SOUTH CAROLINA
SEA GRANT CONSORTIUM

ANNUAL REPORT
1987-1988

Printed Under The Direction Of The
State Budget And Control Board

The Honorable Carroll A. Campbell, Jr., Governor
The Honorable Members of the South
Carolina General Assembly

Your Excellency, Ladies and Gentlemen:

On behalf of the S.C. Sea Grant Consortium Board of Directors, it is my pleasure to present to you the annual report of the S.C. Sea Grant Consortium for the fiscal year 1987-1988.

We appreciate your continued assistance and cooperation and look forward to working with you during the next year.

Please do not hestitate to call on us if we can be of service.

Respectfully submitted,

BOARD OF DIRECTORS
S.C. SEA GRANT CONSORTIUM

DR. JAMES A. TIMMERMAN, JR.
Chairman

September 1, 1988

Dr. James A. Timmerman, Jr.
Chairman, Board of Directors
S.C. Sea Grant Consortium
Charleston, S.C. 29401

Sir:

Attached hereto is the annual report of the S.C. Sea Grant Consortium, for fiscal year 1987-1988.

This report contains a description of the activities and accomplishments of Sea Grant Consortium programs in marine and coastal research, education and extension. More detailed information is available and can be supplied upon request.

We look forward to working with you and the Board of Directors during the next year.

Respectfully submitted,

MARGARET A. DAVIDSON
Executive Director

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THE SOUTH CAROLINA SEA GRANT CONSORTIUM

Created by South Carolina Act No. 643 in 1978 (amended May 6, 1987, R106, H2331), the principal purpose of the South Carolina Sea Grant Consortium is to provide a mechanism for the development and management of the Sea Grant Program for the state of South Carolina and adjacent regions that share a common environment and resource heritage. The Consortium serves to support, improve and share research, education, training, and extension programs in fields related to ocean and coastal resources. The Consortium further encourages and follows a regional approach to solving problems or meeting needs relating to ocean and coastal resources in cooperation with appropriate institutions, programs, and persons in the region.

Charter Members

The membership of the Consortium consists of the College of Charleston, Clemson University, the Medical University of South Carolina, South Carolina State College, S.C. Wildlife and Marine Resources Department, The Citadel and the University of South Carolina. These members are designated as charter members.

The terms of the membership are perpetual, and a majority of the charter members may vote the admission of a new member into the Consortium.

Board of Directors

The Board of Directors for the Consortium is comprised of the chief executive officer of each of the participating educational institutions and state agencies or his designee.

Executive Director

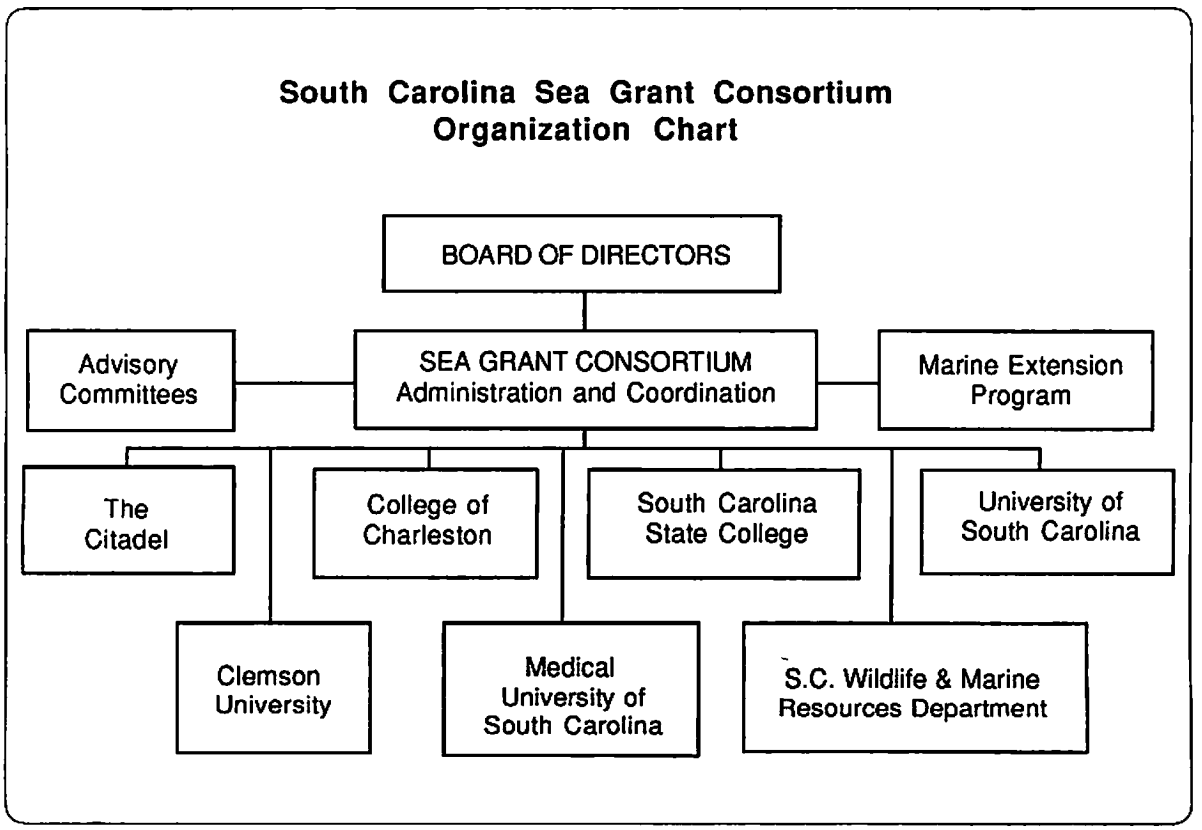
The Board has the express power to employ the Consortium Director, who has the following powers and duties to:

1. direct supervision over all Consortium proposals;
2. prepare Consortium proposals to be submitted to interested agencies;
3. prepare an annual summary of all submitted proposals;
4. negotiate funding levels for proposals submitted by member institutions;
5. provide an accounting to the board of the director's development funds;
6. request and receive funds from local, state, federal, and private sources for use by the director,

Consortium, individual member institutions, or other persons;
7. gather, maintain, and make available to interested persons natural resource information from state and federal agencies, higher education institutions, and any other appropriate entity;
8. designate the location of the consortium office, subject to the approval of the board;
9. exercise all incidental powers necessary to carry out the provisions of this chapter.

Advisory Committees

The Sea Grant Director is assisted by an advisory committee which consists of seven members who serve for four-year terms. These seven people, representing private coastal and marine users, are appointed to assist the Director with the identification of statewide and regional constituent needs. In addition, six program area advisory groups, consisting of two research professionals, two private sector representatives, and one public offical, assist in the identification of research projects and their incorporation into a cohesive program area package.



OVERVIEW

The South Carolina Sea Grant Consortium is a unique partnership of universities, colleges and one state agency working to promote and implement research, education and extension programs in the sphere of marine and coastal resources. The Consortium accomplishes these concurrent tasks by drawing on the diverse and extensive talents and expertise available at its seven constituent institutions.

*Clemson University
*College of Charleston
*Medical University of South Carolina
*South Carolina State College
*South Carolina Wildlife & Marine Resources Department
*The Citadel
*University of South Carolina

The Consortium is charged with bringing together and coordinating the diverse and extensive talents and expertise of its constituent institutions to assist the state in resolving coastal and marine issues. Three distinct advantages are realized by this "partnership" mechanism:

- Duplication, often a problem in scientific research, is avoided by encouraging cooperation among the different institutions and among different disciplines within the institutions.

- The promotion of manpower sharing results in greater productivity and lower costs.

- The ability to put together teams of faculty and staff from the various member institutions to help solve problems of concern to the state maximizes the effectiveness of existing personnel at the lowest possible cost. Because of this, the South Carolina Sea Grant Consortium office can operate efficiently with a very small staff.

As an independent state agency, the Consortium has expanded its efforts in marine research programs, educational activities, and technical and extension services: it serves as a "broker" between its member institutions and those individuals, industries, and agencies that can benefit from the results of such a range of programs. The emphasis is placed on applied research based upon the needs identified by potential users; the information gained from Consortium activities is then transferred to those users. In other words, the Consortium acts as an information synthesis and dissemination clearinghouse.

The Consortium is responsible for the administration and management of the Sea Grant Program for the state of South Carolina. The National Sea Grant College Program, signed

into law in 1966, awards competitive grants to some 31 coastal and Great Lakes states for the express purpose of accelerating the national development of marine resources, including their conservation, proper management, and economic utilization. It is through research, education and extension work that the objectives of the National Sea Grant College Program are implemented and realized.

The Consortium derives its major funding from several sources -- the state of South Carolina, the National Sea Grant College Program and other federal and private funding sources. Through an annual appropriation from the State, the Consortium receives funding to support the staff, program overhead, and the program development fund. The National Sea Grant College Program Office provides funding primarily for full-scale research, education, and extension service projects. This commitment by both the state and the federal government in supporting the Sea Grant Consortium is representative of the cooperative nature of the Consortium as it addresses coastal and marine resource issues.

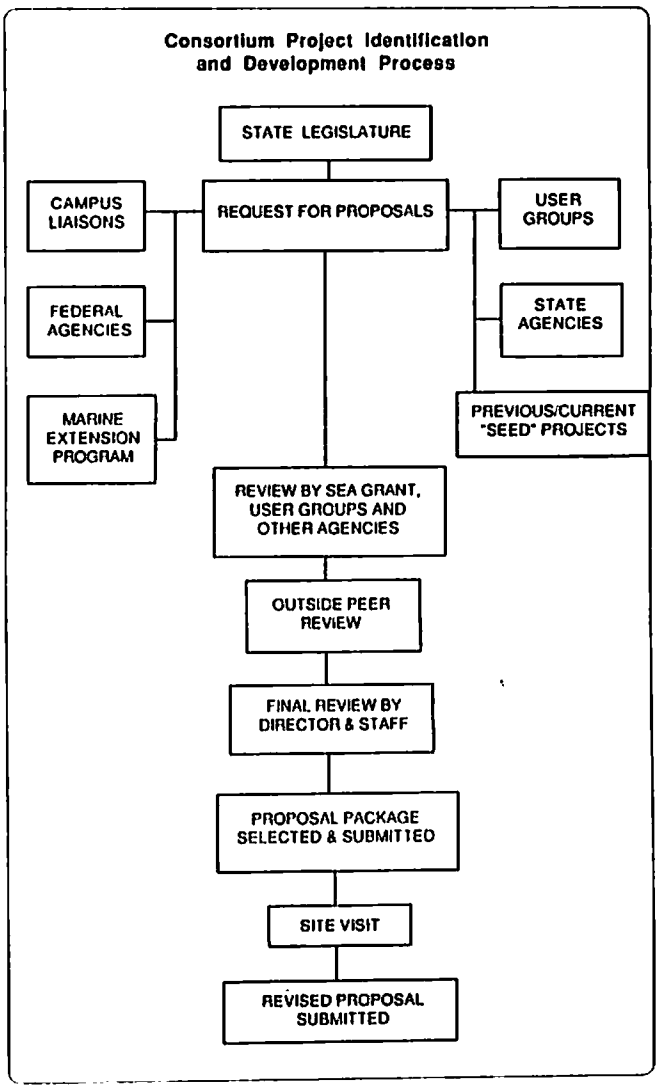
The Consortium is guided in its policy decisions at the state level by its Board of Directors. The Board, which consists of the chief executive officer of each of the Consortium's member institutions, meets regularly to review the Consortium's program and to propose new directions for broadening the scope of its activities.

To facilitate administrative interaction between the Consortium and the faculty and staff of its member institutions, each institution has designated a liaison within its Sponsored Research or Financial Office. These liaisons provide a direct link between investigators and Consortium staff on matters dealing with the proposal process, processing of grants and awards, and oversight of ongoing projects and programs.

Actual research, education, and extension work on Consortium projects is, of course, carried out by the faculty and staff at the institutions. Their expertise and talent are strengths of the South Carolina Sea Grant Consortium; enabling it to meet the challenge of developing and managing coastal resources in an efficient and comprehensive fashion. Both faculty and staff approach this challenge from the variety of perspectives inherent in their multi-disciplinary fields.

In addition to providing professional expertise in many marine and coastal disciplines, member institutions are able to provide a wide range of facilities for use by Consortium project investigators. These investigators have access to more than 30 research laboratories, including those of the South Carolina Wildlife and Marine Resources Department at Fort Johnson and the Waddell Mariculture Center in Bluffton,

and a large biomedical research facility of the Medical University of South Carolina. Six research vessels are available for field studies. Clemson University possesses the best agricultural engineering facilities for technological development and refinement in the state. Further, among the several field laboratories found throughout South Carolina, the University of South Carolina's 5000 square foot Belle W. Baruch Laboratory in Georgetown County provides a staff of twelve research associates and technicians with a fully equipped facility, including living quarters, and a large conference center.



PROGRAM DEVELOPMENT

The South Carolina Sea Grant Consortium has instituted a structured mechanism for its program identification and development process. Program areas are identified by the Consortium staff and program area advisors in consultation with state and federal natural resource agencies, private industry, and Marine Extension Program personnel. The

project identification and development process outlined in the chart above is used in the development of the biennial proposal to the National Sea Grant College Program and, generally, for proposals to other funding sources.

For fiscal year 1987-1988, the Consortium received some 13 initial proposals in response to its call for proposals. Review of these proposals by qualified professionals from academia, government, and industry throughout the United States via written evaluations and on-site meetings was followed by submission of 11 invited, fully-developed proposals. These proposals were included in the FY87-88 proposal package to the National Sea Grant College Program Office for final review and consideration of which 10 proposals were subsequently funded. These are listed in the next section.

In addition to federal Sea Grant project support, the Consortium Director is provided federal and state program development funds to allow for program flexibility and prompt response to high priority needs, to encourage innovative ideas and approaches, and to provide special support as needs arise. A number of development projects were funded during FY1987-88 in program areas that will provide a base of information to build and strengthen the Consortium's programs in future years. In addition to small awards for travel and equipment, the following projects were supported:

STATE DEVELOPMENT FUNDS

A. SD88-1- "Evaluation of Dye Tracer Techniques" - Ben L. Sill - (Clemson) - ($1,000).

B. SD88-2- "Culturing Benthic Copepods To Estimate the Biomass Flux Across the Benthic/Pelagic Boundary - Bruce C. Coull - (USC/Belle W. Baruch) - ($6,000).

C. SD88-3- "Spatial Pattern in Recruitment, Survival and Growth of Oysters (Crassostrea virginica) in Natural and Disturbed Habitats" - William K. Michener - (USC/Belle W. Baruch) - ($2,500).

D. SD88-5- "Impact of Crawfish Culture Upon Pond Water Quality" - D. E. Brune and A. G. Eversole - (Clemson) - ($6,000).

E. SD88-7- "Assessment of Participation and Resource Impact of Shrimp Baiting in Coastal South Carolina" - Dale Theiling - (SCWMRD) - ($5,000).

F. SD88-12- "Determination of the Distribution, Abundance and Status of Colonial Nesting Waterbirds in South Carolina" - T. M. Murphy and P. M. Wilkinson - (SCWRMD) - ($5,000).

G. SD88-13- "Computer and Materials Support for Marine Eduaction Program" - Patrice M. Cunningham - (SCWMRD) - ($5,000).

SEA GRANT DEVELOPMENT FUNDS

A. P/M-2b- "Shrimp Bioengineering Workshop" - William J. Dougherty - (MUSC) - ($2,300).

B. P/M-2c- "Reproductive Mechanisms in Penaeid Shrimp: Microscopic and Biochemical Characteristics of Sperm, Spermatophores and Eggs" - William J. Dougherty - (MUSC) - ($15,000).

C. P/M-2d- "Sediment-Water Dynamics: 1988 FERREL Cruise" - Thomas Tisue - (Clemson) - ($3,000).

SEA GRANT PROGRAM DESCRIPTION AND REVIEW

The South Carolina Sea Grant Consortium manages and administers the Sea Grant College Program for the State. As its primary responsibility, the Consortium develops a program that focuses on institutional research, marine education, and marine extension services. Since 1980, the Consortium has administered over $8 million in federal and state-appropriated funds for over 200 research, education and extension service projects. For the 1987-88 fiscal year, a number of projects were funded at a combined federal-state level of over $1.6 million. More important, however, is the fact that major economic effects accrue to the state, the region, and in many cases, the nation from these investments.

INSTITUTIONAL RESEARCH

Marine and coastal research programs undertaken by Consortium institutional investigators are categorized into five program areas:

- Living Marine Resources
- Marine Environmental Research
- Coastal Resources Development and Management
- Bioengineering and Marine Technology
- Coastal Processes

During its first five years as a fully operational, independent state agency, the South Carolina Sea Grant Consortium gave preliminary consideration to a wide range of

marine related projects. Beginning in FY1985-86, the Consortium's Program Proposal reflected a change in direction and a shift from broad, short-term projects to focused, long-term program areas. This transition implied a commitment to addressing major needs and concerns of coastal and marine users and managers through objective-oriented, integrated efforts.

This section provides the reader with a brief overview of the 10 fully developed proposals selected, grouped into the five program areas.

Living Marine Resources

Aquaculture Subprogram

The aquaculture industry has evolved slowly in the United States compared with other countries where aquaculture plays a significant role in their economy. With the growing consumer desire for seafood exceeding current supply, the concept of aquaculture has been gaining more and more attention nationally. This is true in South Carolina where a variety of species, including hard clams, shrimp, crawfish, redfish, baitfish (minnows), catfish and hybrid striped bass are currently being cultured or examined because of their potential as aquaculture crops.

The South Carolina Sea Grant Consortium has and will continue to conduct research and extension activities in support of aquaculture. These activities have already been greatly enhanced by the opening of the James M. Waddell, Jr. Mariculture Research and Development Center at Victoria Bluff. The Center provides state-of-the-art facilities and equipment to those conducting aquaculture research and extension work. The Consortium also continues to work closely with the Center to improve opportunities for the private sector to pursue aquaculture.

The aquaculture of finfish has shown great promise in South Carolina, and has been the source of innovative cooperation between public and private sectors. The overall goal of a four-year effort (R/A-17 Smith) is to complete the development and demonstration of the potential for striped bass/white bass hybrid aquaculture in South Carolina. With previous Sea Grant support, the investigator has documented the ability to induce out-of-season spawning of captive brood stock and to produce fingerlings in intensive nursery systems. Further, production levels attained by striped bass/white bass hybrids reared under different salinity and population density conditions have been determined. This project, now in its third year, will result in a complete evaluation of the aquaculture potential of hybrid bass culture in South Carolina.

Hard Clam Genetics Subprogram

The hard clam (Mercenaria mercenaria) fishery in the United States has suffered significant declines in total landings over the last three decades. The manipulation of genetic materials and development of genetic strains in the hard clam could result in the improvement of genetic stock for both aquaculture and natural resource rehabilitation. A five-year project (R/A-15 Manzi) seeks to produce genetic stocks of hard clams with greater growth rates and survivability through the development and incorporation of various genetic breeding and selection efforts. Techniques being used in the breeding program include: hybridization, selected breeding, induced polyploidy, and crosses to include heterozygotes. Afterwards, the relationships are evaluated between specific allozymes or combinations of allozymes and growth and survival of populations.

Three complimentary efforts were undertaken to examine the physiological attributes of the selected stocks of hard clams. Eversole (R/A-18) is investigating the relationship in partitioning energy between reproduction and growth in constructed stocks. The second project (R/A-21 Hilbish) focuses on evaluating the physiological variation in selected stocks of Mercenaria and testing the hypothesis that improvements in growth rates among selected strains are environmentally dependent. The third project (R/A-22 Hilbish) investigates the presence of significant genetic variation in Mercenaria that could improve productivity during artificial selection. The component projects utilize the resources and appropriate personnel of three Consortium institutions, and the combined attention of these four interdependent studies focuses the resources on the central hypothesis.

Marine Environmental Research

Continued interest in the marine and coastal environment is based primarily on its natural resource potential and economic value. Exploitation of various resources available along the coast has led to increasing demand and competition for the right and access to those resources. Encouraging harmony among all users of the coast and the marine environment must be one of the overall goals of managers responsible for ensuring the wise use and controlled development of the state's natural resources.

The South Carolina Sea Grant Consortium is committed to providing information and data to natural resource agencies and users which will lead towards minimizing and mitigating environmental effects resulting from increased pressure along the state's coast. A major area of concern has been identified, -- the study of estuarine systems -- and forms the basis for the research undertaken this year in estuarine studies.

Estuarine Subprogram

Estuaries of the United States are considered one of the most productive ecosystems in the world: significant economic development depends on the maintenance of high quality estuarine resources. Many commercially and recreationally important fisheries species spend at least a portion of their life cycle in estuarine environments. Estuaries serve as buffer zones between freshwater riverine systems and the coastal ocean. They receive and process large inputs of freshwater, sediments, nutrients, and other materials that drain from terrestrial-based watersheds. However, the physical, chemical and biological processes that control these functions are far from being adequately understood.

Physical processes affecting estuaries are important in determining the recruitment and habitat selection patterns of larval marine species and the fate of pollutants. A continuing three-year proposal (R/EM-5 Kjerfve) was designed to provide a succinct synthesis of the physical oceanographic conditions in the Charleston Harbor estuary. The specific objectives of this second year were to: (1) assess circulation, salinity, and turbidity changes in the harbor; (2) integrate information on dispersion mechanisms with Dr. E. Wenner (through R/ER-5) by incorporating information on sub-adult shrimp migration and estuarine habitat utilization; (3) to synthesize available and new physical oceanographic data for the Charleston Harbor estuary into a comprehensive model.

The role of ocean and shallow water habitats in providing for commercially and recreationally important marine organisms is important when formulating habitat management policies. However, the nursery role of marshes along the estuarine salinity gradient for penaeid shrimp also needs to be examined. A three-year effort (R/ER-5 E. Wenner) looks at the utilization of varying salt marsh habitats along salinity gradients by sub-adult penaeid shrimp. The study has concentrated on the importance of habitat structure and salinity regime to selection and utilization by juvenile shrimp.

A needed component of any viable fisheries management scheme is direct information on diet of the species in areas to be managed. In the final year of a three-year proposal (R/CF-10 Feller), the investigator provides an analysis of dietary components useful in the assignment of habitat value to the South Carolina shrimp resource. The results of this three year project will provide a quantitative list of prey items found over time in shrimp from a salt marsh tidal creek habitat, quantitative analysis of diet changes in feeding intensity, and a relative means by which to biologically assess habitat suitability for shrimp management.

Coastal Resources Development and Management

In the context of increasing resource use pressures, coastal resource management issues in South Carolina are of the utmost importance to planners, managers, developers, and those involved in commerce, industry, recreation and tourism. The South Carolina Sea Grant Consortium plans to continue to examine coastal management issues in cooperation with management agencies and user groups. Research, education, and extension projects dealing with economics, policy, law, regulation, preservation and development of the coast will form the basis for future Consortium efforts. Needs of the State and region will thus be served through coastal decision-making, planning and assessment.

Bioengineering and Marine Technology

Industry spends billions of dollars each year on the research and development of new and better products. Recently, attention has been focused on the exploration of marine sources for these new products. These explorations have been enhanced by the creation of a field of scientific activity called biotechnology. Marine biotechnology research has already made significant contributions to the energy, food, pharmaceutical, biomaterial and pollution control industries.

The South Carolina Sea Grant Consortium has focused its research efforts upon the derivation of marine extracts and pharmaceuticals from marine sources. In FY1987-88 the Consortium continued its investigation in the field of biotechnology.

Every year the shipping and fishing industries, private boat owners and bridge maintenance crews spend millions of dollars controlling and removing scale and fouling organisms from their vessels and structures. In a three-year effort (R/MX-5 Wheeler), the investigator will provide the basis for the development of new anti-fouling and anti-scaling technlogies using inhibitors extracted from biominerals or analogues of those inhibitors. The second year of this project seeks to improve the extraction procedures for natural inhibitors of $CaCO_3$ crystallization, to chemically characterize the inhibitors, to test the efficacy of these new inhibitors as anti-scaling and anti-fouling agents using novel assays, to evaluate and test synthetic analogues of these inhibitors, and to identify anti-scalants of other minerals using the strategies developed for $CaCO_3$ scale inhibitors. This research should lead to improvements in the technology to control scaling and fouling organisms.

Coastal Processes

South Carolina's coastal zone can be divided into three segments. In fact, the morphology of the coast is typically represented as a transition zone between the North Carolina and Georgia coastlines. The Northern coast, from the North Carolina border to Winyah Bay, is a typical arc-like strand with broad sandy beaches, few inlets, well-developed dunes and sparse salt marshes. The southern section of the coast is dominated by a series of barrier islands, separated from the mainland by miles of tidal creeks and wide areas of salt marsh. There are few dune systems; instead, tidal inlets are prevalent. The central portion of the coast retains characteristics of both northern and southern sections.

This variable coast is fronted by 159 miles of beach and 40 barrier islands. A number of factors, including storms, rising sea level, and high rainfall make this coastline highly dynamic and continually subject to erosion and accretion, inlet migration and other physical changes. Yet this same area provides the state with significant economic, social and environmental opportunities. The South Carolina Sea Grant Consortium examines coastal processes in order to address the needs of residents and visitors, providing important information about the processes that affect where they work, live and recreate.

Erosion and accretion problems in the vicinity of inlets are well recognized. The size and geometry of ebb tidal shoals are major factors which affect these shoreline changes by causing sheltered zones and storing large volumes of sediments. However, there is no quantitative theory describing their formation. The overall goal of a two-year study (R/CP-6 Hayter) is to develop a predictive ebb tidal shoal model using a laboratory inlet (physical) model which incorporates sediment transport. Project investigators have worked closely with researchers at the University of South Carolina, who have completed a field of study to quantify morphologic changes in Captain Sam's Inlet, South Carolina (R/CF-5, FY85-86).

MARINE OUTREACH

The marine outreach program represents the Consortium's overall commitment to provide information to coastal constituents, both public and private, concerning coastal and marine resource use and management. Projects in education and extension services were the focus of the Consortium's outreach program during FY1987-88.

Marine Extension Program

The South Carolina Sea Grant Marine Extension Program (A/E-1 Sweeny/Goodwin) represents the extension arm of the Consortium. The MEP handles a broad range of requests from commercial fishing, aquaculture, marine recreation, coastal development and public education interests.

Examples of MEP projects in FY 1987-88 include:

*Two finance workshops for South Carolina fishermen covering information on taxes, insurance and incorporation;

*A publication on the economic analysis of semi-intensive penaeid shrimp culture in South Carolina;

*The publication of "South Carolina Crawfish Budgets" in Aquaculture Digest and Aquaculture magazine;

*The development of an experimental, inshore, artificial reef at Paradise Pier, Hunting Island (with the S.C. Wildlife and Marine Resources Department);

*The creation of the South Carolina Charter Captain's Association and its first workshop (Spring 1987);

*The publication of the booklet "Beach Erosion in South Carolina."

In addition, the MEP continues to work closely with other Sea Grant Programs, the SEMAS network, the National Marine Fisheries Service, the National Weather Service, Clemson Cooperative Extension Service, and other state and federal agencies to ensure the timely delivery of practical information to various user groups and the general public.

The MEP designs its activities to meet the needs of marine resource users and provides the information necessary to ensure wise and effective use of South Carolina's marine resources. Through MEP identification of needs, research efforts can be identified and conducted in a responsive and efficient manner.

Communications Program

The Communications Program is designed to compliment the Marine Extension Program by producing and distributing appropriate information products, attending coastal festivals, and through other public information vehicles that reach coastal constituents. All Communications projects attempt to relate the complex and fragile nature of our coastal resources and promote public awareness on important coastal issues and opportunities.

Specific goals of the Communications Program are to: identify specific user groups and respond to their needs with appropriate information products, increase public awareness of the Consortium and the Marine Extension Program, establish consistent and continuous contact with Consortium constituents, improve media familiarity and coverage of the Consortium, and develop support materials for Consortium festival and event appearances.

During FY1987-88 the Communications Program produced or distributed the following information products:

Food Production --

*SC Coastal Wetland Impoundments(CWIP)
*CWIP Workshop Proceedings
*Mariculture Workshop brochure
*Port News article on acquaculture in SC
*Coastal Heritage, winter '87, "Here Come the Hybrids"
*An Interim Guide to Acquaculture Permitting in SC (revised)

Coastal Development --

*"South Carolina Estuaries: Under Siege?" proceedings
*Coastal Heritage, spring '88, "Non Point Source Pollution"
*Coastal Construction: Building in a Hazardous Place
*Op/Ed article on coastal development for SC Forum
*Beach Erosion in South Carolina
*"SC Sea Grant Consortium - Your Key to the Coast" brochure
*SC Estuary Bulletin

Marine Related Industries

*Coastal Heritage, summer '87, "Water Safety"
*Dive Symposium '88 promotional materials
*Coastal Heritage, summer '88, "Marine Litter"
*Coastal Access Guide
*Radio PSAs for National Science Week
*"Status of Research on Charleston Harbor" in Port News
*Red Tide poster
*A Gudie to Swimming Safely off South Carolina's Coast

OTHER GRANTS AND ACTIVITIES

The Consortium supports a variety of programs and activities to meet its goal and objectives. Projects undertaken through Sea Grant support represent the core elements of the Consortium's programs. Pass through grants and extramural projects are initiated to complement the Sea Grant effort at this time; the future of the Consortium lies in its ability to increase its non-Sea Grant program support.

National Ocean Survey -- National Data Buoy Center

"South Atlantic Bight Maritime Observational Data: An Assessment of Data Availability, Products and Needs" - Margaret A. Davidson - (SCSGC) - Funds to provide partial support to hold a workshop and develop materials outlining S.A. Bight programs. FY87 - $10,000 plus $2,700 match.

National Ocean Survey - Office of Coastal Resources Management

"Physical and Biological Studies of Charleston Harbor, South Carolina" - (Multi-disciplinary) - FY87 - $95,000.

National Ocean Survey - Estuarine & Ocean Physics Branch

"Investigation and Modeling of Estuarine Dynamics in Charleston Harbor" - Dr. Bjorn Kjerfve (USC) - FY88 - $33,100 plus $16,200 match.

National Marine Pollution Program Office

"A Systematic Characterization of the Long-term Trends in Water Quality and Living Marine Resources in Two South Carolina Estuaries" - Mr. M. Richard Devoe (SCSGC), Dr. R. Van Dolah (SCWMRD), Dr. Elizabeth Blood (USC), and Dr. F. John Vernberg (USC) - FY87 - $51,900 plus $21,600 match.

National Sea Grant College Program

"Support for a Workshop on Frontiers in Shrimp Research" - Ms. Margaret A. Davidson (SCSGC) - FY88 - $5,000.

Gulf & South Atlantic Fisheries Development Foundation

"Turtle Excluder Demonstration Project" - Ms. Margaret A. Davidson (SCSGC) - FY87 - $20,000 plus $10,000 match.

U.S. Environmental Protection Agency

"Presentation of Charleston Harbor Estuary Citizens Workshops" - Ms. Margaret A. Davidson (SCSGC) - FY88 - $9,995.

S.C Water Resources Commission

"Metabolism of Wetland Ecosystems Along a Salinity Gradient" - Dr. James T. Morris (USC) - FY88 -$10,000.

"Integration of Digital Databases in GIS Environment for Coastal Applications" - Dr. David J. Cowen (USC) FY88- $10,000.

NOAA Ship/Submersible Support - National Undersea Research Program

"Visual Assessment of the Golden Crab, Geryon fenneri, in the South Atlantic Bight: Abundance and Trap Efficiency - Phase I" - Dr. Elizabeth Wenner (SCWMRD) - September 1986 - R/V Johnson and Sea Link. Value = $60,000 (approx.)

"Continuation of Sediment - Water Interface Studies" - Dr. Thomas Tisue (Clemson) - November 1986 and August 1987 - NOAA Ship PEIRCE. Value = $149,500 (approx.)

FISCAL REPORTS

Contents

EXHIBIT A

S.C. Sea Grant Consortium
Balance Sheet
June 30, 1988

Assets			Liability and Fund Balance		
Current Funds:			Current Funds:		
Cash on hand	$ 200		Unrestricted	$	
Accounts Receivable					
State Treasurer	$ 5,356		Due to State General Fund	5,556	
		$ 5,556			$ 5,556
Restricted Funds:					
Due from Grantors	7,840		Restricted Funds		
State Treasurer	77,805		Deferred Revenue	85,645	
		85,645			85,645
Total Current Funds		$ 91,201	Total Current Funds		$ 91,201
Fixed Assets			Fixed Assets Funds		
Equipment Inventory	124,399		Funds Balance	124,399	
Total Fixed Assets Funds		$124,399			$ 124,399

Exhibit B

S.C. Sea Grant Consortium
Statement of Changes in Current Operating Funds
Year Ended June 30, 1988

	Administration
Balance July 1, 1987	$ 200
Additions:	
Original Appropriation	453,553
Salary Adjustments	4,570
Supplemental Appropriation	13,500
Total Additions	471,623
Deductions:	
Expenditures	452,767
Carry-Forward Supplemental Appropriation	13,500
Total Deductions	466,267
Balance Due to General Fund	$ 5,556

Exhibit C

S.C. Sea Grant Consortium
Statment of Changes in Restricted Funds
Year Ended June 30, 1988

	Balance 7/1/87	Total Additions	Total Deductions	Balance 6/30/88
Sea Grant Contracts	$	$	$	$
85-86		77,911	77,911	
86-87		329,011	329,011	
87-88		362,167	362,167	
Other Restric. Funds	31,630	127,034	78,311	80,358
Totals	$31,630	$896,123	$847,400	$80,353

Exhibit D

S.C. Sea Grant Consortium
Statement of Changes in Fixed Assets
Year Ended June 30, 1988

	Balance 7/1/87	Total Additions	Total Deductions	Balance 6/30/88
Capital Equipment	$105,411	$ 11,900	$ 13,759	$ 103,552
Motor Vehicle Equip.	20,847	-0-	-0-	20,847
Totals	$126,258	$ 11,900	$ 13,759	$ 124,399

Schedule I

S.C. Sea Grant Consortium
Schedule of Current Unrestricted Expenditures
Year Ended June 30, 1988

Title	Original Approp.	Revised Approp.	Expenditures	Balance
Personal Services	$240,413	$ 227,608	$227,073	$ 535
Fringe Benefits	44,239	44,239	41,071	3,168
Contractual Services	27,852	41,877	41,629	248
State Development	59,500	55,500	54,268	1,232
Supplies	15,130	19,745	19,741	4
Fixed Charges	45,719	48,398	48,373	25
Travel	11,700	11,850	11,841	9
Equipment	1,000	17,100 *	3,600	13,500
Utilities	5,000	3,656	3,655	1
Transportation	3,000	1,650	1,516	134
Carry Forward to FY 89			13,500*	<13,500>
	$453,553	$ 471,623	$ 466,267	$ 5,356

* $ 13,500 from Civil Contingency Fund Appropriated FY 88 to be carried forward and disbursed in FY 89

Schedule I-A

S.C. Sea Grant Consortium
State Development Grants
Year Ended June 30, 1988

	Grantee	Expenditures
Evaluation of Dye Tracer	Clemson	$ 687
Culturing Benthic Copecods	USC	6,000
Survival of Oysters	USC	2,500
Data Base/Watershed	SCWRC	10,000
Impact of Crawfish Culture	Clemson	6,000
Estuarine Comparison	USC	5,400
Impact of Shrimp Baiting	SCWMRD	4,115
Publication of CZM Guide	CofC	924
Impoundment Publication	SCWMRD	600
Water Treat. & Monitor. Equip.	SCWMRD	4,872
Bird Guide	SCWMRD	5,000
Marine Education & Equipment	SCWMRD	4,770
Salary Support - Hinckley	USC	650
Travel-Bahamas	CofC	2,000
ADP Equip. Graduate Program	CofC	750
Total		$ 54,268

Schedule II-A

S.C. Sea Grant Consortium
Schedule of Restricted Expenditures
Sea Grant 1985-86
Year Ended June 30, 1988

	Sub-Contracts	Contractual	Travel	Totals
Development	$ 24,029	$	$ 252	$ 24,281
Impoundment		1,190		1,190
Visiting Scientist	1,600	2,581	1,534	5,715
Seafood Data Base	46,725			46,725
Totals	$ 72,354	$ 3,771	$1,786	$ 77,911

Schedule II-A-1

S.C. Sea Grant Consortium
Development Funds
Sea Grant 1985-86
Year Ended June 30, 1988

	Grantee	Expenditures
Mitigation of Wetlands	USC	$ 334
Investigation of Chemical Fluxes	Clemson	904
Printing of Brochure	Patriots Point	500
CZM Seminar	CofC	289
Long Term Impacts of Coastal Dev.	USC	6,500
Estuarine Circulation	USC	3,118
Harbor Management Planning	USC	2,637
USA/Japan Nat'l Res. Panel	SCWMRD	5,600
Fluxes at Sediment Water Interface	Clemson	2,598
Data Management for Estuarine Res.	SCWMRD	-0-
Science Weekend	CofC	725
Otolith Fishes - Page Charges	USC	-0-
Spatial Patterns in Oysters	USC	824
Total		$ 24,029

Schedule II-B

S.C. Sea Grant Consortium
Statement of Changes in Restricted Expenditures
Sea Grant 85-86
Year Ended June 30, 1988

	Balance 7/1/87	Total Additions	Total Deductions	Balance 6/30/88
Administration	$	$ -0-	$ -0-	$
Development		24,281	24,281	
Communications		-0-	-0-	
Impoundment		1,190	1,190	
Intern		-0-	-0-	
Visiting Scientist		5,715	5,715	
Sub Contracts		-0-	-0-	
Seafood Data Base		46,725	46,725	
Totals	$	$ 77,911	$ 77,911	$

Schedule III-A

S.C. Sea Grant Consortium
Schedule of Restricted Expenditures
Sea Grant 1986-87
Year Ended June 30, 1988

	Salaries	Fringe Benefits	Contract Services	Sub-Contracts	Supplies	Travel	Equip.	Total
Administration	$ 779	$807	$3,600	$ 3,007	$	$3,881	$6,857	$18,931
Development			89	38,746		1,790		40,625
Communications	964	62	13,580	397	373	887	840	17,103
Sub-Contract Atlantic Bight				252,352				252,352
Total	$ 1,743	$869	$17,269	$294,502	$ 373	$6,558	$7,697	$329,011

Schedule III-A-1

S.C. Sea Grant Consortium
Sub-Contracts
Sea Grant 1986-87
Year Ended June 30, 1988

	Grantee	Expenditures
Hard Clam Mariculture - Breeding	MRRI	$ 63,805
Hard Clam Mariculture - Early Life	Clemson	8,724
Hard Clam Mariculture - Growth	CofC	9,847
Striped Bass/White Bass Hybrids	MRRI	23,163
Pesticide Runoff into Tidal Creeks	USC	19,590
Estuarine Habitats of Shrimp	MRRI	24,205
Diet Analysis of White Shrimp	USC	7,782
Estuarine Circulation & Dispersion	USC	2,523
Anti-Scaling/Anti-Fouling	Clemson	21,814
Investigation of Tidal Inlets	Clemson	18,172
Marine Extension Program	Clemson	52,727
Totals		$252,352

Schedule III-A-2

S.C. Sea Grant Consortium
Development Funds
Sea Grant 1986-87
Year Ended June 30, 1988

	Grantee	Expenditures
Hurricane Wind Damage	Clemson	$ 9,900
Impact of Tourism on Beaufort	Clemson	8,878
Framework for Coastal Eng. Ctr.	Citadel	2,760
1987 Water Symposium	WRC	3,000
Tidal Inlet Study	USC	5,336
Verification of Circulation Model	USC	4,500
Use of Satelite Remote Sensing	USC	2,996
SC Coastal Access Study	Clemson	1,376
Stock Assessment of Blue Crab	SCWMRD	-0-
Coastal Growth Forum	Citadel	-0-
Recapture of Whelks	Clemson	-0-
Dev. in Numer. Phys. Ocean Modeling	USC	-0-
Data Base Cooper River/Chas. Harbor	SCWMRD	-0-
Internship in Coastal Engineering	Citadel	-0-
Total		$ 38,746

Schedule III-B

S.C. Sea Grant Consortium
Statement of Changes in Restricted Expenditures
Sea Grant 86-87
Year Ended June 30, 1988

	Balance 7/1/87	Total Additions	Total Deductions	Balance 6/30/88
Administration	$	$ 18,931	$ 18,931	$
Development		40,625	40,625	
Communications		17,103	17,103	
Sub-Contract		252,352	252,352	
Atlantic Bight		-0-	-0-	
Total	$	$329,011	$329,011	$

S.C. Sea Grant Consortium
Schedule of Restricted Expenditures
Sea Grant 1987-88
Year Ended June 30, 1988

	Salaries	Fringe Benefits	Contract.	Sub Contract	Supplies	Fixed Charges	Travel	Total
Administration	$11,391	$ 734	$ 10,768	$	$ 1,256	$	$ 6,978	$ 31,127
Development				4,514		2,054		6,568
Communications	1,898	142	34,215		15,805	1,105	982	54,147
Mar. Ext. Pro.	19,611	3,545	4,582		1,846	90	3,009	32,683
NMPO-Long Term				28,649				28,649
Sub-Contracts				208,993				208,993
Inv. of Estu. Dyn.								-0-
Total	$32,900	$4,421	$ 49,565	$242,156	$ 18,907	$3,249	$10,969	$362,167

Schedule IV-A-1

S.C. Sea Grant Consortium
Sub-Contracts
Sea Grant 1987-88
Year Ended June 30, 1988

	Grantee	Expenditures
Hard Clam Breeding	SCWMRD	$ 14,626
Hard Clam Breeding	CofC	33,276
Hard Clam Gametogenesis	Clemson	4,755
Hard Clam Variation	USC	11,340
Hard Clam Productivity	USC	1,253
Potential of Bass Hybrids	SCWMRD	25,994
Estuarine Habitats of Shrimp	SCWMRD	32,689
Diet Analysis of Shrimp	USC	23,015
Estuarine Circulation	USC	15,000
Anti-Scaling/Anti-Fouling	Clemson	14,144
Tidal Inlets	Clemson	10,392
Marine Extension Program	Clemson	20,394
MEP-SCWMRD	SCWMRD	2,115
Total		$208,993

Schedule IV-A-2

S.C. Sea Grant Consortium
Development Funds
Sea Grant 1987-88
Year Ended June 30, 1988

	Grantee	Expenditures
Travel-World Aqua Society	SCWMRD	$ 1,250
Shrimp Workshop	MUSC	3,264
Total		$ 4,514

Schedule IV-B

S.C. Sea Grant Consortium
Statement of Changes in Restricted Grants
Sea Grant 1987-88
Year Ended June 30, 1988

	Balance 7/1/87	Total Additions	Total Deductions	Balance 6/30/88
Administration	$	$ 31,127	$ 31,127	$
Development		6,568	6,568	
Communications		54,147	54,147	
Marine Ext. Prog.		32,683	32,683	
NMPO-Long Term		28,649	28,649	
Sub-Contracts		208,993	208,993	
Inv. of Estuarine Dyn.				
Totals	$	$362,167	$362,167	$

Schedule V-A

S.C. Sea Grant Consortium
Schedule of Other Restricted Expenditures
Year Ended June 30, 1988

	Salaries	Fringe Benefits	Contract Services	Sub Contracts	Travel	Equip.	Supplies	Total
GCFI Proceedings	$	$	$ 304	$	$	$	$	$ 304
Interna'l Unres.	3,666				607			4,273
PRC-Folly Beach			4,992					4,992
TED Demonstration	2,613	188	9,991		18			12,810
Caribbean Support								-0-
Water Resources			1,225					1,225
PICMD-Donation					656			656
PICMD-Goodwin	2,711	1,789						4,500
Hybrid Bass-Donation			13,417					13,417
Econ. Viability-St. Kitts	2,723		4,321					7,044
Sale of Assets						604		604
Shrimp Workshop			1,806		518			2,324
Dual Employment	1,196	151						1,347
Water Res. I								-0-
Water Res. II				1,973				1,973
Sale of Publications								-0-
Bird Guide								-0-
EPA-Estuaries							224	224
OCRM				21,913				21,913
Totals	$12,909	$2,128	$36,056	$23,886	$1,799	$ 604	$ 224	$77,606

Schedule V-B

S.C. Sea Grant Consortium
Statement of Changes in Other Restricted Funds
Year Ended June 30, 1988

	Balance 7/1/87	Total Additions	Total Deductions	Balance 6/30/88
GCFI Proceedings	$1,180	$ 210	$ 304	$ 1,086
Intern'l Unrest.	3,023	1,250	4,273	-0-
PRC-Folly Beach		5,000	4,992	8
TED Demonstration	4,000	9,038	12,810	228
Caribbean Support	9			9
Water Resources	1,225		1,225	-0-
PICMD-Donation	955		656	299
PICMD-Goodwin		4,500	4,500	
Hybrid Bass Dona.	14,841	25,199	13,417	26,623
Econ. Via.-St. Kitts	6,397	4,567	7,044	3,920
Sale of Assets		699	604	95
Shrimp Workshop			2,324	<2,324>
Dual Employment		1,350	1,347	3
Water Resources I		10,000		10,000
Water Resources II		10,000	1,973	8,027
Sale of Publications		219		219
Bird Guide		29,836		29,836
EPA - Estuaries			224	<224>
OCRM		21,913	21,913	-0-
Total	$ 31,630	$ 123,781	$ 77,606	$ 77,805

S.C. Sea Grant Consortium
Notes to Financial Statements
June 30, 1988

Note 1 - Summary of Significant Accounting Policies

Basis of Accounting:

The financial statements have been prepared on an accrual basis.

Fund Accounting:

To ensure observance of limitations and restrictions placed on the use of resources available to the Consortium, the accounts are maintained in accordance with the principles of fund accounting. This is the procedure by which resources for various purposes are classified for accounting and reporting purposes into funds that are in accordance with specified activities or objectives. Separate accounts are maintained for each fund.

General Fixed Assets:

Fixed assets are recorded as expenditures of the general operating fund upon acquisition and subsequently capitalized at actual cost in the general fixed asset account group. In accordance with generally accepted accounting principles prescribed for governmental funds, a provision for depreciation of general fixed assets is not recorded.

Grant Accounting:

The Consortium is a State agency involved in ocean and coastal research, education, and advisory extension work. It serves to encourage, coordinate and facilitate projects pertaining to coastal and ocean areas of South Carolina and to utilize the talents of its members to address marine issues and opportunities.

The Consortium identifies these projects through planning and priority setting exercises. The Consortium arranges for the design and implementation of the projects, usually through its member institutions. On a biennial basis, core projects are submitted to the National Sea Grant Program for funding. Additionally, the Consortium submits project proposals to federal, state and private funding agencies for consideration and support. A majority

of the projects funded are then sub-contracted to various member institutions.

Expenditures paid by the Consortium at June 30 and not yet reimbursed by the primary grantor are recorded as accounts receivable. Revenues received on specific grants which are in excess of expenditures are recorded as deferred revenues.

Note 2 - Retirement Plan

Substantially all employees of the Consortium are covered by a retirement plan through the South Carolina Retirement System. It was not feasible to separately identify current year retirement plan costs included as a portion of employer contributions in the accompanying financial statements.

Information regarding the excess, if any, applicable to the Consortium of the actuarially computed value of vested benefits over the total of the pension fund and any balance sheet accruals, less any pension pre-payments of deferred charges in not available. By State Law, the Consortium's liability under the retirement plan is limited to the amounts appropriated therefore in the South Carolina Appropriation Act, plus the amount paid from other revenue sources for the current year. Accordingly the Consortium recognizes no contingent liability for unfunded costs associated with participation in the plan.

Note 3 - Contingent Liabilities

The Consortium has numerous contracts with the Federal Government, other State agencies and other funding sources for the reimbursement of specific costs related to the various programs described in each contract. Reimbursement costs subsequently deemed to be unallowable by the grantor, if any, would have to be repaid. A majority of the contracts are in turn sub-contracted by the Consortium and reimbursed costs deemed to be unallowable would result in a claim by the Consortium against the sub-contractor.

Note 4 - Changes in General Fixed Assets

Changes in general fixed assets for the year ended June 30, 1988 are as follows:

	Balance 7/1/87	Additions	Deletions	Balance 6/30/88
Equipment	$126,258	$11,900	$13,759	$124,399