoyed little historic interest by harvesters. Whether it be herrings, jacks, or any one of a score of other species, many stocks remain poorly understood, let alone used. Indeed, while the Fishery Conservation and Management Act is a

reflection of many of those subjects discussed in the Law of the Sea text, many areas are not well defined. For example, as in other countries, we have separated management and development by law, but we have not yet created the administrative structures to relate the two.

THE DOMESTIC SITUATION—DEVELOPMENT

While the world's fisheries catch continues to rapidly rise, our own domestic production has grown slowly. With both sport and commercial harvests directed at a limited number of species, our Nation has not, as a consequence, used many of the stocks available. In part, this has resulted in a growing dependence on imported seafood products. Indeed, our balance of trade deficit in fisheries continues to expand beyond its current two-billion-dollar level. American consumers, while traditionally limited in their tastes, have, however, begun to show signs of expanding their culinary interests. Increased selection, new product forms, and rising costs of luxury foods have spurred this development. Additionally, institutional and retail offerings are beginning to reflect the availability and variety of new seafood items. Traditional favorites, i.e. shrimp, tuna, and important groundfish, will someday be joined by a host of new selections.

Last year, American consumers purchased almost ten billion dollars worth of seafood products. These purchases grew most rapidly through institutional channels, a reflection of the American penchant to dine outside the home. More than five million metric tons of seafood were sold. While the figures appear most impressive, they require scrutiny. Indeed, the figures reflect a continued reduction by domestic harvesters in the domestic market-share. Few consumers recognize that the widely touted 200-mile limit has not yet reversed our dependence on imported seafood.

OPPORTUNITIES

What steps are available for the commercial industry to expand without upsetting the growing recreational interests? First, it is important to realize that both fisheries management and development must have economic objectives. This is clearly spelled out in the Law of the Sea text. This results, as already noted, because coastal governments look to their commercial fishing industries to provide important input to the nation's commerce. While there are varying degrees of importance attached to the commercial versus the social aims of fisheries, the basic objectives, in a majority of instances, focus on the appropriate search for economic benefits. As a consequence, those responsible for fisheries management must act with the same overall concern for the good of the nation as those concerned with development. In so doing, government and industry must protect their independence, but deal with the various users in a fair, impartial, and open manner.

Since the passage of the Fishery Conservation and Management Act, the domestic industry has shown great interest in reasserting itself. However, as described, numerous and formidable barriers must be overcome. Specifically, the industry must address the following (Anderson, 1978):

1. The domestic industry is fragmented, i.e. the seafood industry is composed almost entirely of small businesses. The majority of these enterprises are unable to easily acquire the financial, technical, or managerial support needed for major expansion.
2. Over half of the domestic processing plants employ fewer than 20 people, with annual sales of less than $350,000. By comparison, the average for other food-related industries approaches 56 employees, with nearly four million dollars in annual sales.
3. American vessels have limited harvesting capacities, with the average vessel employing three crewmen, or less, with annual gross earnings of less than $100,000.
4. Industry-wide capital requirements are substantial. To replace foreign participation, and achieve additional growth over the next 10 years, an investment of five billion dollars may be needed to modernize and construct needed vessels and processing facilities. At present, the domestic fleet appears capable of harvesting only one-fifth of the available finfish resources.
5. Domestic fleets and processing facilities are tradition-bound. For example, harvesting and production are concentrated on a limited number of species, with a few species accounting for 60% of volume and 70% of value. Additionally, 80% of the industrial fish catch is concentrated on a single species, i.e. menhaden. Expansion will require considerable product diversification with significant market development, both here and abroad.
6. Seafood transportation and marketing networks are poorly established. Most processing, storage, and transportation facilities, as well as marketing support services, are undeveloped. Considerable

modernization and technical input, reflecting the experiences of other food-related industries, are required:

Through joint action of industry and government, fisheries development can thus mean the establishment of:

1. Solid economic bases for analyzing growth opportunities.
2. Basic information and training for industry diversification and growth.
3. Financial incentives (i.e. loans, loan guarantees, and tax incentives) to reduce risk and encourage expansion.
4. Mechanisms whereby industry can act collectively to solve its own problems (Anderson, 1978).

Though little industry expansion has been noted in recent years, the future of fisheries development to the Nation offers:

1. Potential for greater cash flow and capital accumulation.
2. Increased interest by the investment community.
3. Greater opportunity for export market development.
4. Improved quality control and consumer protection.
5. Greater availability and variety of product selection (Anderson, 1978).

SUMMARY

While commercial fisheries development poses major challenges to industry and government, the opportunities and rewards are great, offering both public and private benefits. These challenges can be pursued in light of greater concern for sport fishing interests, particularly as user groups begin to better appreciate their respective interests, needs, and opportunities. To meet and fulfill these opportunities will, however, require the same insight that other nations are employing as they better understand the complexities of the Law of the Sea. The challenge has been posed. Both industry and government must now more clearly define the appropriate goals and objectives, then pursue them with the same enthusiasm that generated the Fishery Conservation and Management Act of 1976.

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RECREATIONAL AND COMMERCIAL FISHING WORKSHOP REPORT

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Discussion in the workshop session pointed out several problem areas which affect the fisheries industry of the Region. The top three problems, in order of priority, were identified as: 1) insufficient statistical data on fish stocks and user groups, particularly recreational fishermen; 2) a need for increased or improved efforts in marine information and education; and 3) inadequate funding for artificial reef construction and maintenance. Other problem areas which were discussed but which were given no particular priority included: 4) a need for improved access to fishing opportunities and overcrowding of many prime fishing areas, particularly with respect to recreational fishing; 5) a need for improved organization of commercial and recreational fishermen and closer cooperation within and among these two general groups; 6) the labyrinth of regulatory agencies which impact or inhibit commercial fisheries development; 7) a need to continue development of new and expanded fishery marketing opportunities, especially for underutilized species; and 8) a need for centralized port facilities to service the commercial fishing industry.

DISCUSSION AND RECOMMENDATIONS

1. Lack of Statistical Data on Fish Stocks and Fishermen. The lack of sufficient information on fish stocks and on fishery resources user groups was identified as the most pressing problem which must be adequately addressed in order to permit the optimum management of fish stocks, as mandated under the Fishery Conservation and Management Act (FCMA), and in order to allow rational development of fishery resources for both commercial and recreational interests.

The basic biological aspects of the life histories of many commercial and recreationally important species are poorly understood and, in some cases, completely unknown. Additonally, socio-economic information on user groups is incomplete. The recreational fishing population, for example, is not well-identified in terms of numbers of participants or in terms of economic importance on State, Regional, or National levels.

Passage of the FCMA has brought an accelerated need for information on fish stocks and fishermen for use in making resource management decisions. To a certain extent, the Act has promoted an increased effort to acquire the necessary information but much remains to be done.

Specific recommendations on how to meet the need for this information included:

a. Establish a centralized Regional system for collecting, cataloging, storing, and disseminating information and data on fishery resources.
b. License marine recreational fishermen in order to identify and enumerate this user group and thereby streamline the process of obtaining the appropriate information needed for fishery management purposes. Licensing could also provide much of the funding needed to increase research and data gathering efforts.
c. Increase the existing efforts through increased appropriations at the State, Regional, and National levels.

2. The Need for Increased Efforts in Marine Information and Education. This was identified as the number two priority problem area by the workshop group, and it was felt that improvement in existing marine information and education efforts is basic to the solution of many of the other problem areas outlined in this report. Recommendations relative to the problems of inadequate data on fish stocks and fishermen, improved fishing opportunities, improved organization and communication among fishery resource users and managers, the regulatory labyrinth, fishery market development, and development of seafood ports pointed to the need for improved information and education efforts. It was recommended that a central Regional information and education func-

tion, coordinated with similar programs at the State and National levels, be created. It was also recommended that the Coastal Plains Marine Center might logically assume this role.

3. Inadequate Funding For Artificial Reef Construction and Maintenance. This was identified as the number three priority problem area by the workshop. Artificial reefs have been demonstrated to be valuable fishery management tools by increasing the habitat available for fish populations, increasing the productivity and harvestability of certain finfish and shellfish, and providing quality fishing close to access points and a means to help distribute fishing pressure over a larger area. Further, they have been shown to have a beneficial effect on the economies of local communities through stimulation of recreational fishing-related expenditures and can serve a very useful function of making beneficial use of large quantities of scrap material and solid wastes such as obsolete ships, boats, barges, automobile and truck tires, construction rubble, etc.

While some of the States of the Region do have coherent State-wide programs for artificial reef construction, maintenance, and research, administered by the appropriate State agency, all do not. Likewise, sources of funding differ from State to State, there being no reliable single source of funding available on a long-term basis.

Recommendations on how to provide this funding included:

a. Licensing of marine recreational fishermen with a portion of the license fee being earmarked for artificial reef construction.
b. Legislation at the State level which would allow the use of unrebated fuel tax revenues from the sale of boat fuel for the purpose of reef construction and maintenance. Such legislation was, at one time, in force in North Carolina and, for several years, provided funds for reef construction.
c. Support for Federal legislation which would provide funds for artificial reef construction, such as Senate Bill S. 3094, introduced in the 95th Congress by Senator Richard Stone of Florida. This bill expired in committee with the adjournment of Congress but may be reintroduced in the 96th Congress.
d. Levy an advance or pre-paid tax on the sale of new tires to provide a pool of funding for use in disposal of tires, a portion or all of which could be used for disposal of tires at artificial reef sites.
e. Utilize obsolete offshore oil and gas rigs as reefs rather than dismantling them.

4. Need for Improved Public Access to Recreational Fishing Opportunities. As the population in the coastal areas of the Region grows, and as more and more people spend their leisure time at the coast, the demand for access to recreational fishing opportunities grows. In fact, as is pointed out in the program area assessment paper on recreational fishing, the area from North Carolina to Florida boasts the largest number of recreational fishing participants and, with the number of anglers increasing at a rate estimated to be twice the national population growth rate, the demand for space on the South Atlantic shoreline is going to be ever more tremendous.

It was the consensus of the workshop group that this problem is more acute in some sections of the Region than in others but, nevertheless, the lack of adequate berthing space in marinas, crowded conditions at boat-launching ramps, the demand for space on well-known prime fishing grounds, and the resulting crowded conditions all were felt to be significant problems affecting the current and future development of the recreational fishing (and boating) industry. Specific recommendations for alleviating these problems included:

a. Conduct a survey of the Region to determine specifically what geographic sections are lacking in recreational access facilities and determine what can be done to stimulate their development by the private and/or public sector.
b. Provide funding for the development of public and municipal marinas and boat basins.
c. Provide additional funds to the States for the purpose of constructing launching ramps for trailered boats.
d. Provide funding for the construction of public fishing piers and for construction of fishing access facilities, such as catwalks, at bridges and jetties.
e. Increase funding for the construction and maintenance of artificial reefs in order to improve the habitat for marine game fish and increase the availability of prime fishing space.
f. Increase the information/education effort aimed at informing the public of the locations of prime fishing areas, especially those not widely known or used, the locations of appropriate access points, how to fish for those species likely to be found at such locations, etc.

5. Need for Improved Organization of the Commercial and Recreational Fishing Industries and Closer Cooperation Within and Between These Groups. There was a general feeling that the various segments of the commercial fishing

industry and particularly the recreational fishing industry are fragmentally organized, and that both groups tend to think of themselves as separate and distinct entities rather than as one resource user group with many common interests. It was recommended that cooperation between the two groups could be stimulated through better information and education programs at the State Regional, and National levels. This effort should place particular emphasis on intra-industry dialogue concerning matters of mutual interest and should seek to foster cooperation among both commercial and recreational factions and the various fishery management organizations, particularly the Fishery Management Councils, in working towards resource management decisions.

6. The Regulatory Labyrinth. The program area assessment paper on commercial fishing pointed out that the array of government agencies which have influence on the commercial fisheries industry's growth and prosperity has tended to limit communication between government and industry. This view was reiterated by the workshop participants.

It was concluded that the solution to this problem, as it affects the industry, is inextricably intertwined with that of the previously mentioned problem areas, of information and education and improved organization of the fisheries industry. That is, improved organization of the fisheries industry, and improved communication among factions of the industry and between industry and government, should help to reduce the impacts of regulation on the industry. Likewise, it should help to reduce industry myopia and bring greater awareness of opportunities and needs for growth and changes.

7. The Need for New Markets for Commercial Species. In order for the commercial fisheries industry to grow and prosper, there is a need to develop new and expanded markets for fishery products, particularly for currently underutilized species. It was felt that the commercial fisheries industry of the Region, in cooperation with the State and Federal governments, is making a very strong and timely effort in this direction at the present time, and that this effort should be continued and perhaps increased through the existing programs of Sea Grant, State and Federal fishery marketing agencies, and industry organizations such as the Gulf and South Atlantic Fishery Development Foundation, Inc.

Several persons in the workshop also felt that there is a corollary need to determine whether many species of fish which are thought to be underutilized are, in fact, underutilized. That is, the underutilized designation of certain species is based on the commercial harvest, rather than on combined figures for commercial and recreational harvests. It was felt that some such species might not be underutilized if the recreational harvest were considered. This further indicates the need for improved data on the recreational fisheries, since statistical data on the recreational catch of many species is unavailable or unreliable.

8. Need for Centralized Port Facilities to Service the Commercial Fishing Industry. There was a general feeling that the limitations of existing port facilities are inhibiting the growth and development of the commercial fishing industry, and that the development of centralized seafood industrial parks could have positive effects on the level of total catch and its distribution and marketing. It was recommended that the current efforts to develop the concept of seafood industrial parks in the Region and to actually build them should be continued.

At least one participant in the workshop who represented the commercial fishing industry, however, expressed concern with the concept since, he felt, it would place some members of the fisheries industry in competition with businesses which located in the parks and would, therefore, be essentially government-sanctioned or subsidized. It was pointed out that the purpose of seafood industrial parks is not to create a government subsidy for industry but to provide private investors the opportunity to lease and develop their own private operations within a central service-oriented complex.

Two ways to allay this apparent fear of government competition and control were recommended:

a. Improved information and educational efforts by the States involved in developing the seafood industrial park concept in order to inform the fisheries community of the benefits which can be derived from such complexes.
b. Financial assistance to existing members of the seafood industry in the respective States for the purpose of locating in such parks.

SUMMARY
OF RECOMMENDATIONS
AND INFORMATION ON
CONFERENCE PARTICIPANTS

SUMMARY OF RECOMMENDATIONS

RESEARCH AND DEVELOPMENT (Recommendations are not necessarily in order of priority.)

1. Continue the program to establish marine research facilities, to include such facilities in Virginia and Florida.
2. Expand the marine research facilities already established in North Carolina, South Carolina, and Georgia.
3. Support projects developed to communicate results derived from research and development to users and scientists, to include continuing support of the Coastal Plains Marine Center.
4. Support Regionally-oriented, economically relevant projects that have been properly reviewed.
5. Undertake joint multi-state programs to explore common problems such as fishery management and offshore oil and gas development.
6. Utilize basic research to achieve an improved capability to predict the results of actions proposed to be taken in the marine environment.

MARINE TRANSPORTATION (Recommendations are not necessarily in order of priority.)

1. Provide services which will monitor and abstract new laws and the writing and rewriting of rules and regulations that relate to the maritime industry and, when necessary, visit regulatory agencies and lobby in behalf of the industry, so as to minimize the adverse economic impact of these regulatory activities.
2. Study the development of a Regional, single-source organization that will deal with the public agencies and, through professional institutions in the Region, provide expertise in the evaluation process associated with permits for construction in coastal areas, so as to minimize the repetitive, time-consuming, and costly process necessary to obtain such permits.
3. Study the appropriate methodology for the collection of data for subsequent analysis and publication, so as to determine whether the mitigation process involving the permit grantee and the regulatory agency is fair to both public and private interests.
4. Produce a profile of public opinion to guide information and educational programs which would be prepared and distributed to appropriate news media over an extended period of time, so as to improve public awareness and understanding of the economic impact of the maritime industry.
5. Study the volume of activity which seafood industrial parks could be expected to generate, the reaction of fishing boat operators, and costs associated with a program to exploit the vast potential export for frozen fish.
6. Form a council of State Governors, steamship industry leaders, port operators, harbor pilots, and professional marine engineers to provide the Congress with an in-depth grasp of the dredging situation and to make recommendations toward resolving related problems through the provision of necessary funds and equipment.

MINERAL AND CHEMICAL INDUSTRIES (Recommendations have equal priorities.)

1. Investigate and evaluate peat, uranium, geothermal, and solar resources as alternative sources of energy for the Coastal Plains States.
2. Evaluate and develop mineral and chemical raw materials in the Coastal Plains States, both onshore and offshore, in order to offset dependence on foreign imports and to increase economic growth in the area.
3. Provide objective information to the general public, elected officials, and other decision makers on the benefits of mineral and chemical industries in their lives.

MARINE STRUCTURES (Recommendations are not necessarily in order of priority.)

1. Improve technology transfer (utilizing pamphlets and other literature, seminars, workshops, media promotions, etc.) by:
   a. Compiling a pamphlet, including design ideas for low-cost protection of shorelines subject to erosion, to explain to affected homeowners the problem and alternative solutions.
   b. Developing design criteria for commercial fishing piers for the use of potential owners and contractors.
   c. Compiling a catalog containing oceanographic data for the use of private individuals, engineering and design firms, and others.
   d. Developing an up-to-date manual for the design of small marinas for the use of both owner-operators and design engineers.
   e. Coordinating the activities of coastal and marine engineering extension agents in the Coastal Plains States so that mutual assistance is achieved through cooperative ventures such as joint workshops, seminars, etc.
2. Support additional research and development in

the area of marine structures, with particular emphasis on techniques for estimating winds, waves, and currents; techniques for design of marine pipeline systems; predictions of water circulation patterns in harbors; capitalizing, through further research and technology transfer, on the application of recent advances in construction technology and foundation engineering to ports and harbors; and improved design criteria for large rubblemound structures, nearshore structures including jetties, and low-cost artificial reefs.

3. Encourage the installation of a greatly simplified and accelerated method for the permitting of marine structures in the Coastal Plains States.
4. Encourage the engineering and design community to recognize the importance of the aesthetic design of coastal and marine structures.

RECREATIONAL AND COMMERCIAL FISHING (Recommendations 1, 2, and 3 are in order of priority. Other recommendations are of lower priority and equal among themselves.)

1. Improve the availability of statistical data and information on fish stocks and fishermen by:
   a. Establishing a centralized Regional fishery data and information storage, retrieval, and dissemination system.
   b. Encouraging the licensing of marine recreational fishermen.
   c. Increasing appropriations for biological research on fish stocks, data collection on user groups, and information dissemination at State and National levels.
2. Increase efforts in marine information and education by establishing a central Regional information and education program, coordinated with similar programs at the State and National levels, which would assume the appropriate information and education functions recommended in paragraphs 1a, 4f, 5a, 5b, 5c, 6b, and 8a of this section.
3. Increase funding for artificial reef construction and maintenance by:
   a. Utilizing revenues obtained from licensing of marine recreational fishermen, if licensing is enacted.
   b. Encouraging the enactment of State legislation which would allow use of unrebated fuel tax revenues, generated from sales of boat fuel, for the purpose of reef construction and maintenance.
   c. Supporting Federal legislation to provide appropriations for reef construction and maintenance.
   d. Encouraging legislation to require an advance tax on the sale of new tires in order to provide funds for disposal of the tires (i.e. at artificial reef sites).
   e. Encouraging the use of obsolete offshore oil and gas rigs as reefs.
4. Improve public access to recreational fishing opportunities by:
   a. Conducting a survey to determine geographic needs for access facilities.
   b. Providing funds for development of public marinas and boat basins.
   c. Providing additional funds to the States for the purpose of constructing launching ramps for trailered boats.
   d. Providing funds for construction of public fishing piers and fishing access facilities at bridges and jetties.
   e. Increasing funding for construction of artificial reefs in order to improve habitat for marine game fish and increase the availability of prime fishing space.
   f. Providing information to the public on the locations of prime fishing areas, appropriate access points, fishing techniques, etc.
   g. Encouraging the streamlining of the process of obtaining the permits necessary for construction of access facilities.
5. Foster improved organization of the commercial and recreational segments of the fisheries industry and closer cooperation within and between these groups by:
   a. Encouraging participation by organized recreational and commercial fisheries groups in appropriate conferences, workshops, public hearings, and meetings of regulatory and management agencies.
   b. Encouraging intra-industry dialogue through increased information and education efforts at the State, Regional, and National levels.
   c. Emphasizing the needs for organization through information and education media.
6. Ease the impacts of regulations by:
   a. Encouraging better communications between government and the various sectors of the fisheries industry.
   b. Improving technology and information transfer with respect to new opportunities and techniques in fishing, processing, marketing, fishery product transportation, and matters of regulatory compliance.
7. Continue and expand current efforts to develop new markets for commercial species by:
   a. Increasing funds for the purpose in the existing programs of Sea Grant, State and Federal fishery marketing agencies, and industry organizations.

b. Encouraging and funding research to determine the true status of species considered to be underutilized.

8. Continue current efforts to develop seafood industrial parks and attempt to allay the fears of members of the commercial fisheries industry concerning the concept by:

a. Improving information and educational efforts to inform the commercial fisheries community and members of allied industries of the benefits which can be derived from such development.

b. Providing financial assistance for the purpose of locating in seafood industrial parks.

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Roger D. Anderson, a native of Racine, Wisconsin, received his Bachelor's Degree from St. Olaf College and his Master's and Ph.D. Degrees in marine biology from Texas A&M University. Dr. Anderson was formerly a Senior Marine Scientist at the Virginia Institute of Marine Science and since early 1977 has been Executive Director of the Gulf and South Atlantic Fishery Development Foundation, Inc., headquartered in Tampa, Florida.

Edward Chin received his Bachelor's Degree from Harvard University, his Master's Degree from the University of New Hampshire, and his Ph.D. Degree from the University of Washington. He is Director of the Marine Sciences Program of the University of Georgia and of the Georgia Sea Grant Program.

Billy L. Edge received his Ph.D. Degree in civil engineering from the Georgia Institute of Technology. He spent two years with the U.S. Army Corps of Engineers in the Great Lakes area and has spent the last eight and one-half years at Clemson University, where he is a professor in the Department of Civil Engineering. Dr. Edge is currently on leave of absence, working with Dames and Moore, Inc., in their Washington, D.C. office.

Richard J. Fox has been with Standard Oil Company (Indiana) in various subsidiaries for the past fourteen years. He has experience in marketing, planning, and public and government affairs. Mr. Fox presently is a Washington representative with primary responsibilities for land management issues.

William J. Hargis, Jr. received his Bachelor's and Master's Degrees from the University of Richmond and his Ph.D. Degree from Florida State University. Dr. Hargis has been the Director of the Virginia Institute of Marine Science since 1959 and has served on several service committees at the National level. In addition, he holds memberships in a number of professional organizations and is the author of numerous research publications and essays on marine resources.

Kenneth A. Hinman is a native of Summit, New Jersey, and graduated from the University of New Hampshire with a major in environmental conservation and a minor in environmental communication. He is Executive Assistant to the President of the National Coalition for Marine Conservation.

Julius Kurens completed his undergraduate work at the City University of New York and has done graduate work in public administration at New York University. Mr. Kurens joined the Maritime Administration in 1963 as Personnel Director for the Eastern Region and was appointed Deputy Director in 1971.

L. Jay Langfelder received his Bachelor's and Master's Degrees in civil engineering from the University of Florida and his Ph.D. Degree in civil engineering from the University of Illinois. Dr. Langfelder is a member of several advisory councils and is currently Head of the Department of Marine Science and Engineering at North Carolina State University.

Norman K. Olson received a Bachelor's Degree in geology from Iowa State University and a Master's Degree in geology from the University of Iowa. Mr. Olson is a member of several professional societies, has performed field work in the Rocky Mountains, Alaska, and the Southeast, and is currently the South Carolina State Geologist and Director of the South Carolina Geological Survey.

Margaret M. Stamey, a native of Asheville, North Carolina, is a graduate of Brevard College and has studied at the University of Maryland. Mrs. Stamey has served as Deputy Principal Clerk for the North Carolina House of Representatives and has been a member of the South Atlantic Fishery Management Council since 1977.

James M. Waddell, Jr. is a graduate of The Citadel in civil engineering and holds an Honorary Doctor of Laws and Letters from The Citadel. He is a former member of the South Carolina House of Representatives and has served in the South Carolina Senate since 1960. Senator Waddell is a member of several Standing and Special Committees in the South Carolina Senate, was instrumental in the drafting and passage of South Carolina's coastal management legislation, and is currently Chairman of the South Carolina Coastal Council.

W. Don Welch received a Bachelor's Degree in economics from the University of Florida and a Master's Degree in transportation from the University of Tennessee. Mr. Welch has served on the executive committees of the American Association of Port Authorities, the International Association of Ports and Harbors, and the South Atlantic and Caribbean Ports Association. He has served as Executive Director of the South Carolina State Ports Authority since 1971.

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