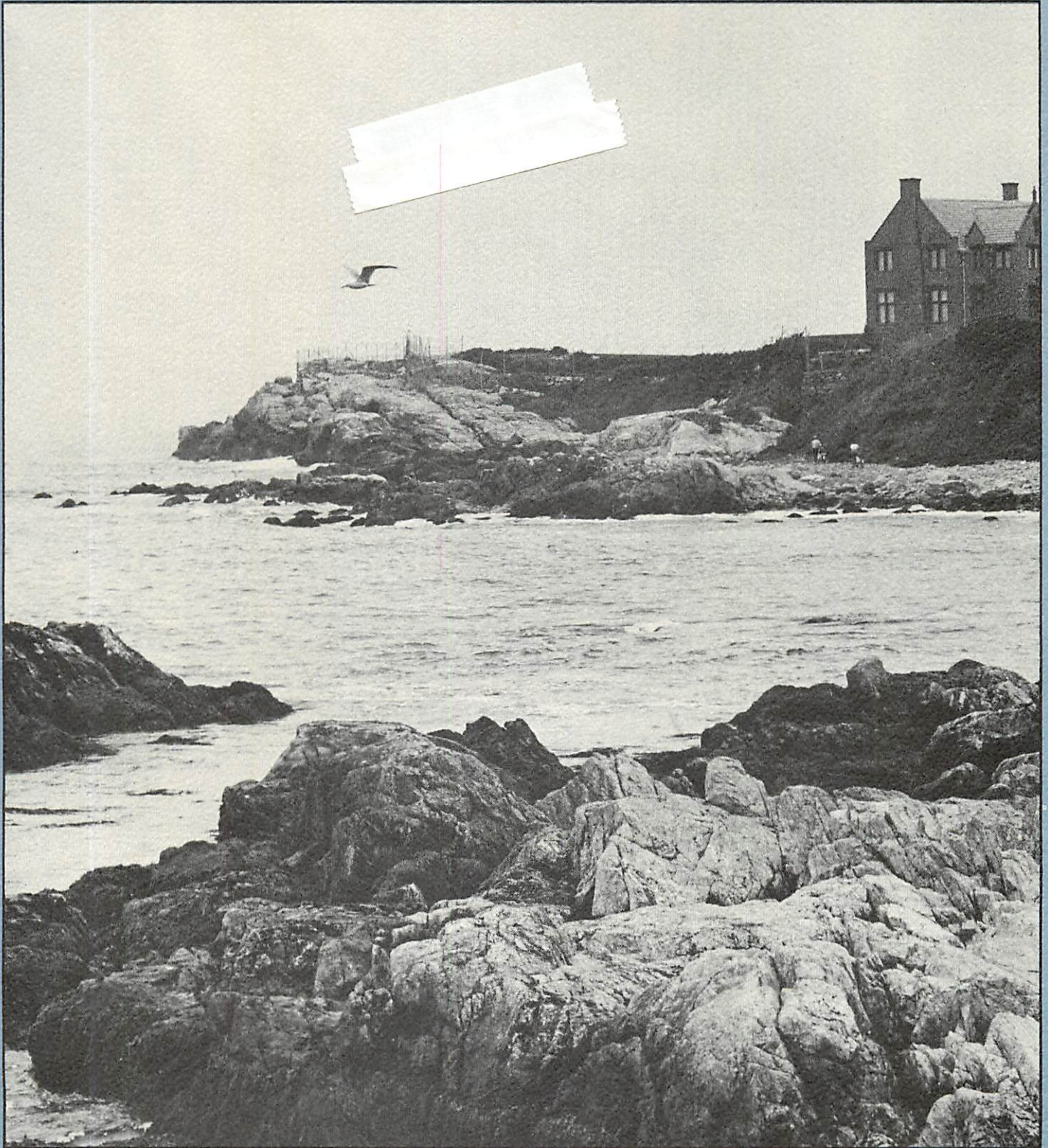


A REPORT ON THE UNIVERSITY OF RHODE ISLAND
SEA GRANT PROGRAM  JULY 1978 TO JUNE 1979



FOREWORD

Rhode Island's senior senator, Claiborne Pell, co-authored the Sea Grant College and Program Act of 1966. Recently he was asked to comment on the program's performance over the years.

"Sea Grant began before environmental issues were a deep concern, but it is making major contributions toward solving environmental problems. Nationally, the program has grown at a moderate pace, and I think there have been advantages in that. It has grown solidly and proved itself extremely cost-effective."

The University of Rhode Island's Sea Grant Program is guided by the realization that in order to keep the public support it has won since 1967 it must continue to solve real problems for people and continue to improve the quality of life in the state and in the region.

Niels Rorholm
Coordinator
URI Sea Grant Program



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MARINE ADVISORY AND TECHNICAL ASSISTANCE



Fisheries Development

The Sea Grant Marine Advisory Service, the Coastal Resources Center, the National Sea Grant Depository and the Northeast Regional Coastal Information Center make up the Division of Marine Resources at the University.

Overall, the role of the Division is to develop, package and deliver information, technology and research results to the marine community, not only within the state but wherever needed.

Toward that end, it relies on the expertise of faculty throughout the University. Close to 20 different departments and units work with Marine Advisory personnel on a wide variety of projects.

To provide even greater communication between and among University marine-related faculty and staff, the director of the Division of Marine Resources was made part-time assistant provost for marine affairs.

The fisheries specialist has traditionally assisted fishermen by introducing them to new concepts in gear and by improving existing gear designs. This year was no exception.

A Rhode Island captain who geared for Scottish seining with MAS assistance increased his landings five-fold. He said another benefit was that, because the vessel was more versatile, more days could be logged and a wider area covered. Slower speeds during towing also reduced engine maintenance. Requests for demonstrations of this method continue to come in from around the country.

Another important demonstration project involved French polyvalent doors. The design for these doors was imported from Europe, where they had shown promise in being low in maintenance, easy to handle and capable of increasing the efficiency of draggers. They were tried out extensively by Rhode Island vessels in the spring, and construction diagrams for them are now available.

Marine Education

The state's 40 school districts and its citizenry continued to be made aware in a variety of ways of how important Narragansett Bay and the ocean are to every aspect of life in Rhode Island. Marine education projects are designed primarily for use within the state but could easily be adapted for use throughout the region and nation.

Schoolteachers have commented on the lack of teaching materials in marine subjects. To fill that need, the MAS marine education specialist undertook to amass and catalog a variety of teaching materials that could be made available to schools. The Marine Awareness Center, which opened during the year at URI's Narragansett Bay Campus, includes over 3,000 documents, available on loan or as copies to schools, teachers and the general public. The Center has also published and distributed a bibliography of its holdings. Since its opening, the Center's project coordinator has answered close to 500 teacher inquiries and held 45 training conferences.

Thanks to two National Science Foundation grants, the Center has been able to disseminate marine science materials to kindergarten through eighth grades in Rhode Island schools.

Among other projects carried out by the education specialist were a summer Marine Awareness Program for high school students, distribution of fact sheets on marine topics in both English and Spanish, construction of display units which were widely used by schools, distribution of a marine events calendar, and significant additions to the Marine Advisory Service slide collection.

Marine Recreation and Coastal Utilization

The scope of projects in this area has expanded in many directions from the field specialist's initial involvement in the state's boating industry a decade ago. Today his work reaches into engineering, economics, business management, health and safety, law enforcement, coastal planning, ecology and agriculture. This work has become increasingly useful to an audience far outside the state's boundaries.

A case in point was a two-day workshop, the first of its kind ever held, which was organized by URI last winter. Participants from 11 states heard the world's foremost experts on hypothermia and cold water survival explain how cold kills, how hypothermia can be prevented and how it can be treated. The response nationwide showed a real need for information and training on the subject. As a result, a training manual was produced and plans were made for URI to host a five-day international conference and workshop on hypothermia in 1980.

Other activities of the marine recreation specialist included:

- Initiation of a research demonstration project at URI involving a marine anti-fouling device.
- Continued involvement with floating tire breakwater development. This valuable concept was pioneered at URI.
- Continuing assistance in providing environmental information to the public concerning marinas and boats.
- Preparation and distribution of information for mariners on the dangers of red tides. The U.S. Coast Guard contemplates distributing this information nationwide.

Seafood Technology

Rhode Island has become increasingly involved with seafood processing, and the Marine Advisory Service seafood technologist continues to find specific new areas in which to help the industry.

To consolidate and expand research and education programs in food science, especially marine foods, the University combined three existing departments into a new Department of Food Science and Technology, Nutrition and Dietetics. The MAS specialist was named an adjunct professor in the department, thus becoming an even more valuable link between the seafood industry and University researchers.

A three-year project with a seafood-processing company was successfully completed during the year. A multispecies-processing technique, a relatively new concept, was developed, and generated tremendous interest throughout the state's processing industry.

Continuing projects included one on clam depuration and another on saltwater wells. Technological information generated for clam depuration was made available to processors of other bivalves. Potential saltwater wells, which abound in the state, had been identified by the specialist as having potential usefulness in both aquaculture and fish processing. A publication on the subject is in preparation.

A collaborative research project between the University and a seafood company was concluded during the year. The project of turning clam-processing waste into commercial feed for salmon was in its last stage of evaluation, and the specialist interested a trout farm in trying it for their purposes. Concurrently, he worked with University researchers to develop a more efficient method for recovering the clam wastes.

Marine Economics/Business

The Marine Advisory Service again has on its staff (one-third time) a URI professor of resource economics with a profound understanding of the commercial fishing industry. His major emphasis was on helping fishermen and potential investors with financial and tax questions and in determining the economics of exploiting more underutilized fish species, particularly those with export potential.

In this past year, MAS was also able to give considerable assistance to marinas and boatyards. At the industry's request, faculty from the College of Business Administration analyzed the financial structure of marinas and boatyards and produced a report published in January 1980. A number of seminars were also held, aimed at improving the financial management skills of marina and boatyard operators.

The Coastal Resources Center

The CRC continued to provide all levels of government with advisory services on a broad range of coastal management topics and continued to function as a principal source of technical and planning assistance to the state's Coastal Resources Management Council.

At the request of the EPA Regional Office in Boston and the EPA Research Laboratory in Narragansett, it produced a detailed review of the literature available on water quality in Narragansett Bay. This information is vital to state and federal agencies as they evaluate strategies for improving the quality of the Bay's severely polluted water.

Working closely with the Governor's Office, the Center provided technical information and evaluation of problems and proposals concerning energy facility siting, development of the outer continental shelf and expansion of the state's marine fisheries. Many of its recommendations became parts of various documents signed by the Governor.

A major effort for both the Management Council and the Rhode Island Department of Environmental Management was a review of all possible candidate areas for estuarine sanctuaries. Findings were used both in an informal brochure for the public and as the basis for the state's proposal to the federal Office of Coastal Zone Management.

Several coastal communities turned to the Center for help in dealing with such problems as water pollution, possible nuclear plant siting and disposal of dredge spoils.

A new group in the state in need of assistance is the Rhode Island Aquaculture Association, which is trying to encourage passage of comprehensive state policies and regulations over aquaculture.

Communications and Information

Dialogue between URI Sea Grant and the public takes place on a steady basis in a variety of ways: through meetings with groups, distribution of specific publications and answering requests for information as well as by keeping the public and the media aware of current marine research at the University.

In 1978-79, the publications distribution manager sent out approximately 35,000 research, advisory and education publications. About 110,500 copies of one quarterly and three bimonthly periodicals went to an audience of 18,500 individuals, libraries, businesses and schools. Twenty-eight new titles were issued during the year. The URI Sea Grant Publications Catalog, which abstracts 300 publications, was in such demand that an updated edition was made available in the fall.

The communications specialist continued to work with the media as well as write news releases and popular articles. One of the articles, which appeared in the state's leading newspaper on the marine life of Narragansett Bay, won a \$1,000 American Association for the Advancement of Science-Westinghouse Science Writing Award. This is the second time URI has won it.

The newsletter editor wrote six issues of the bimonthly *NEMAS Information*, which has a readership of 11,000. Her article on hypothermia and the University's ground-breaking conference on the subject appeared in the *New York Times Magazine* and another, on red tides, in *Soundings*.

Three separate user information services, the Marine Advisory Service Information Center (MASIC), the Northeast Regional Coastal Information Center (NERCIC) and the Division of Marine Resources Library, began their second year of cooperative activities. Information requests increased from 700 in the first year to over 2,000. The MAS Center also distributed monthly lists of acquisitions to a variety of clients and produced a number of information packages.

The Center for Ocean Management Studies

The Center carried out its job of promoting communication between branches of the marine scientific community through newsletters, lectures, workshops and seminars.

A major research activity focused on the disastrous Amoco Cadiz oil spill of 1977, and involved a comprehensive study of the spill's economic impact. Researchers are looking into the direct costs of the accident to fishermen and hotel owners, into indirect costs to the community, and into the overall impact of the spill on the French economy, and they are assessing oil spill cleanup techniques.

During the year, a research associate program was created, providing a unique opportunity for top management from government, industry and other academic institutions to conduct research on a marine management issue of national importance. Dr. Eric Schneider, Director of the EPA's Narragansett, R.I., laboratory, became the first research associate on June 1. During his two-year assignment at COMS he will analyze marine pollution problems in coastal waters, lecture at the University and participate in marine studies at the Center.

EDUCATION



Prentice Stout
(holding fish)

The University of Rhode Island recognized the national need for more effective management of the ocean environment more than ten years ago and with Sea Grant support developed a number of programs in education to meet that need. The scope and quality of these programs have increased year by year.

Nineteen seventy-nine marks the tenth anniversary of the **Master of Marine Affairs Program**, a unique effort to give professionals in marine fields a broad overview of the various disciplines that contribute to the wise use and management of marine resources. The 22 students enrolled in the program during 1978-79 were able to choose one of four study concentrations — coastal zone management, fisheries management, maritime policy and international marine resources management. This final option is primarily for international students who plan to transfer the United States experience with marine resources management to their own countries. Five foreign students were enrolled in the course during the year.

There are presently 175 alumni in 19 countries, holding a wide variety of positions. Those in coastal zone management make up the largest group.

The two-year **Master of Arts in Marine Affairs Program**, initiated in the fall of 1977, also completed a successful year. Several of its 22 students who had served as interns with the state's Coastal Resources Management Council and the Department of Environmental Management are currently employed in state agencies.

A Ph.D. program in **Marine Resource Economics**, which was completely restructured and offered once again in the fall of 1978 after a lapse of several years, now has 14 graduates, all in high-level positions here and abroad.

The need for this unique program was made obvious by the dramatic increase over the past decade in problems concerning marine resources. Dealing with them requires an understanding of ocean management as well as training in general economics.

URI has responded with a master's and a Ph.D. program that capitalize on the University's breadth of expertise in marine subjects. In a period of generally declining enrollment, the two programs are attracting a growing number of truly outstanding students. One graduate is chairman of the Department of Economics at Connecticut College; another is senior staff economist for the New England Regional Fisheries Management Council. Thirty applicants were accepted for the fall of 1979.

Major research areas which have been developed for the restructured programs include international fisheries development; the economics of marine recreation, fishing, offshore oil and gas, and aquaculture; the economic costs of oil spills and the impact of marine business on the region's economy.

Shortly after the Amoco Cadiz spill, the University was asked to coordinate an economic study with other universities here and abroad of the costs of such a massive environmental catastrophe, and several students in the programs have been involved in this work.

The **Fisheries and Marine Technology Program** offered 34 courses and had an enrollment of close to 100 during the year. Thirty of them received an A.S. degree in May, while 12, four of whom were foreign students, earned a B.S. through the Marine Resources Option.

Employment in fishing or other marine-related industries continues at high levels and 44 students registered for the fall of 1979 in the associate degree program.

To meet the needs of the general public, faculty in the department offered evening classes in commercial fishing, diesel engineering, and coastwise and celestial navigation. These classes were always filled.

Several changes in the curriculum were made to increase operational efficiency, and more are anticipated.

An event of major importance for the program was the acquisition of an additional 4,000 square feet of laboratory and classroom space. The department is now housed in an adequate and permanent facility and able to contemplate activities that would not have been possible previously.

This year, department members completed a program of training for United States Fisheries Observers. A training manual and curriculum digest published in the fall of 1979 identify the essential elements of observer education. This was developed at the request of the National Marine Fisheries Service and generated interest and cooperation from a number of fisheries associations and government agencies.

Aquaculture

The other four projects dealing with coastal management were individual studies:

Carbon Flux in a Coastal Marine Bottom Community. In order to understand the response of marine bottom communities to such man-caused perturbations as dumping, anoxic waters, and oil sludge, solid information on the rates and mechanisms of bottom community dynamics is needed. Toward that end, biologists at the Graduate School of Oceanography began this study with Sea Grant support in 1976. Originally scheduled to end in 1979, the project has been extended another year. Work goes on to perfect methods for measuring rates and pathways of carbon and nitrogen flow, to define how the type and amount of organic input to the bottom affects production of benthic animals and demersal fish and to develop the first numerical model of a benthic community—a powerful research and managerial tool.

Circulation Dynamics of Narragansett Bay. Those charged with the welfare of the state's major natural resource, Narragansett Bay, need very much to know what happens to the heated water, sewage and industrial waste discharged into it. This need is being met by a project now in its second year. Using data from a field study done by the National Ocean Survey in 1977, ocean engineers are verifying the details in their circulation model of the Bay.

Marine Recreational Fishing in Rhode Island. This study will provide useful socioeconomic information for resource managers, dealers in sport fishing supplies and others, as well as detailed information on the size and composition of the recreational fishery catch. A year of data collection included a telephone survey of randomly

selected Rhode Island households and field interviews with some 6,000 sport fishermen. The information gathered will make it possible to estimate economic and biological parameters and relationships for saltwater fishing in the state.

***Industry Average Financial Ratios of Southern New England Marinas and Boatyards.** Financial ratio analysis is a common technique for assessing the financial health and performance of a business. It involves using financial performance ratios based on simple data gathered from area businesses. Ratios such as current assets to current debt, net profits to net sales, and sales to average inventory provide a measure against which a firm can compare its own performance.

However, until recently no codified set of industry average financial ratios existed for marinas and boatyards, so there were no reliable benchmarks against which the ratios of individual firms could be compared. Banks, which historically have had little experience with these businesses, tended either to steer clear of them as loan applicants or to treat them as equivalent to automobile dealerships, which led to overly conservative evaluations of their credit worthiness.

At the request of marina and boatyard owners, the University's College of Business Administration undertook to develop financial performance ratios for all of southern New England. This study, supported by Sea Grant for one year, was carried out via questionnaires, and received an enthusiastic response from owners of marinas and boatyards in Connecticut, Rhode Island and Massachusetts. The final report, which was published in January 1980, reflects industry averages and not the performances of individual firms.

Salmonid Aquaculture in New England: An Economic Analysis. This study was begun in 1977 to assess the future for salmon culture in New England under various circumstances. So far, a method has been devised to make an economic analysis of ocean ranching with a water reuse system, and an analysis of the primary recreational benefits of augmented recreational fish stocks has been completed.

Marine Pathology. This laboratory is called on more and more to solve disease problems or to diagnose cause of death in marine mammals, turtles, fish and invertebrates. One result of this public service function is that accessions, which also serve as teaching and research material, have increased by about 4,000. Specific research projects during the year were co-sponsored by the National Science Foundation, American Petroleum Institute, Sea Grant Miami, Woods Hole Oceanographic Institution, EPA and URI.

***Production of Salmonids in Closed Systems.** There is considerable interest both in this country and abroad in raising salmon in hatcheries that reuse water. If the proper environment can be achieved, smolts can be produced more cheaply and pollution lessened.

This project, which began in 1976, has been directed at producing that environment. Early achievements in-



cluded developing a low-cost and efficient diet and reducing mortality due to disease and premature sexual development.

In the past year, project personnel worked with other agencies and institutions on solving water quality problems; specifically, nitrite toxicity, high mortality during smoltification and impaired respiration. Nitrite toxicity was resolved through chloride ion enrichment of the water; smolt mortality of steelhead trout, traced to elevation of ammonia in the erythrocyte, was reduced by sodium ion enrichment; and the complex problem of impaired respiration was partially solved through calcium ion manipulation. The result has been increased interest on the part of governments and commercial growers in making use of closed systems. In addition to federal and state hatcheries here and in Canada, firms in Maine, New York, Connecticut and Washington have recently adopted them.

Fisheries

Tank Testing URI Series 340 Trawl. This net, developed by URI for the National Marine Fisheries Service in 1964, has been a tremendous success with fishermen here and abroad. It is a small net, comparatively speaking, but capable of much versatility in both its size and its catch type. In response to a number of inquiries about possible design modifications, six scale models were designed, constructed and tested in the White Fish Authority Flume Tank in Hull, England, during the year. Promising design changes shown by the tests are being investigated.

Analysis of Changes in Capital Stock in New England Fisheries. The ability of the New England Regional Fisheries Management Council to predict entry into and exit from specific fisheries by fishermen is crucial to management decisions. This study, now in its second year, is looking into an area of fisheries economy about which very little is known—the changing number of vessels in a fishery. This is a far more significant figure than catch per vessel for the prediction of fishery stocks and the regulation of effort. Two sources of useful data have been identified, and the result is a body of information on capital stock and fishing activities of New England firms over the period 1970-78. The mathematical model being developed will be used for long-run forecasting.

Food and Drugs

The Biochemical Composition and Biological Effectiveness of Brine Shrimp in Aquaculture. An estimated 99 percent of aquaculturists use brine shrimp to feed fish and shellfish. This study is part of an international project aimed at providing the aquaculture industry with needed information on the nutritional and biological value of new strains of brine shrimp that appear on the market. URI researchers expect to complete their portion of the study in 1980.

Food Service Management Personnel and Clientele Reactions Toward Fish Utilization in Food Service Systems in Rhode Island. This project was initiated in 1978 to promote the use of fish in food service systems statewide. Researchers in the Department of Food Science and Technology, Nutrition and Dietetics have now developed a questionnaire to survey the following: fish utilization in all known food service systems in the state, the adequacy of available equipment and refrigeration, supply sources, budgets, and client response. Recommended species of fish have also been identified and recipes developed.

***Removal of Wastes from Salmon Culture Water and Utilization of Wastes from Seafood Processing Plants.** A process developed by chemical engineers over the past year not only turns a waste into a useful raw material but addresses a basic problem in closed-system aquaculture.

Aquaculturists wishing to recycle water must clean it first. Foam separation, the principle by which detergents work, is a common and effective method of water treatment.

Looking for a natural foaming agent that would behave like standard commercial detergents but not be toxic to fish and algae, the URI researchers found it in waste water from clam-processing operations in the state. When this water is pumped through a foam generator, it produces a micro-foam with unusual characteristics. Its special virtues include small bubble size, long lifetime, and the fact that, being more stable than traditional foams, it can be pumped. In aquaculture systems it removes 90 to 100 percent of fish wastes.

It was also found to have uses outside aquaculture which will become increasingly important as fish and other kinds of food processing firms are required to meet new government standards on the waters they discharge. The surfactant produced from clam waste, it was found, can also float off suspended solids in the waste waters of a variety of processing operations.

Other URI researchers have been investigating the foam's potential for supplementing the diet of fish in aquaculture and for aerating their water. All in all, this natural surfactant shows impressive promise for the food and aquaculture industries.

***Pragmatic Facets of Deleterious Dinoflagellate Toxins.** Poisonous red tides, the phytoplankton blooms that occur periodically in oceans around the world, have been known since biblical times. But today, with shellfish more important to world trade than ever before, a red tide can have serious health and economic consequences. In 1977, red tide cost Japan \$15 million. Last year, the scallop aquaculture in that country was badly crippled by another red tide.

Since the early 1970s, when scores of New Englanders suffered paralytic shellfish poisoning with disastrous results for the seafood industry, a pharmacognosy team at URI has been studying various aspects of the problem. By 1976, their research was internationally known and shellfish samples from around the world began to be sent to them for analysis.

Many mysteries about red tides still remain. It isn't even known what triggers a population explosion or "bloom" of the minute phytoplankton whose toxins accumulate in the bodies of shellfish. Speculation is that a specific combination of water chemistry, water salinity and weather is the cause.

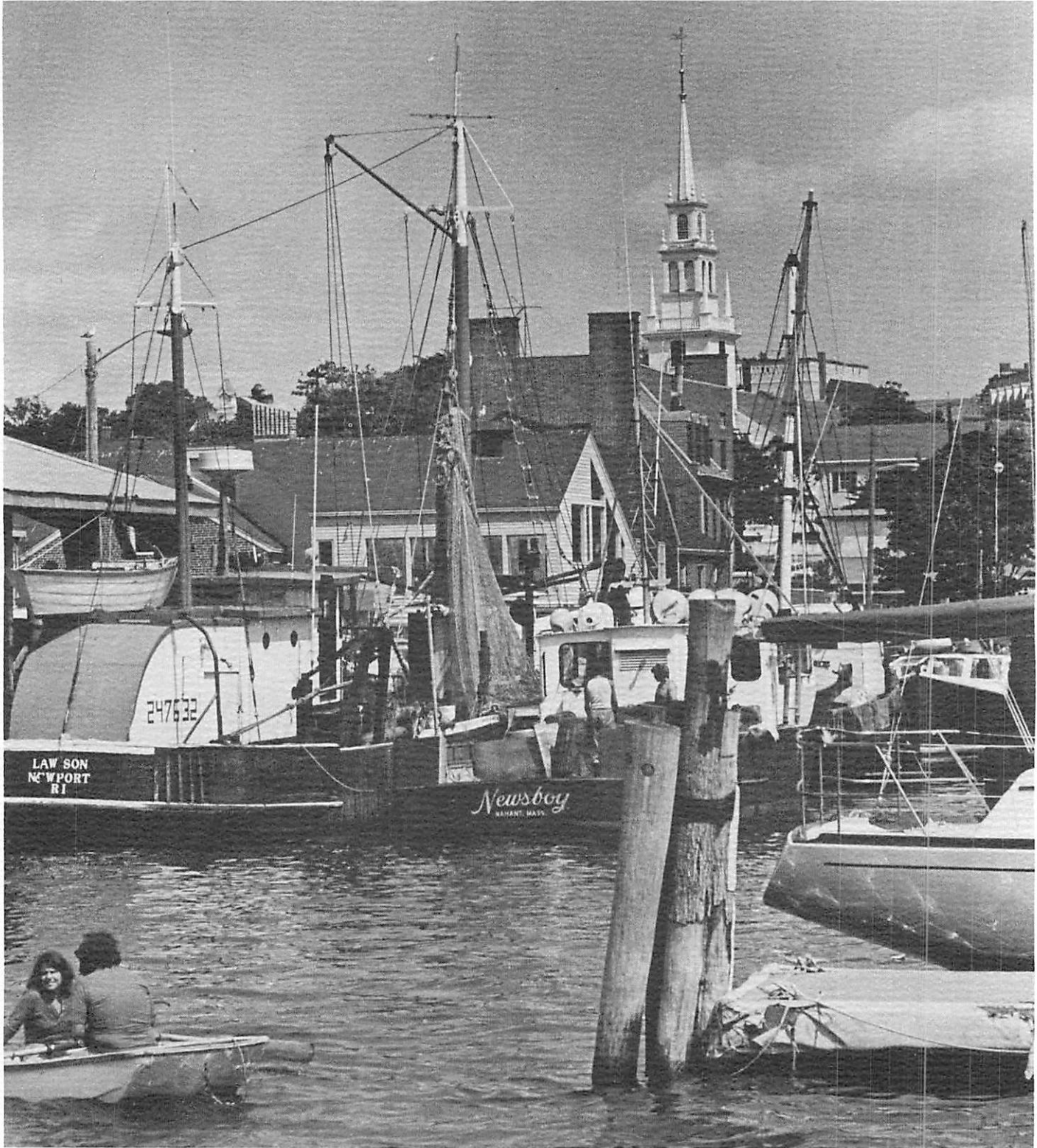
Current research at URI continues to try to improve understanding of the dinoflagellate toxins, to evaluate their impact on humans and to devise ways to prevent poisoning other than the indiscriminate closing of shellfish beds, which is so disastrous to the international seafood trade.

***Rapid Visual Methods for Seafood Quality: Combined Enzyme Strips for Grading.** The freshness of fish is affected both by enzymatic breakdown and by bacterial spoilage. Hypoxanthine, a metabolic by-product, accumulates in fish tissue from harvest. It increases as freshness decreases.

The researchers succeeded in developing a rapid visual method for measuring this compound in fish. The "strip test" is based on the fact that when muscle fluid of fish is placed on a dyed and enzyme-coated strip of paper, a chemical interaction occurs which turns the paper from blue to pink if fish is not fresh. The researchers then developed a visual enzyme strip which can detect diamines, the compounds which accumulate in fish tissue as products of bacterial spoilage. As diamine forms, the color changes from white to green.

These two separate colorimetric test strips will be incorporated into a single unit and then refined to detect hypoxanthine and diamine development in the three quality phases: fresh, acceptable, and incipient spoilage. Industry is interested in this easy-to-use method.

PROGRAM DEVELOPMENT



Frequently, the Sea Grant Program is able to respond quickly to needs in the marine community and implement promising new ideas for research because of a fund maintained for the development of unanticipated and short-term projects. Often such "quick-response actions" lead to larger scale, formally funded research in the following years.

Nine such studies received financial help from Sea Grant during the past year. Boat theft, a relatively new kind of crime, increases yearly. One reason it flourishes is because law enforcement agencies do not have a coherent strategy for combatting it. A URI study examined all existing information systems in the United States and concluded that what was needed was not a new method for reporting boat theft but better cooperation between various authorities and a more effective coordination of information. Their findings and recommendations were circulated at a national workshop on boat theft last spring.

Other projects were:

- Development of a seagoing apprentice program to inform high school seniors of seagoing job opportunities and the realities of working at sea.
- Development of a syllabus for an undergraduate-level course in oceanography.
- A study of the "structure and behavior" of fish marketing, a major and little-documented segment of the New England economy.
- Analysis of legal mechanisms available to Rhode Island to establish fishery management jurisdiction in nonstate waters between Block Island and the mainland.
- Development of a waterfront planning project for the city of Newport.
- Preparation of a comprehensive report on a 13-year census of fish populations in Narragansett Bay.
- A preliminary investigation of the immune response in Malaysian prawns which could be of enormous value in shrimp culture.
- An analysis of the nature and volume of marine growth on floating tire breakwaters as a step toward engineering more floatability into these structures.

PROJECT STATUS FISCAL YEAR 1979

<i>Project Number and Title</i>			<i>Planned Termination Date</i>	<i>Date Initiated</i>
Advisory Services	A/AS-3	Marine Advisory Service	None	1975
	A/COM-1	Center for Ocean Management Studies	1983	1977
	A/CR-5	Coastal Resources Center	None	1971
Education	E/FT-1	Fisheries and Marine Technology	1981	1968
	E/MA-2	Master of Marine Affairs	1980	1977
	E/ME-2	Marine Resources Economics Option	1982	1977
	E/OT-1	Fisheries Observer Training Program	1979C	1977
Coastal Resources	R/ES-11	Carbon Flux in a Coastal Marine Bottom Community	1978C*	1976
	R/ES-14	Circulation Dynamics of Narragansett Bay	1980	1978
	R/CL-1	Development and Verification of Hydrodynamic and Dispersion Models for Coastal Ponds	1981	1978
	R/CL-2	Waterfowl in Coastal Lagoons	1981	1978
	R/CL-3	Submerged Macrophytes in R.I. Coastal Lagoons and Ponds	1981	1978
	R/CL-4	Sediment Transport and Depositional Patterns in Selected Lagoons and Salt Ponds	1981	1978
	R/CL-5	Fish and Fisheries of R.I. Coastal Lagoons and Ponds	1981	1978
	R/CL-6	Options and Techniques for Management of Coastal Lagoons and Ponds	1981	1978
	R/MR-3	Study of Marine Recreational Fishing in Rhode Island	1980	1977
R/MR-4	Study of Industry Average Financial Ratios of Southern New England Marinas and Boatyards	1979C	1978	
Fisheries	R/F-26	Analysis of Changes in Capital Stock in New England Fisheries	1980	1978
	R/F-27	Tank Testing URI Series 340 Trawl	1980	1978
Aquaculture	R/A-11	Production of Salmonids in Closed Systems	1979C	1976
	R/A-12	Marine Pathology	1981	1978
	R/A-13	Salmonid Aquaculture in New England: An Economic Analysis	1980	1978
Food and Drugs	R/D-5	Pragmatic Facets of Deleterious Dinoflagellate Toxins	1979C	1976
	R/T-7	Rapid Visual Methods for Seafood Quality: Combined Enzyme Strips for Grading	1979C	1977
	R/T-9	Removal of Wastes from Salmon Culture Water and Utilization of Wastes from Seafood Processing Plants	1979C	1977
	R/T-10	Study of Food Service Management Personnel and Clientele Reactions Toward Fish Utilization in Food Service Systems in R.I.	1980	1978
	R/T-11	Biochemical Composition and Biological Effectiveness of Brine Shrimp in Aquaculture	1980	1978
Management and Development	M/PM-1	Program Management	None	1971
	M/PD-1	Program Development	None	1973

C indicates project was completed in that year.

* Some final studies were funded under M/PD-1 for fiscal year 1980.

ACTIVITY BUDGET

		NOAA Grant Funds	University Matching Funds
Marine Resources Development	Aquaculture	\$67,446	\$ 49,789
	Living Resources Other Than Aquaculture	25,079	8,035
	Marine Biomedicinals and Extracts	20,011	6,531
Socioeconomic and Legal Studies	Marine Economics	59,550	9,826
	Marine Recreation	84,807	42,155
Marine Technology Research and Development	Resources Recovery and Utilization	80,019	29,576
Marine Environmental Research	Research and Studies in Direct Support of Coastal Management Decisions	25,865	45,620
	Ecosystems Research	239,185	62,492
Marine Education and Training	College Level	66,030	112,156
	Vocational Marine Technician Training	94,329	109,792
Advisory Services	Marine Advisory Services	350,000	160,834
	Center for Ocean Management Studies	20,000	73,017
Program Management and Development	Program Management	90,174	10,935
	Program Development	87,505	--
	TOTAL	\$1,310,000	\$722,958
	ROUNDED TO	--	\$723,000*

**While matching is shown at \$723,000, the University of Rhode Island does not wish to claim matching for audit purposes for more than one-third of the total cost of the University of Rhode Island Sea Grant Program.*

SEA GRANT PUBLICATIONS AND PAPERS

July 1978 to June 1979

Note: The P number at end of citation is the order number used by the Publications Unit of the URI Marine Advisory Service.

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Motte, G. A. (Fisheries and Mar. Tech., URI). "Cutting Web Tapers," 2nd Printing (1979), P 13.

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