

## Sea Grant Programs

The National Science Foundation Sea Grant Program supports activities in research, education and training, and advisory services for development of the nation's marine resources. In fiscal year 1970, the Foundation awarded approximately \$9 million for these purposes as shown in the table below.

One of the principal objectives of the National Sea Grant College and Program Act of 1966 is the creation of a strong base of institutions dedicated to development of marine resources comparable to the Land Grant College efforts in the field of agriculture. In its third year of operation, the Foundation's National Sea Grant Program has continued active development of the National Sea Grant network of institutions with the addition of the University of Southern California, bringing the total of major universities now in the program to nine.

The other eight institutions which received initial support in fiscal years 1968 and 1969 are: Oregon State University, the University of Rhode Island, the University of Washington, Texas A&M University, the University of Hawaii, the University of Wisconsin, the University of Miami, and the University of Michigan.

The nine institutions are engaged in comprehensive Sea Grant programs involving research in all fields important to marine conservation, management, and development, including law, economics, and other social sciences as well as engineering and the natural sciences. All institutions have major educational programs at both the graduate and undergraduate level, and all engage in programs designed to communicate the results of research to such users as fishermen, seafood processors, ocean engineering firms, and State governments.

In addition to the major institutions, the Sea Grant Program has initiated comprehensive activities in several smaller institutions for

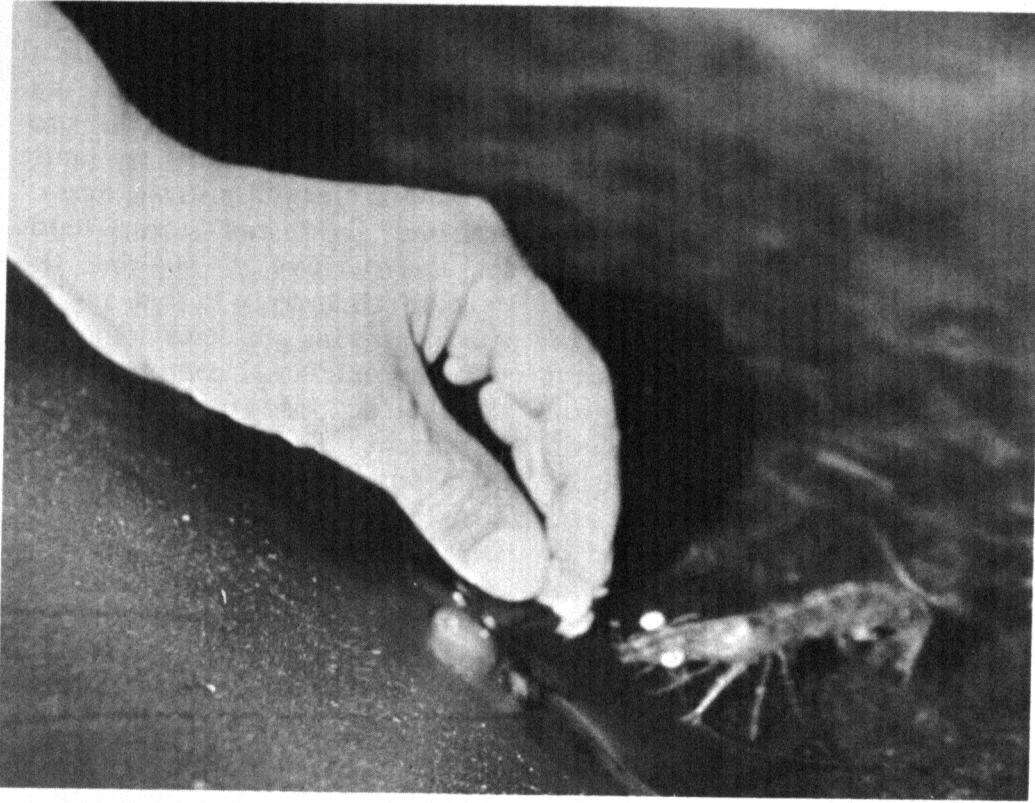
the purpose of developing major marine competence in geographical areas where no broadly based marine research and education programs now exist. Grants are made to universities with a strong core of activities in limited marine fields for the purpose of applying the existing competence to local and regional marine problems while developing additional competence for the future. Such grants, known as "Coherent Project Grants," were made in 1968 to Louisiana State University and the University of Delaware. In 1969, the University of California at Santa Barbara, Humboldt State College, Calif., and the Virginia Institute of Marine Sciences were added. In fiscal year 1970, major coherent project grants were made to the University of Alaska and the Massachusetts Institute of Technology. These grants, in company with the institutional grants, form the base of the rapidly growing Sea Grant family of institutions.

Activities funded in previous years, under institutional, coherent project, and general project grants, began to show positive results of value to the national marine effort during fiscal year 1970.

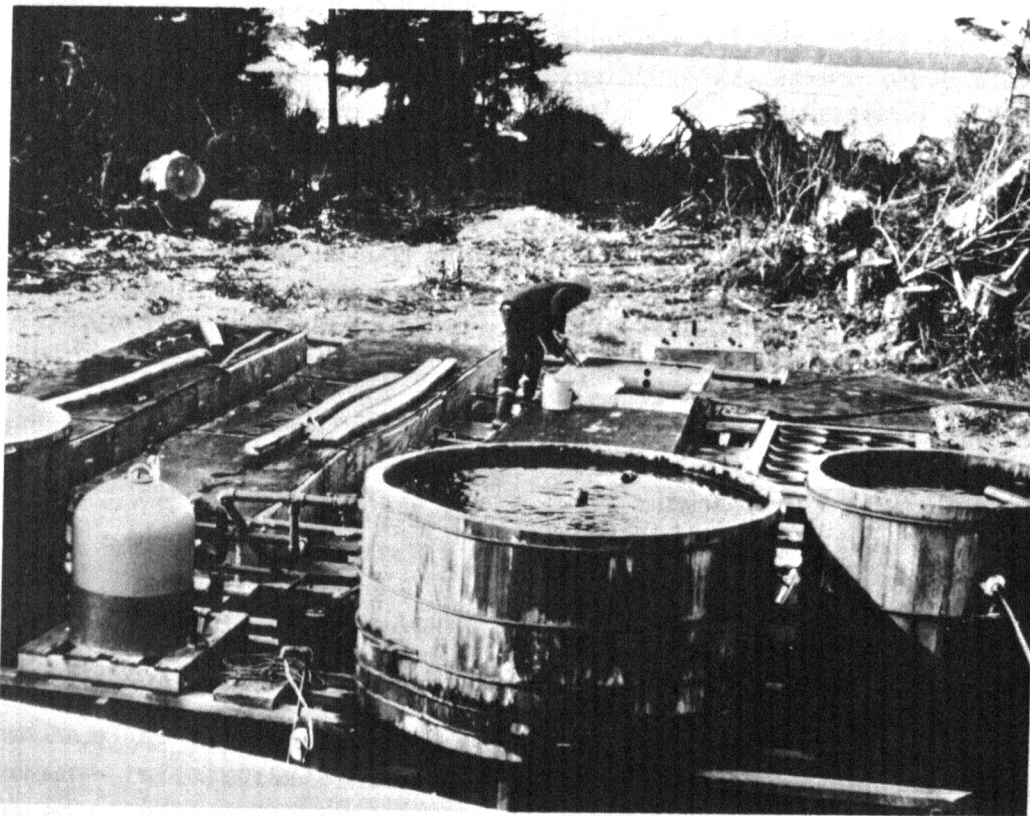
Sea Grant efforts to develop techniques for the mass culture of high-value marine food organisms are continuing with a number of problems in aquaculture already solved.

Table 11  
National Science Foundation  
Sea Grant Program  
Awards Fiscal Year 1970

Category of grant	Number	Amount
Institutional support.....	7	\$5,675,400
Project support:		
Coherent area projects.....	3	797,400
Educational projects.....	7	561,512
Research projects.....	17	1,776,144
Study and planning projects.....	2	33,700
Advisory services projects.....	2	130,000
<b>Total.....</b>	<b>38</b>	<b>8,974,156</b>



Notable advances have been made in the development of techniques for mass culture of marine food organisms, including the successful raising of shrimp from egg to adult. (Photo University of Miami)



Tanks and artificial ponds are used by scientists at Oregon State University in a project designed to introduce exotic species of salmon into Oregon waters. (Photo Oregon State University)

One of these is the raising of shrimp from egg to adult, accomplished at the University of Miami. Substantial progress in the introduction of exotic species of salmon into Oregon waters was made during the year by fisheries scientists at Oregon State University. Louisiana State University scientists determined the salinity and temperature tolerances necessary for the culture of pompano.

Disease of fish and shellfish will be an increasing problem as aquaculture on a large scale is attempted. Scientists at Texas A&M University identified what could be a serious problem for commercial shrimp growers when it was noted that shrimp being used for nutritional experiments developed a high mortality. The Texas A&M Sea Grant team determined the cause to be a pathogenic bacterium, *Vibrio parahaemolyticus*. This organism could be especially lethal in closed ponds where young shrimp are raised. While the bacterium also could cause food poisoning in America (as it does in Japan), this is unlikely because little seafood is eaten raw in this country; cooking destroys the disease organism.

Scientists at the Lamont-Doherty Geological Observatory of Columbia University successfully installed the first stage of a system that will not only provide nutrients for aquaculture, but should also produce fresh water and electric power through the raising of deep, cold seawater from near the ocean bottom. A mile-long pipeline was laid from the shore of St. Croix, in the Virgin Islands, into deep water where the temperature is only 41 degrees, and far more nutrient-laden than the warm surface waters. As the project continues, the cold water will be used in large condensers to remove fresh water from the warm trade winds by condensation. The cold water will also contribute to production of electric power by use of a steam generator powered



by the temperature difference between the surface and bottom waters. Finally, the bottom water will be fed into a lagoon where its nutrients will support the start of a food chain that will end with commercially valuable marine organisms.

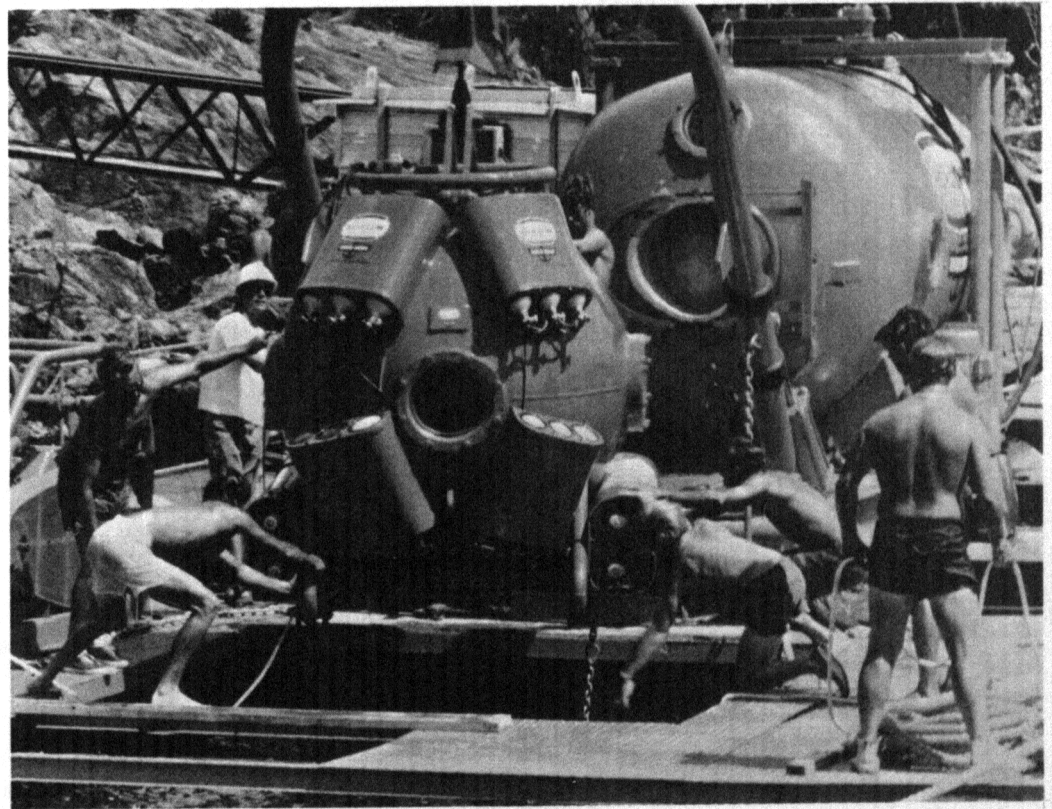
On the neighboring Virgin Island of St. John, Project Tektite II, a continuation of the man-in-the-sea program under Department of the Interior leadership, received major support from Sea Grantees. For the first time, student divers were given prime responsibility for logistic and diver safety support in a major operation. The divers were senior students from Highline Community College, Midway, Wash., trained and supported under the University of Washington institutional Sea Grant program. Cape Fear Technical Institute operated its own training vessel, *Advance II*, and the NSF vessel, *Undaunted*, in support of the operation. The Cape Fear Technical Institute at Wilmington, N.C., was responsible for coordinating and supporting a program of scientific oceanographic and meteorological research conducted in conjunction with the underwater scientific program, with over 400 persons and more than two dozen universities, industries, and Government agencies taking part. The University of Delaware Sea Grant program supplied the girl engineer, Margaret Lucas, to the first all-female aquanaut team. The Texas biomedical Institute at Galveston, under a Sea Grant project, conducted both medical support and a training program for diving doctors as part of Tektite. Southern Maine Vocational Technical Institute at South Portland, Me., provided both technician trainees and faculty members to the Tektite operations.

In advisory service operations, a significant forward step was the organization of the Pacific Coast Advisory Service. Centered at

Oregon State University, the service involves institutions and agencies in California, Oregon, Washington, British Columbia, and Alaska. Cooperating with the Sea Grant program are the Bureau of Commercial Fisheries, the Environmental Science Services Administration, and a number of State agencies. The program is planned to improve information and extension services to marine activities throughout the Pacific coast.

During the year, other grants produced a broad spectrum of research and education activities, including the following:

- Scientists at Texas A&M University measured the effects of waves and currents on submerged pipelines and listed the data in a regular Sea Grant publication available to industry as a basis for improving pipeline operations.
- The cooperative work-study ocean engineering program at Florida Atlantic University resulted in 27 industry requests for the first 11 graduates. Fourteen graduates of the comparable bachelor-degree course at Mississippi State University/Gulf Coast Technical Institute were employed after graduation in June.
- Engineers at Stevens Institute of Technology developed a computer program for analysis of offshore floating platforms. By application of this technique, they expect to improve by 10 percent the design of offshore oil derricks for resistance to all elements of sea damage. This should eventually decrease insurance costs to industry and reduce platform loss.
- Sea Grantees at the University of Washington have successfully completed the first stage in de-



Student divers from Highline Community College, trained under the University of Washington Sea Grant program, provided logistic and diver safety support service in connection with Tektite II man-in-the-sea program. (Photo University of Washington)

- velopment of a system to locate biological targets in the sea more effectively through acoustic techniques—a project to help fishermen cut down the long periods spent hunting for fish.
- The University of Rhode Island has made extensive strides in developing a computerized lobster management model for optimizing the environment for lobster rearing.
  - Sea Grantees at the University of Wisconsin have received a grant from oil companies to be used for unspecified research occurring as an outgrowth of the minerals research carried out under the Sea Grant program.
  - The University of Maine Law School has identified and categorized the laws, regulations, and court decisions of Maine pertaining to recovery of living and mineral resources of State waters.
  - Sea Grant food scientists and marine extension agents at Oregon State University brought shrimp and crab processors together for the first time, and conducted a program that has increased both the sanitation and efficiency of the entire Oregon shrimp and crab processing industry.
  - The University of Hawaii uncovered deep shrimp resources about 1,500 feet under the sea. The shrimp may occur in commercially exploitable quantities. Tests indicate that, with heavy hauling gear, fishermen might catch as much as 1,000 pounds of shrimp per working day. Experiments at the University of Hawaii in growth rates of an octopus with commercial potential indicate that this is an extremely promising organism for aquaculture because of its rapid growth, good energy conversion, and high retail price.
  - Scientists at the University of Rhode Island succeeded in raising Atlantic salmon from an average weight of 1½ ounces to a size of nearly 12 ounces in 6 months under relatively poor growing conditions. With improved environmental controls, it should be possible to effect an even greater growth rate. Progress is also being made in the raising of other so-called luxury fish, including chinook salmon from Alaska, rainbow trout, bluefish, and striped bass.
- The Sea Grant Program is primarily geared to long-term results, and these “quick returns” represent a tiny fraction of the potential.