CONN-Q-88-001

Connecticut Sea Grant Program 1986-1988

PROGRESS REPORT

Contents

THE CONNECTICUT SEA GRANT PROGRAM

The Connecticut Sea Grant Program is a partnership between the National Sea Grant College Program and the University of Connecticut. Supported by both federal and state funds, it is one of the 30 university-based programs in states along the East, West, Gulf Coasts, and states bordering the Great Lakes. Each program serves national and local constituencies by awarding grants for marine research, providing advisory services, and fostering public awareness of the marine environment through educational programs. The federal program, modeled after the Land Grant College programs in 1862, was established by Congress in 1966.

Recent years have seen many changes in the program, as it moved steadily toward reaching college status, with expanding opportunities and myriad accomplishments. This publication will document those changes and accomplishments by providing an overview of the program's acitivities in the years 1986 to 1988.

Remarks From the Director

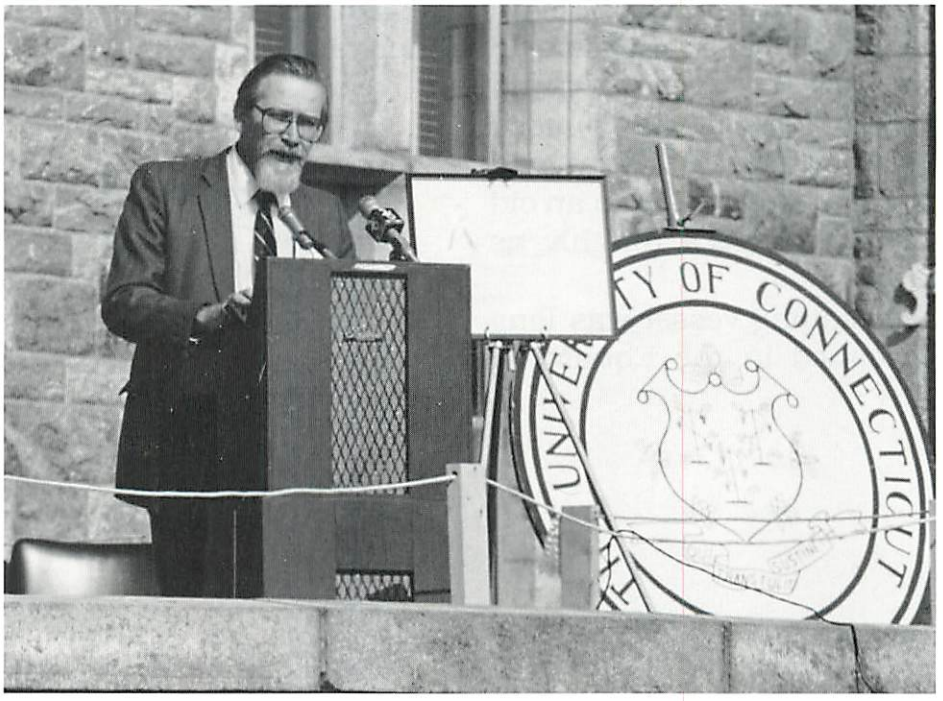
(excerpted from E.C. Monahan's presentation at the Connecticut Sea Grant College designation ceremony Oct. 5, 1988)

Our current comprehensive Sea Grant Program can trace its roots back more than a decade to the origins of the Sea Grant Marine Advisory Services here at Avery Point. The outreach efforts of our half-dozen Sea Grant Marine Advisory specialists result in fruitful contacts with thousands of citizens each year. At present our SGMAP staff coordinates, on behalf of the Connecticut Sea Grant College Program and the New York Sea Grant Institute, the public education and participation program for the Long Island Sound Study, a time consuming but very worthwhile effort.

We are proud of the marine research we have been able to foster, not only on the several campuses of UConn, but at other universities in this State as well.

In a nearby university, concern was expressed about what was called the "Ivory Tower Syndrome." I find it hard to recognize a valid basis for such concern in the public universities of the late 1980s. When medical wastes hit the beaches, the University marine scientists are not to be found sequestered in the upper chambers of the Ivory Towers; rather, their plight is akin to that of traders on the floor of the New York Stock Exchange, as they do their best to give immediate answers to urgent questions. It is the corpus of prior knowledge, gathered over years, that we must rely on to provide the initial answers. A society that appreciates the benefits of insurance should readily recognize that the investment required to sustain an active marine scientific community is a cost effective premium whose payment will guarantee that the answers, or at least the methodologies required to get the answers, are available when impending traumas to our marine environment loom just offshore.

The decade that I spent teaching in Europe reinforced my perception that there are some things that American Universities do well, and other areas where our higher education system could benefit by looking closely at what is done elsewhere. The Sea Grant Program, and its model, the



Edward C. Monahan, Director of the Connecticut Sea Grant Program, at the designation ceremony.

Land Grant Program, are excellent examples of what our universities do very well. In this context, I am pleased to announce that the Connecticut and Rhode Island Sea Grant Programs, with assistance from the other New England programs, will have in place before this year is over, the initial phase of a program to introduce the Sea Grant concept to the universities of Ireland.

Given that the Connecticut Sea Grant Program developed during the winter-like '80s, we still have some fleshing out to do to come shoulder-to-shoulder with the Sea Grant programs in the other New England states. I take some comfort, as I contemplate what still needs to be done, from an old tale which goes roughly as follows:

A sailing vessel was long becalmed in the Equatorial Atlantic, off the coast of Brazil and out of sight of land, when an errant breeze brought another vessel within hailing distance. Since they had long broached their last cask of drinking water, they immediately called over and asked the newly arrived vessel if they might row over and secure a few full casks. They were dumb-struck when the second vessel's captain hollered back, "Put down your bucket where you are." After this seemingly heartless response was repeated, the crew of the first vessel, in desperation more than in hope, acted on this suggestion and were amazed to find their bucket filled with drinkable water, a consequence of the extent of the vast seaward plume of Amazon River water.

Let us set aside any discussion of the salinity of this brackish plume. But let us all note that the various Sea Grant programs represent a pool of trained and motivated marine scientists. And let us hope that as our marine environment continues to suffer insult and deterioration, our elected leaders will have the wisdom to draw upon this ready resource as they prepare to address difficult environmental problems. If they do so, I am confident that the necessary scientific and technical talent can be mustered with minimum delay, and incidentally, the Sea Grant Program will experience a well-deserved second spring.

Mysteries of Crustacean Reproduction

In Search of the Super Shrimp

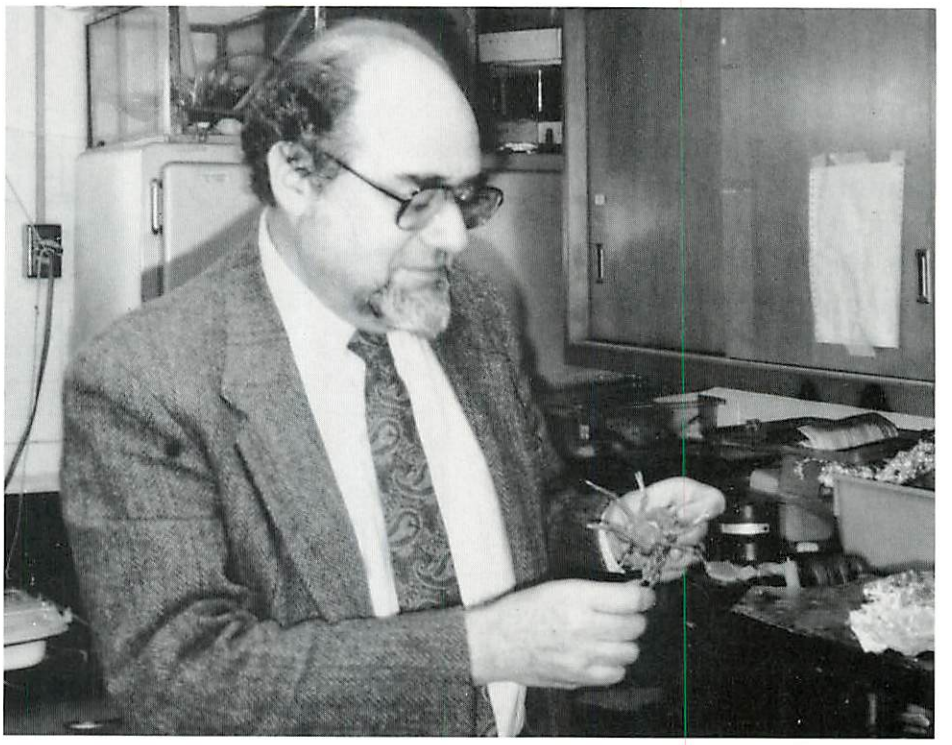
The mysteries of crustacean reproduction and development are unfolding to Hans Laufer, whose expertise in molecular and cell biology, genetics, embryology and endocrinology can put together the pieces of the puzzle. Although these processes are fairly well understood in insects, little is known about their fellow arthropods, crustaceans.

Working with the blue crab, lobster and the spider crab in his Sea Grant research, Laufer and his colleaues have identified the juvenile hormone similar to that of insects in these crustaceans, and its biological precursor, methyl farnesoate. This compound plays a role in inhibiting the maturation of crustaceans. In addition, he has discovered the site of methyl farnesoate production and secretion, the mandibular organ.

In examining the role of methyl farnesoate in crustacean development, which includes metamorphosis, Laufer has produced "super larvae" in his UConn laboratory, by removing the eyestalks of spider crabs. Young crabs undergo the molting process and become adult sized, but their bodies do not mature into the final shape that would allow females to reproduce and hold eggs. The eyestalks of these creatures contain a compound that may be a growth stimulating hormone, inhibiting the formation of methyl farnesoate.

Laufer's work could improve our understanding of the complex processes underway in the crustacean endocrine system, giving us the ability to turn the reproductive cycle on or off. This ability has tremendous implications for aquaculture and mariculture. Desirable species such as lobsters and crabs could be selectively bred to increase size and yield. At the same time, species we consider undesirable, such as boat-fouling barnacles, could be discouraged by biological means. Laufer is now extending his research applications to include crustaceans that are reluctant to breed in captivity, including shrimp and prawn.

As the mysteries of crustacean reproduction and growth continue to unfold, prospects for increasing the world's supply of food from the sea brighten.



By removing the eye stalks of young crabs Hans Laufer has produced "super larvae" in his UCONN laboratory.

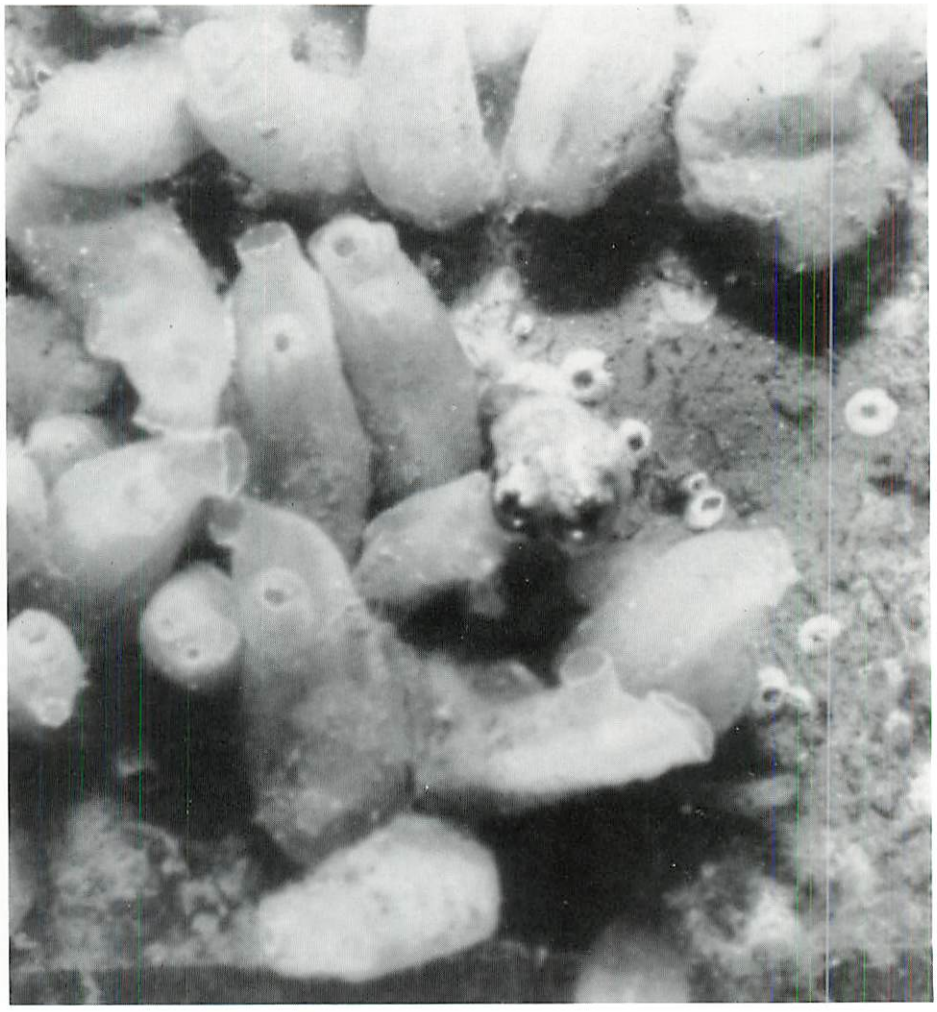
Against All Odds:

Survival of Juvenile Oysters

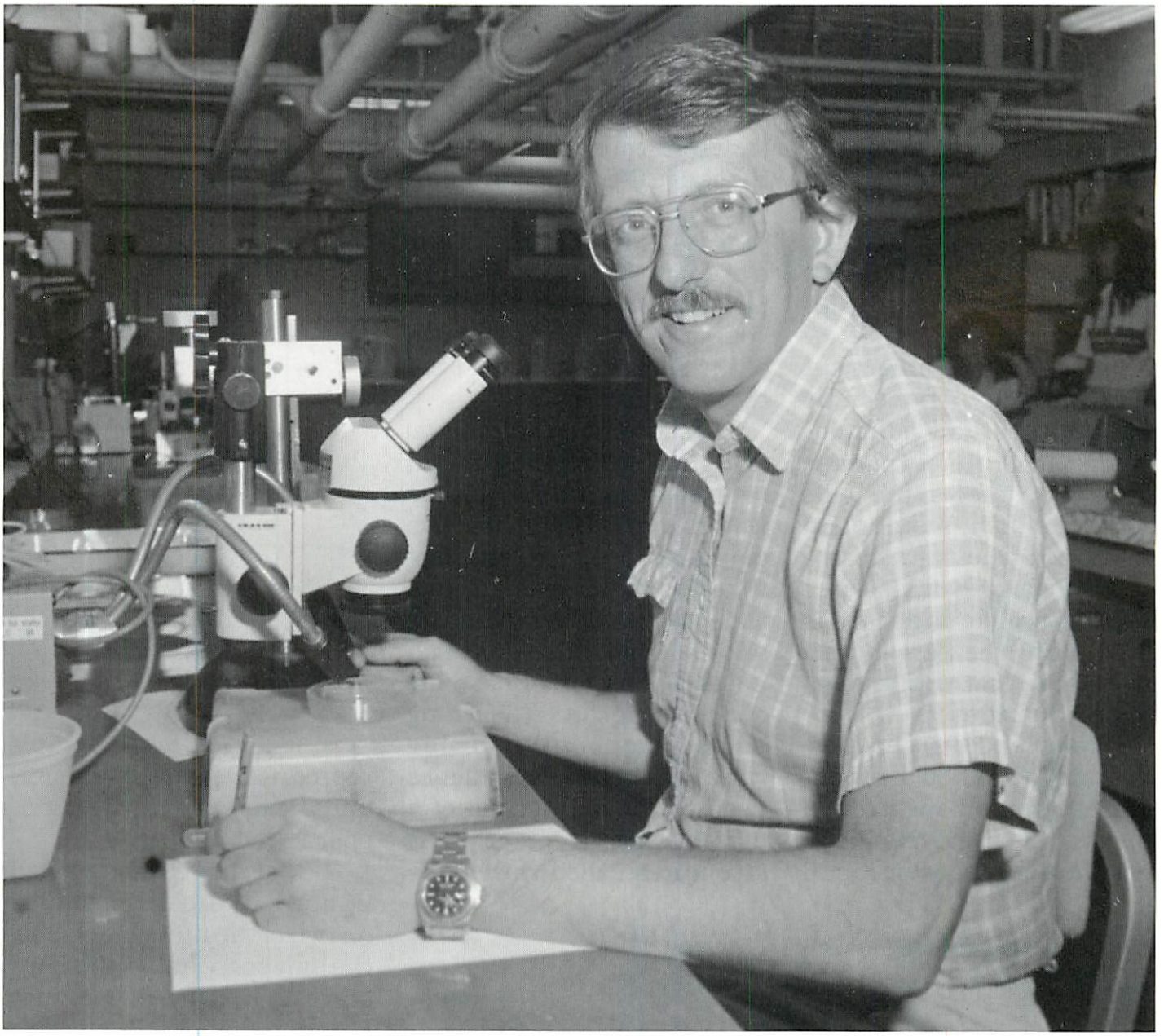
An oyster's life is not an easy one, as Dr. Robert Whitlatch's research on their life history shows. Of the 60 million eggs that a female bivalve may produce, only about 42,000 survive to settle to the bottom, and a mere 13 survive to see their first birthday. During the critical stages in which the pelagic larvae settle to the bottom and metamorphose, the young oysters need a hard substrate for support. But, in addition to predation, they face competition for space from other sessile species—barnacles, tunicates and hydroids.

Not all of these animals that call the bottom of coastal waters home are natives; some are exotic marine interlopers. Whitlatch's research examines organisms that compete with juvenile oysters for a niche on the bottom, including two species of sea squirts that have invaded from the Pacific. These introduced tunicates, efficient predators and competitors of young oysters, are spreading rapidly in Long Island Sound. One newcomer, *Styela clava*, appeared in the Mystic River as recently as 1985, perhaps hitching a ride on the underside of a ship. The other one, *Botrylloides*, an orange, encrusting ascidian, apparently escaped from Woods Hole in the late 1970s. Because the two newcomers have no natural predators in the Atlantic, and are larger than related native species, they multiply in great numbers and may cause profound changes in the ecology of Long Island Sound, threatening the Sound's commercially important bivalves. Commercial oyster growers have found that these foreign interlopers foul the nets on which they keep their oyster crop, adding extra weight to the nets, and interefere with the oysters' filter feeding ability.

Measuring only the net recruitment of oysters, Whitlatch has found, severely



Ciona intestinalis, a solitary ascidian that preys on oyster larvae.



Robert Whitlatch prepares to examine benthic invertebrates that compete with juvenile oysters.

underestimates the effects of competing species on larval settlement and post-settlement mortality. He has looked at both solitary and colonial competitors; barnacles, ascidians and bryozoans. One species, *Ciona intestinalis*, was found to be an oyster predator. But these organisms can also limit oyster survival in other ways, competing for the same food source, for example, and by usurping the available habitat. These animals could possibly worsen the recurring low-oxygen problem in Long Island Sound, once they spread to the western end.

Whitlatch's research is helping us learn just how far-reaching the impact of these benthic invertebrates is, and is benefiting shellfish management agencies and commercial industries with information on reducing the mortality of juvenile oysters.

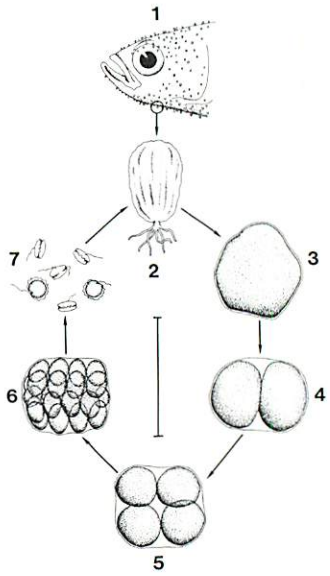
Arresting a Killer

Amyloodinium ocellatum

A deadly parasite of marine and brackish water fish could be stopped in its tracks by research completed by Carol Bower and David Turner of the Institute for Marine and Aquarium Studies at Eastern Connecticut State University. The scourge of aquariums and aquaculture facilities, *Amyloodinium ocellatum* infects the gills and skin of fish, resulting in anorexia, difficulty in breathing, and clamped fins. Three times the prolific parasite has devastated the coral reef exhibits at the Mystic Marinelife Aquarium.

Bower and Turner have developed a method of propagating this organism through its entire life cycle on a large scale in the laboratory, and tested chemical compounds that have the ability to immobilize the parasite. Such a process is important for our understanding of the parasite's life cycle and for a source of similar organisms of the same age to use in the research process.

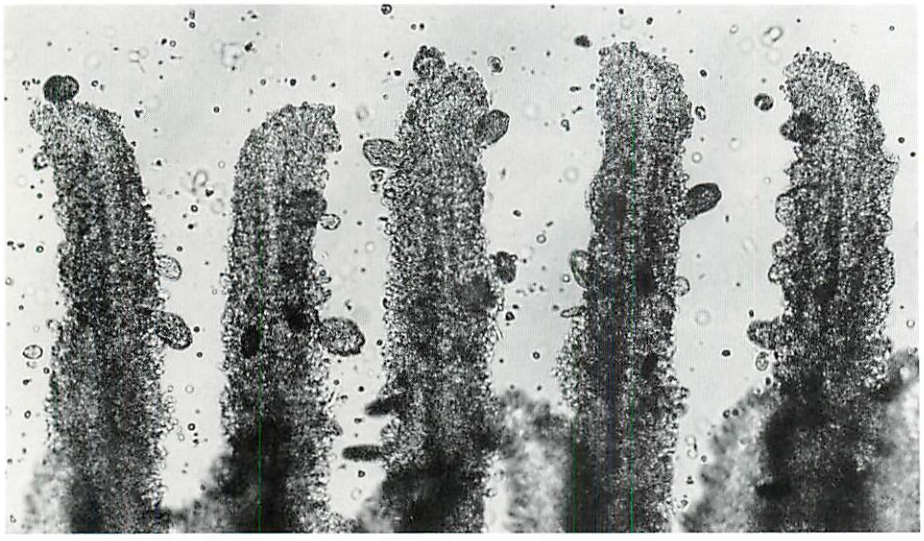
Amyloodinium ocellatum is a dinoflagellate often found in both estuarine and marine waters. Part of its destructive potential is due to the fact that it is more resistant to a wide range of temperature and salinity than its fish hosts. It has a tri-phase life cycle that includes a feeding stage (trophont), during which the organism attaches itself to the skin or gill of a fish by means of gripping structures called rhizoids, a reproductive stage (tomont) and the infective stage (dinospore).



Life cycle of Amyloodinium ocellatum. 1-2) Parasitic, feeding stage (trophont). 3-6) Encysted, reproductive stage (tomont). 7) Free-swimming, invasive stage (dinospore).

Bower and Turner tested 26 anti-protozoal compounds on two of the three life stages, the dinospore and the tomont stages. Of these, 19 were found to immobilize invasive dinospores after twenty four hours. Five were shown to inhibit sporulation of the tomont stage as well.

Millions of dollars in commercial losses could be prevented by the results of Bower's research, removing a major obstacle to finfish mariculture.



Amyloodinium trophonts on the gill lamellae of a hybrid striped bass.

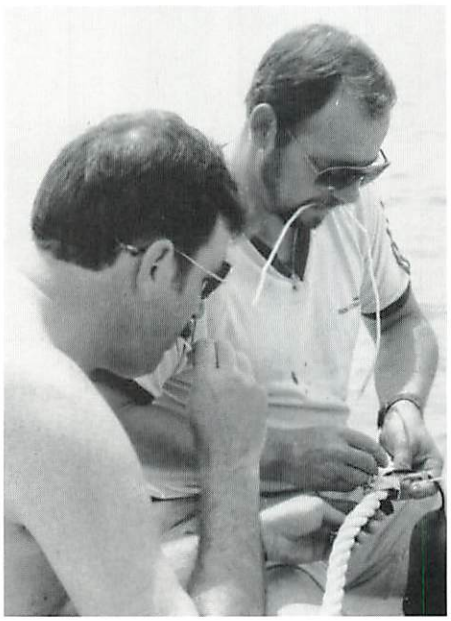
Seaweed in the Sound

When we think of the typical New England farmer, we generally imagine someone in faded jeans, perhaps standing in a cornfield. But thanks to Charles Yarish's research on developing maximum biomass in *Laminaria*, the farmer of the future may wear a wetsuit, and the crop may be those ruffled, brown banners we often find cast up on shore, kelp. And the fertilizer might well be the billions of gallons of lowly sewage that enter Long Island Sound each and every day.

Laminaria is an important primary producer of the nearshore benthic environment. It is consumed in the Orient as a vegetable, kombu, or used as soup stock. In this country, kelp is valued more for its phycocolloids, gel-like substances that are used as binders, stabilizers and smoothing agents in a number of food items and other products. One of these phycocolloids, alginate, is of particular commercial importance to the food, textile, cosmetic and pharmaceutical industries.

Ever wonder what makes the glaze on your chocolate doughnut so smooth, or your ice cream creamy? Alginate is also part of fabric finishers, glossy coatings on paper, lipsticks, toothpaste, and photographic film emulsions. The list could go on and on. In China, commercial cultivation of kelp produces two million wet tons per year. In the United States, kelp is harvested on the west coast, but not farmed. On the east coast, very little is done with kelp at all. But Yarish may change all that.

In Yarish's estimation, the protected estuarine environment of eastern Long Island Sound would make an ideal nursery for young kelp plants, transplanted from seedlings grown on special ropes in the laboratory or greenhouse. To this end, he has been isolating and breeding special strains of *Laminaria* in Petri dish cultures in his Stamford laboratory to produce genetically superior kelp adapted to conditions in the Sound. Yarish prefers *Laminaria longicruris* because it grows rapidly to great lengths, but this cold water species can't tolerate warm waters at the western end of the Sound. He has used selective breeding to develop a strain that will grow well at temperatures two degrees warmer than previously recorded.



Charles Yarish and assistant prepare young kelp plants for transplanting into Long Island Sound.

The first step in kelp breeding is to collect indigenous plants from the wild, then isolate hardy plants that grow quickly to great lengths and bulk. These strains are then cultured on special gradient tables that allow for variation in temperature and irradiance, creating up to 75 different environmental conditions

at once. Selected plants are then crossed with others to produce an even hardier generation. In this manner, a "pedigree" line of "super kelps" is established.

Uptake kinetics and nutrient interaction in these pedigree kelps was examined, along with other growth factors, by testing the effects of various ammonia levels on the growth of both micro- and macro-plants. Preliminary results showed that young macrosporophytes thrive, regardless of the ammonia concentration. Plants were tested at levels from 10 to 100 micromolar concentration (22 is the average sewage treatment plant level). Low levels produced as much growth as high levels.

Could this kelp specimen, held by Charles Yarish, represent the crop of the future in Long Island Sound?

The United States Environmental Protection Agency laboratories in Narragansett, R.I. are using strains of *Laminaria* from this project as prototype pollution monitors.

Yarish's collection of genetically different strains in his Stamford laboratory at the University of Connecticut has an additional benefit: in case of an ecological disaster that might hypothetically wipe out the native kelp, this stock could repopulate the area. Yarish now has about 100 strains in his collection. The project is done in cooperation with researchers and facilities at SUNY at Stony Brook, New York.

The summer of 1988 saw these select young kelp plants transplanted into Long Island

Blanc Mange Pudding

INGREDIENTS

1 quart milk
1 handful Irish Moss (1 cup)
3 Tablespoons sugar
1/2 teaspoon vanilla,
fruit or brandy, if desired

Collect *Chondrus crispus* (Irish moss) either as living plants from a rocky shore or as shorecast sprigs that have been bleached by sun and rain. Remove sand and small animals (they taste too much like the seashore), rinse briefly in fresh water, and either use immediately or dry for later use. Dry moss can be stored indefinitely in a dry, airtight container.

Simmer milk in a double boiler (or use a single pan, but be careful not to burn the milk). Add seaweed to hot milk and simmer for about 20 minutes, until viscous. Carrageens extracted from the moss increase the viscosity of the pudding, causing it to gel. Remove the seaweed from the pudding and place it on your compost pile, or leave it in to add texture. Save the viscous milk. Sweeten and flavor with sugar and vanilla. Add fruit or brandy for variety. Set aside to gel.

Be a seaweed gourmet! Try this tasty pudding recipe. It is but one of many delicious treats that can be created using marine plants.

Sound at the Black Ledge study site. Yarish sees the kelp farming industry as an opportunity to develop a hidden resource into a whole new industry for the state. It could be an important off-season activity for commercial fishermen. In addition, kelp plays an important ecological role as a protective habitat for young lobsters and some epiphytes. Such a commercial venture could provide jobs for aquaculturists and food processors alike.

What do these familiar food products have in common? They all contain ingredients extracted from seaweed!

Mapping Ocean Depths

Uncharted shoals have always posed a threat to seafarers, and even today, the dynamic nature of the restless ocean makes it difficult to keep accurate navigational charts. A New England "nor'easter" can make a sandbar appear overnight, or otherwise rapidly change the coastal configuration.

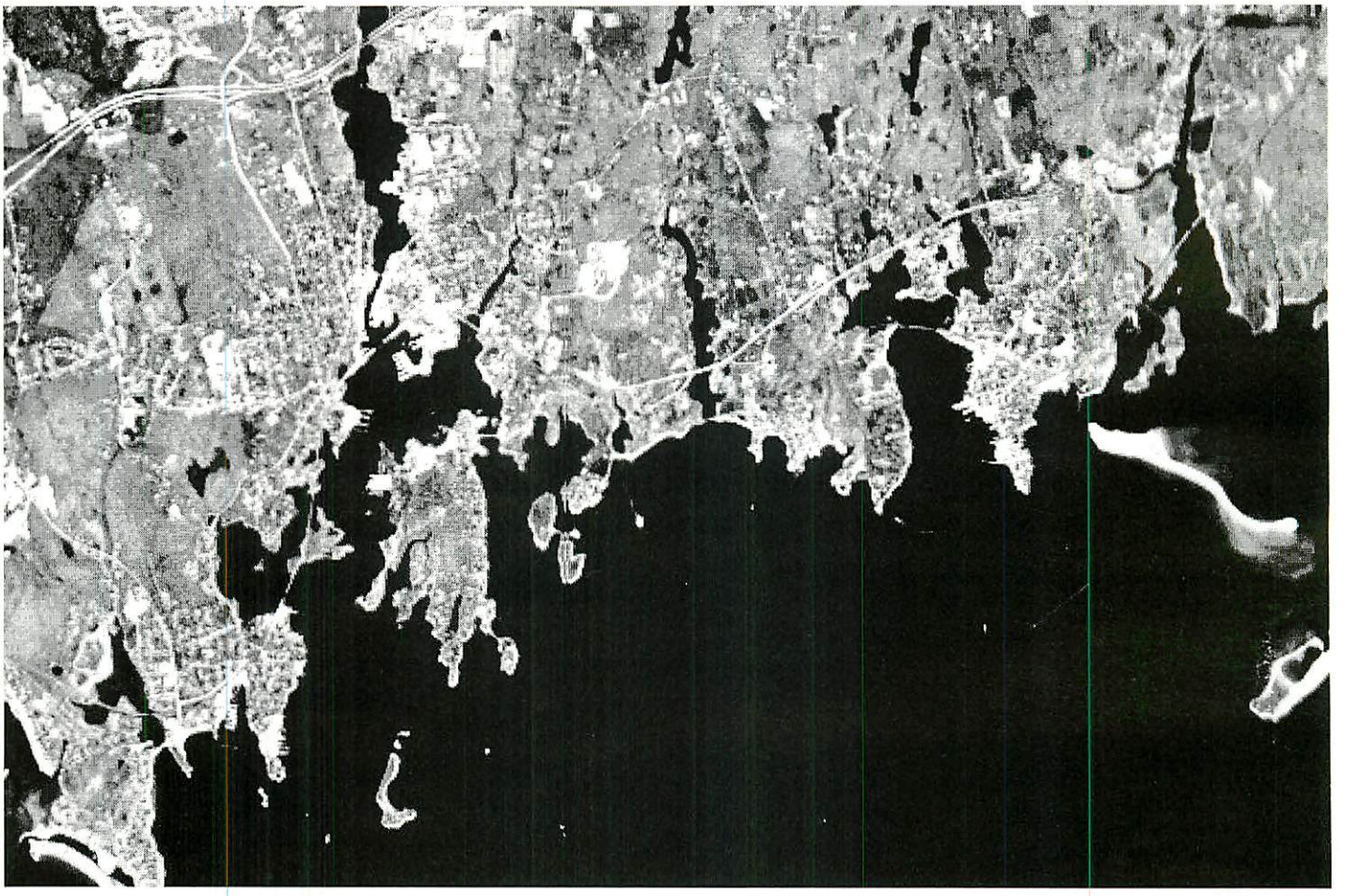
William Kennard and Daniel Civco are meeting the challenge by heading a team that is investigating bathymetry using remote sensing to reveal submarine topography in shallow coastal waters.

Dan Civco points out some of the dynamic processes taking place in shallow coastal waters, as revealed by remote sensing techniques.

The team uses data from the U.S. Landsat 4 and 5 satellites to create images that allow them to calculate depths based on the intensity of reflected light. Landsat uses two sophisticated sensing devices, the multispectral scanner and the Thematic Mapper. Using an oscillating mirror, the sensors collect reflected solar radiation in various bands of the electromagnetic spectrum, which is then converted to electrical energy. This electrical energy is digitized by computer and transformed into a graphic image in a grid format composed of many pixels (picture elements), resembling a mosaic of floor tiles. Every substance reflects light in a distinctive way, so it is possible for a skilled human eye to distinguish surfaces by their color and brightness in these images. Theoretically, in the ocean, the closer the sea floor is to the surface, the brighter the image. Many variables come into play here, however; for example, substrate type, clarity of the water, and roughness of the sea. Sand containing quartz crystals, for example, is brighter than mud. A bed of kelp or turbid water would complicate things further.

In fact, satellites can "see" better than the human eye. In addition to the visible spectrum that humans can see, the satellite records radiance in the invisible reflective and thermal infrared portions of the spectrum. This information can be converted into "false color" graphics and included in the final image. This allows geological hotspots, such as undersea volcanoes, to be readily seen.

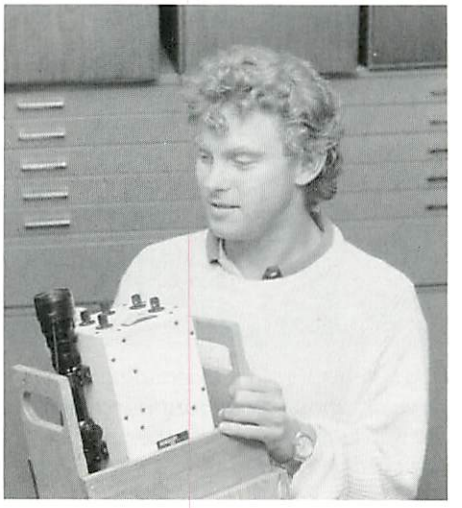
Kennard and Civco have developed a mathematical model, which has proved to be accurate to within ten percent in waters to 15 meters in depth, to assist them in interpreting repetitive satellite data and integrating the many variables to retrieve ocean depths. They also use infrared aerial photos and in situ "sea truth" measurements to complement this information. One final tool in



This 1987 LANDSAT Thematic Mapper image shows a landscape of the Fisher's Island Sound area from Napatree Point, RI to Groton Long Point, CT.

the remote sensing team's toolbox is the sediment and bottom condition data collected with the assistance of Lance Stewart of the National Undersea Research Program, using remotely operated submersible vehicles.

In addition to bathymetry, the remote sensing techniques have myriad other practical applications, including the mapping of coastal mineral resources and changes in vegetation types, the tracking of oil spills, and environmental monitoring. The bathymetric application will be of tremendous value to recreational boaters, ferry operators, commercial fishermen, shellfish managers, land use planners, and the naval armed forces.



Chris Brown holds a water-tight container, designed by the research team to hold a multiband radiometer.

Further Progress

Educating Decision-Makers

Under the direction of H. Mickey Weiss, Project Oceanology, a non-profit marine education association, conducted a series of educational On-the-Sound workshops for decision makers. Town officials and members of shellfish and waterfront commissions had hands-on experiences aboard the Enviro-lab research vessel to aid them in decision making on coastal issues. Cruise topics included dredging and dredge spoils, shellfishing, harbor management, and toxic contaminants. Other workshop cruises were site-specific, focusing on New Haven Harbor and the Housatonic River. Activities included sampling bottom sediments and plankton in the water column, and trawling for marine animals.

H.M. Weiss, Project Oceanology director, shows community leaders the marine life found in the Housatonic River.

Pass-through Projects

In addition to the Long Island Sound Study public education and participation program, another project was sponsored by pass-through funding from the Environmental Protection Agency: a hydrographic and water quality field program for Long Island Sound, conducted by Frank Bohlen of the University of Connecticut's Marine Sciences Department.

Seed Projects

Several new projects on a small scale were initiated through seed grants from the development fund. One of these was the evaluation of models for forecasting fog over Long Island Sound by Raymond Castillo, meteorologist at Western Connecticut State University. Although fog is responsible for many boating and auto accidents and airport closings each year, not much research has been done to investigate the causes and patterns of fog formation. Castillo's work on fog morphology was published in a technical report.

Paul Fell of Connecticut College in New London examined the salinity tolerance of a common estuarine sponge, *Microciona prolifera*, better known as the Red-Beard Sponge. He found that as salinity decreases, amino acid production decreases, an important factor in osmotic balance for marine organisms, including bivalves and polychaetes.

Other seed projects included the development of a traveling exhibit on Long Island Sound scallops by C. Rettenmeyer of the Connecticut Museum of Natural History; a study of the morphodynamics of sand waves in eastern Long Island Sound by D. Fitzgerald of Boston University; the construction of benthic chambers for use in the study of production and degradation of natural organic halogens by D. Carey of Wesleyan University, and a pilot field experiment on micro-organism-produced mucilage by L. Frankel of the University of Connecticut.

Building the Future:

The Sea Grant Marine Advisory Program

How does the vital knowledge about marine resources that results from Sea Grant-supported research reach the people who could benefit from it? The Sea Grant Marine Advisory Program (SGMAP) serves as an information transfer and educational outreach arm to meet this need. Implemented through the Cooperative Extension Service of the University of Connecticut, the program links laboratories with other universities, the Sea Grant network, state and federal agencies, industry, and the general public.

Program Emphasis

Because Connecticut's waters are shared by a multitude of diverse and sometimes competing user groups, many issues arise concerning the wise management of important coastal resources. Under the guidance of Program Leader Norman Bender, SGMAP develops programs that will let citizens know what the key coastal and marine issues are, and provide them with objective and relevant information to assist them in making decisions. Primary areas of emphasis include fisheries, aquaculture, environmental quality, coastal development, financial and tax management, and marine education. In response to changing societal needs, program emphasis shifted between 1986 and 1988, with less emphasis placed on fisheries and more on coastal development and environmental quality.

Advisory Committee

Exactly how does SGMAP decide what topics are of most importance to Connecticut citizens? To help SGMAP identify and prioritize marine and coastal issues that may serve as a basis for future SGMAP activities, a ten-member SGMAP Advisory Committee was formed in 1988. The committee also generates feedback on existing Sea Grant Marine Advisory projects. Committee members were chosen to reflect a wide spectrum of marine interests, from commercial and sport fishing to aquaculture, seafood marketing, coastal planning, education, and boating.

Coastal Development Trends

"Preserving Water-Dependent Uses on the Connecticut Waterfront," a state-wide Coastal Trends conference, was held in October, 1987 at the Long Wharf Maritime Center in New Haven.

Chester L. Arnold, who filled a new position as Coastal Resource Development Agent,

Teachers get a lesson from SGMAP in setting up and maintaining the salt water aquarium for the classroom.

organized the event. Co-sponsored by SGMAP, the D.E.P. Coastal Management Office, and the City of New Haven's Office of Downtown and Harbor Development, the conference helped town planners, planning and zoning officials, and professional consultants working on waterfront development to clarify issues surrounding the explosion of development pressure along the coast.

Finfish and Shellfish Resources

The restoration of coastal resources is an area of major concern to SGMAP, in light of Connecticut's colorful marine heritage and the growing environmental threats to its resources. SGMAP provides information to state and local officials working in the coastal zone to document habitat changes.

Oyster resources that had been lost due to navigation and dredging activities since 1957 were restored in a successful SGMAP pilot project in the town of Guilford's East River. The new program addressed shellfish management procedures that allowed restoration of the oyster bed without interfering with recreational boating. The project results were published in a paper by Tim Visel, "Mitigation of Dredging Impacts to Oyster Populations," in the *Journal of Shellfish Research.*

John Auble, an intern sponsored by the program, surveyed shellfish commissions about shellfish resource status and management for the entire state, and SGMAP agents have used the information collected to conduct educational programs and to advise shellfish commissions on setting up management guidelines. To further aid them in this task, SGMAP agents use the results of Sea Grant research, including Diane Brousseau's study of the life history of the soft-shell clam, and Robert Whitlatch's studies on hard clam populations and the survival of juvenile oysters.

SGMAP's Marine Fisheries Forum is a popular annual event organized by SGMAP's fisheries and aquaculture agent, Tim Visel. The sixth and seventh forums were held in March of 1987 and 1988, each attracting nearly 300 people. The forums featured presentations by experts on shellfish, aquaculture, fishing gear technology, seafood marketing, the Long Island Sound Study, waterfront development, and economics. It also included technical sessions and an industry trade show.

Marine Education

SGMAP's open house for educators, entitled "Long Island Sound: a Sampler," gave teachers the opportunity to learn about the Sound and related marine resource topics. Co-sponsored by the Zeta Chapter of Alpha Delta Kappa, an educational sorority, the open house allowed educators to share ideas for student activities and view exhibits by organizations involved with marine education. Other activities designed for educators included workshops on setting up and maintaining a marine aquarium, beach walks for 4-H leaders and other educators, 4-H Marine Science Day at Avery Point, and Vocational-

The Long Wharf Maritime Center on the New Haven waterfront is the site of the Coastal Trends Conference.

Agricultural teacher training programs.

SGMAP helped to establish the state's first high school aquaculture program in a Vocational Agricultural Center in Ledyard in 1986. Some students constructed several small boats in applied coursework, while others conducted shellfish experiments.

SGMAP also worked with town agencies to set up shellfish internships that allow high school and college students to assist municipal shellfish commissions with surveying and mapping of shellfish resources.

Seafood Quality

For seafood fans, SGMAP agents and Extension home economists produced a brochure detailing the selection, handling and preparation of mussels. Succulent steamed blue mussels swimming in herbal butter were served to thousands of hungry fair goers at the SGMAP exhibits in the Eastern States ("Big E") Exposition, the Durham Fair, and Milford Harbor Day. Also, SGMAP's seafood quality agent, Jim Wallace, trained home economists in seafood preparation, and developed a helpful *Connecticut Seafood Directory* produced by the Connecticut Department of Agriculture, Aquaculture Division. The directory lists 300 retail seafood outlets and seafood educators in Connecticut, and gives consumers tips on selecting, storing, and preparing seafood.

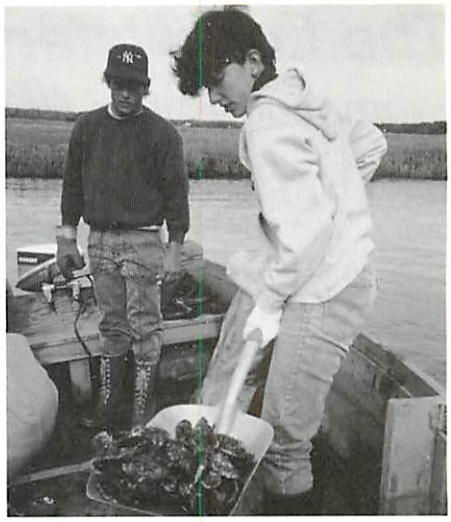
Financial management

Financial management specialist Norman Bender helped to review the joint Internal Revenue Service/ Office of Sea Grant Tax Guide for commercial fishermen. In addition, SGMAP has conducted presentations in marine business management and tax law policy, and reached ten thousand readers through articles on current tax and financial management topics that appeared in *Commercial Fisheries News*.

Cooperation: Key to SGMAP Success

Cooperation between entities on the regional and national level are important, but SGMAP also strives for cooperation within the university and the state. In the summer of 1987, SGMAP sponsored a Marine Advisory/Research Interaction Workshop to strengthen ties between faculty and administrators from UConn's Marine Sciences Institute, Department of Marine Sciences, departments of the College of Agriculture and Natural Resources, Cooperative Extension Service agents, and state agency officials.

An unusual instance of cooperation between states evolved as a result of a series of On-the-Sound workshops for community leaders, carried out by Project Oceanology and SGMAP. After the cruise, officials from Stonington, Connecticut and Westerly, Rhode Island decided to meet together and discuss joint management of a common resource that is also a boundary between the states, the Pawcatuck River. Pressures of shoreline development, water quality level, and programs for stocking anadromous fish were among the topics that could be best addressed on the interstate level. On a grander scale, SGMAP coordinates the public participation component of the Environmental Protection Agency's six-year Long Island Sound Study.



Student interns survey shellfish in the East River in Madison, CT.

The Long Island Sound Study

Promoting Public Participation

How's this for a job description? "The applicant has three years in which to convince 15 million people to spend billions of dollars to clean up an estuary." This is the challenge faced by the Long Island Sound Study (LISS) public participation coordinators of the Connecticut and New York Sea Grant Programs. The two programs joined forces in 1987 to oversee the public education and participation component of the LISS.

Where does the public fit into the complicated and expensive task of cleaning up and protecting the Sound? Almost everywhere, according to Chester Arnold, Extension agent with the Sea Grant Marine Advisory Program, who organized the Public Participation Project in September, 1987. He was joined by full time public participation coordinator for Connecticut, Kathy Rhodes, in January, 1988 and a New York public participation coordinator, Melissa Beristain, in July, 1988. The three feel that public input is necessary for the flow of information between the people conducting the study—scientists and the management committee—and the users of the Sound. And the pollution plaguing the Sound will not diminish until citizens become aware of their role in that process.


LONG ISLAND SOUND STUDY

Hypoxia in Long Island Sound

What is Hypoxia?

How Does Hypoxia Happen?

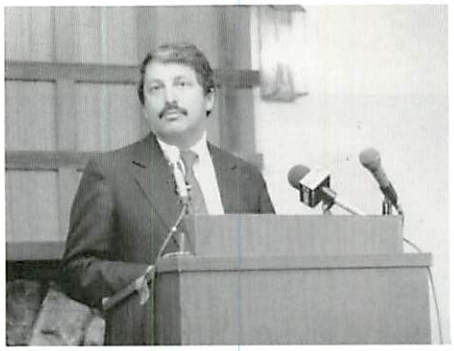
The Surprising Summer of 1987

Colorful fact sheets like this one explaining hypoxia help inform the public about problems in the sound.

Often called the "Urban Sea," Long Island Sound is an estuary of immense size and complexity, stretching from densely populated New York City to the eastern tip of Long Island and eastern Connecticut. The 110-mile waterway is heavily used for recreation, fishing and other marine industries, transportation, the military, and waste disposal. The estuary provides a breeding ground and nursery for many different species of marine life. The Sound's coast is home to 5 million people in two states. Accelerated development of the coastline and a booming population, however, has increased stress on the estuary. A couple of scary summers that were punctuated by brown tides, sewage effluent, medical waste washing ashore, and fish kills have raised alarm about water quality and the overall health of the Sound.

To address these concerns, the federal Environmental Protection Agency's National Estuary Program, authorized by the Water Quality Act, recognized Long Island Sound as "an estuary of national significance." The six-year Long Island Sound Study began in 1985, in an effort to protect and manage the Sound's water quality and marine resources. Nutrient enrichment, toxic contaminants, living resources, and dissolved oxygen levels are some of the parameters being examined to evaluate the Sound's health, and to find out if it's getting cleaner or more polluted, and why.

But how does one see that citizens of two states are kept informed about the Sound and the Study's progress, and that the many different user groups of the Sound and its resources are represented in



Congressman Sam Gejdenson urges commitment to clean up our coastline at a workshop for legislators.

the decision-making process for its future? That's a tall order. The Sea Grant programs have approached the task using two major pathways, a public outreach/ education effort, and a broadening of the Citizen's Advisory Committee.

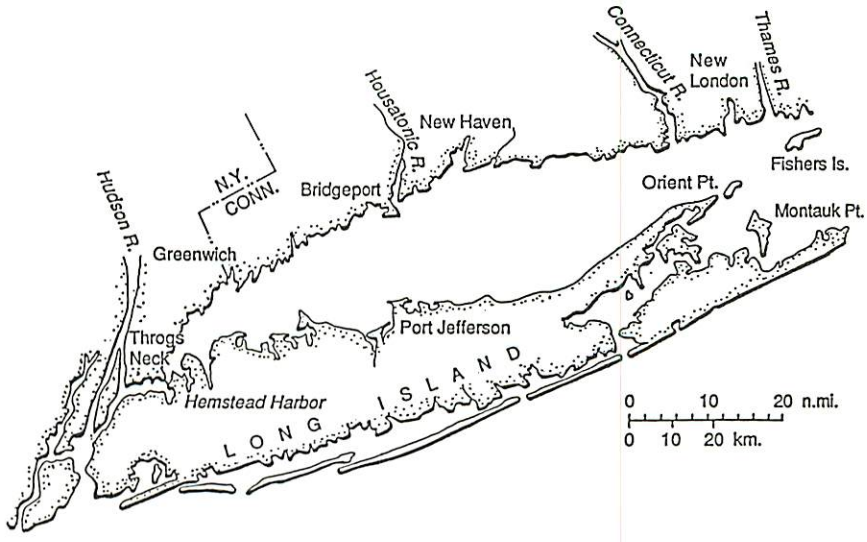
Steps that the Sea Grant programs have taken to inform the public include: a seven-part lecture series featuring experts on various aspects of the Sound, fact sheets, public displays, workshops, news releases, radio and TV spots, educational materials for elementary and secondary schools, and columns for the Long Island Sound Study newsletter.

A day-long workshop for legislators in Westbrook, entitled "Saving the Sound: the Long Island Sound Study and the Future of Connecticut's Coastal Towns" was cosponsored by the Long Island Sound Congressional Caucus members, SGMAP, and agencies involved in the Long Island Sound Study. Mayors, selectmen, state legislators, town planners, conservation directors, town council chairpersons and regional planners attended.

Among the printed materials produced to enhance public awareness are a brochure urging families to "get involved" with the LISS, and a series of colorful, glossy fact sheets. The first fact sheet explains the meaning of hypoxia (low dissolved oxygen in the water) and informs readers that a severe hypoxic event did, indeed, occur in Long Island Sound in the summer of 1987.

The other approach used to ensure public input to the Study is the broadening and strengthening of the Citizens' Advisory Committee (CAC), a group representing a wide variety of municipal, industrial, environmental, and educational interests. The Sea Grant specialists were able to help the committee increase its membership from six to twenty-five members. The CAC members will review research results and comment on the management plan that the study will produce, and provide a wider perspective to the Study.

"The truth is that without public involvement and support, the pollution of the Sound will continue," says Chester Arnold. "The battle for Long Island Sound is being fought on many fronts, and there are many different ways that a concerned citizen can help. After all, it's *our* Sound, and *we*—not *'they'*—will have to to work together to keep it healthy."



Long Island Sound, a complex esturary of immense size and beauty, is threatened by the stress of accelerated coastal development.

Communications

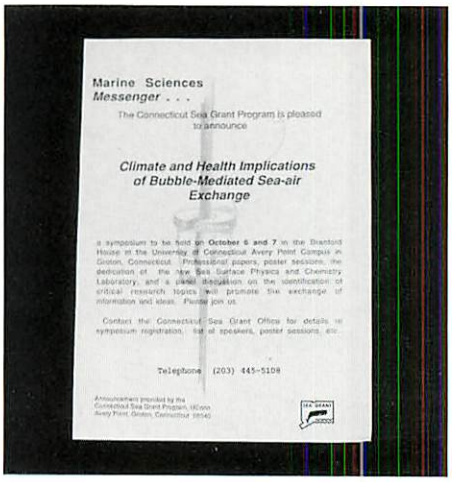
Communications has become an important part of the Connecticut Sea Grant Program. Getting the word out to inform an interested and concerned public has always been vital in our one-person, one-vote society. Now, with three quarters of our state's population living within fifty miles of the coast, it is even more important for citizens to become aware of the need for wise use and conservation of our valuable coastal and marine resources.

Sea Grant communicators inform the public in a variety of ways: preparing press releases, publications, and exhibits; forming contacts with the local media, and assisting Sea Grant researchers and marine advisory staff in their outreach activities.

At the beginning of the funding period, in the absence of a staff communicator, publications were done on a piecemeal, part-time basis. Thanks to the efforts of freelance writer Mark Bittman, the Marine Advisory Program's quarterly newsletter continued publication, fact sheets were produced, and feature articles appeared in the local press.

In 1987, a part-time communicator, Peg Van Patten, was added to the staff, and a transition to computerized desktop publishing was begun. More technical reports were produced in 1987 than in the three previous years combined. Innovative new projects were conceived and carried out: a series of "Profiles in Depth" on Sea Grant researchers and "The Messenger," an attractive master format for sending out timely messages to selected audiences. Other printed materials produced included fliers for workshops and lectures, press releases, fact sheets and the Sea Grant Marine Advisory newsletter, *Connecticut Currents*.

The distribution of *Connecticut Currents* was improved, and its mailing list expanded by 20 percent. Presently it reaches 2200 subscribers. The format was recently redesigned to a modern, attractive grid design, and the range of topics was also expanded to appeal to a wider audience. *Currents* readers include commercial and recreational fishermen, boaters, shellfish commission members, legislators, coastal planners, seafood retailers, educators, respresentatives of the marine industry, and environmentalists.


Marine Sciences
Messenger . . .

The Connecticut Sea Grant Program is pleased to announce

Climate and Health Implications of Bubble-Mediated Sea-air Exchange

a symposium to be held on October 6 and 7 in the Branford House at the University of Connecticut Avery Point Campus in Groton, Connecticut. Presentation papers, poster sessions, the dedication of the new Sea Surface Physics and Chemistry Laboratory, and a panel discussion on the identification of critical research topics will promote the exchange of information and ideas. Please join us.

Contact the Connecticut Sea Grant Office for details on symposium registration, list of speakers, poster sessions, etc.

Telephone (203) 445-5108

"The Messenger," an attractive means of sending timely releases to selected audiences.

Another important communications task is the forming and strengthening of ties with the media. Being available to local media professionals helps reporters and newscasters to get accurate and timely information, and increases coverage of Sea Grant research and events. The mailing of the program's progress report and the "Profiles in Depth" resulted in feature stories on nearly every Sea Grant researcher in major newspapers across the state.

Public concern about scary reports on medical debris, bacteria contamination from sewage and the severe hypoxic event that plagued Long Island Sound in the summer of 1987

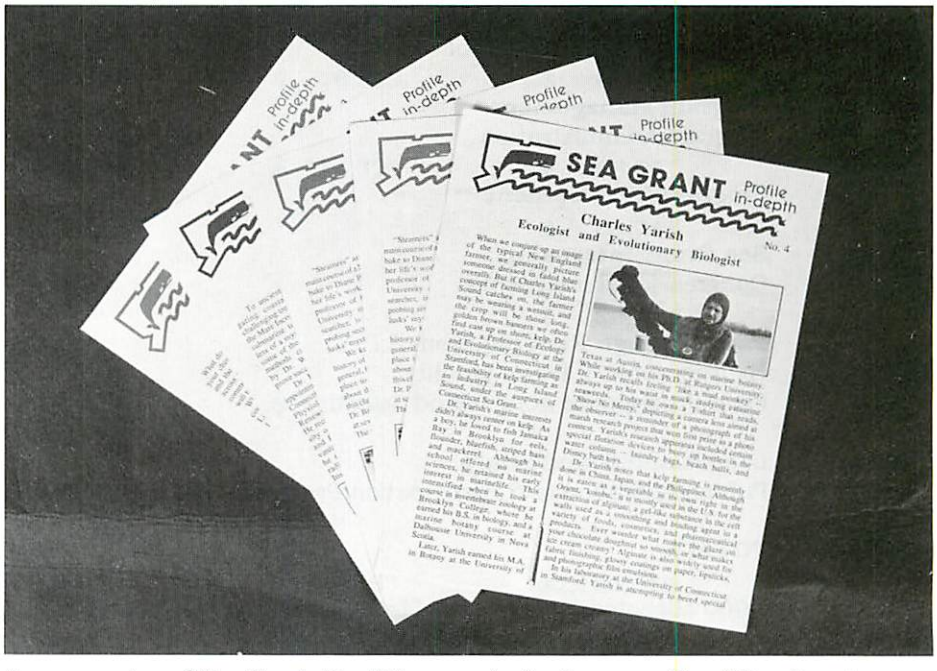
prompted many calls to Sea Grant by local television, radio, and newspaper reporters as well as worried citizens. The communicator was able to reassure the callers by answering such questions as, "What is hypoxia?" and "Is it safe to eat my oysters?" Radio and television coverage of Sea Grant Marine Advisory events increased, too. Advisory agents appeared in news broadcast segments on shellfish restoration, ocean pollution, and the Long Island Sound Study.

The Communications program assists the Marine Advisory Program's joint Long Island Sound Study public participation effort with New York Sea Grant Institute by helping to prepare informative fact sheets, newsletter articles, flyers and press releases.

Regionally, plans moved ahead for a combined effort of the Sea Grant programs in New England and New York to produce a regional magazine, the *Nor'easter*. For the first issue, Connecticut Sea Grant is preparing the feature article, on global climate change and sea level rise, and a joint article on the Long Island Sound Study with New York Sea Grant Institute.

With a surge of public interest in the marine environment, a need for easy-to-assemble and readily transportable display equipment arose. The communicator designed and ordered the construction of four tabletop triptychs and six display panels covered in colorful velcro-compatible fabric. Materials depicting each of the current research projects, key areas of marine advisory work, the Long Island Sound Study, and an overview of the Sea Grant Program are kept instantly available. The displays have since traveled to several libraries and other public places in Connecticut and New York.

The Communicator works closely with Sea Grant researchers and Marine Advisory specialists, as well as with communicators from other programs, to disseminate the results of research, respond rapidly to requests by media representatives, identify audiences for Sea Grant information, expand the current outreach effort, and enhance the program's visibility. This often means not only writing, editing and publishing but also providing public relations, graphic production, and photographic expertise to the Sea Grant researchers, Marine Advisory Program agents, and administrative staff.



A new series of "Profiles in Depth" presents the human side of Sea Grant principal investigators.

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Program Leader, Marine Advisory Program
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Senior Research Chemist
U.S. Coast Guard R&D Center, Avery Point

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Associate Professor of Marine Sciences
(Geophysics)
University of Connecticut, Avery Point

Sung Y. Feng
Professor of Marine Sciences (Biology)
University of Connecticut, Avery Point

Ralph Lewis
Marine Program Coordinator
Natural Resources Center,
Connecticut Department of Environmental
Protection, Avery Point

Edward C. Monahan
Director, Connecticut Sea Grant Program
University of Connecticut, Avery Point

Robert A. Radulski
Assistant Professor of Earth Sciences
(Oceanography and Water Resources)
Southern Connecticut State University, New Haven

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Gene Whaples
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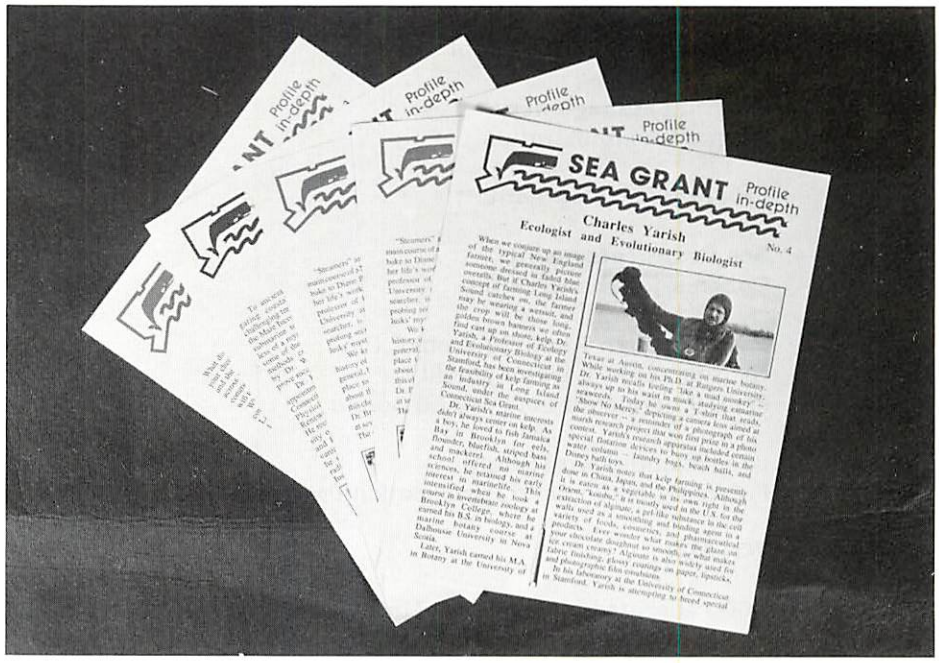

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Financial Report

Project Number	Section and Project Title	Investigator(s)
	Marine Biotechnology	
R/A-2	Growth Regulators Affecting Crustacean Resources	H. Laufer (UConn, Storrs), D. Borst (ILSU)
R/A-3	Strain Selection in *Laminaria longicruris (Phaeophyta, Laminariales)* for Development of Maximum Biomass	C. Yarish (UConn, Stamford) C. Penniman (SUNY)
R/A-4	Control of Reproduction and Growth Regulation in Crustacean Resources	H. Laufer (UConn, Storrs)
	Marine Animal Husbandry	
R/LR-6	Chemical Control of the Marine Fish Parasite, *Amyloodinium ocellatum*	C. Bower, D. Turner (Inst. for Marine Aquarium Studies (ECSU)
R/LR-7	The Importance of Competing Sessile Species to the Survivorship of Juvenile Oysters	R. Whitlatch (UConn, Avery Point) R. Osman (Benedict Est. Lab, MD)
	Coastal Processes and Engineering	
R/OE-1	Remote Bathymetry of Coastal Shallow Waters Using Landsat Thematic Mapper Data	W. Kennard, D. Civco (UConn, Storrs) L. Stewart (UConn, Avery Point)
	Marine Education	
A/AS-1	On-the-Sound Workshops for Community Leaders	H. Weiss (Project Oceanology)
	Advisory Services	
A/E-1	Sea Grant Marine Advisory Program	N. Bender, G. Whaples, T. Visel, C. Arnold, K. Rhodes, J. Wallace
	Communications	
M/CP-1	Communications and Publications	M. Van Patten
	Program Management	
M/PA-1	Program Administration	E. Monahan, E. Minik
M/PD-1	**Program Development*** **	E. Monahan
	Sea Grant Internship	
E/F-3	Congressional internship	L. Crockett
	Pass-Through Funding (from E.P.A.)	
R/EM-9	Hydrographic & Water Quality Field Program for Long Island Sound	W.F. Bohlen
AE-2	Long Island Sound Study Public Education and Participation Program	C. Arnold N. Bender
	TOTALS	

* Includes $47,000 allocated to Sea Grant Marine Advisory Program by the Connecticut Legislature.
** Includes $49,000 allocated to Sea Grant Marine Advisory Program by the Connecticut Legislature.
*** Includes a variety of seed projects (see bottom of facing page).

NOAA SG Funds (1986-87)	Other Funds (1986-87)	NOAA SG Funds (1987-88)	Other Funds (1987-88)	TOTAL
$ 54,790	$ 36,272	-	-	$ 91,062
$ 42,649	$ 9,764	$ 40,969	$ 27,004	$ 120,386
-	-	$ 50,693	$ 41,325	$ 92,018
$ 29,568	$ 60,817	$ 28,526	$ 67,928	$ 186,839
$ 42,013	$ 12,548	$ 40,839	$ 14,427	$ 109,827
$ 46,895	$ 40,210	$ 44,934	$ 45,079	$ 177,118
$ 7,050	$ 10,778	$ 6,605	$ 15,400	$ 39,833
$ 143,850	*$ 205,186	$ 134,349	**$ 228,729	$ 712,114
-	-	$ 34,242	$ 6,935	$ 41,177
$ 39,185	$ 160,444	$ 34,102	$ 114,320	$ 348,051
$ 39,000	-	$ 29,741	-	$ 68,741
$ 30,000	-	-	-	$ 30,000
-	-	$ 45,644	$ 17,006	$ 62,650
-	-	$ 69,700	-	$ 69,700
$ 475,000	$ 536,019	$ 560,344	$ 578,153	$2,149,516

Seed projects: 1986 Communications, Mark Bittmann; Field Experiment on Micro-organism-produced mucilage, L. Frankel, UConn; Benthic Chambers for Use in Study of Production and Degradation of Natural Organic Halogens, D. Carey, Wesleyan University; Evaluation of Models for Forecasting Fog Over Long Island Sound, R. Castillo, Western Connecticut State University; Migratory Exhibit on Long Island Sound Scallops, C. Rettenmeyer, Connecticut State Museum of Natural History; Salinity Tolerance of Estuarine Sponge, Paul Fell, Connecticut College; Shrimp Bioengineering Strategic Initiative, H. Laufer, UConn; and Morphodynamics of Sand Waves in Eastern Long Island Sound, D. Fitzgerald, Boston University.

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Protection, Avery Point

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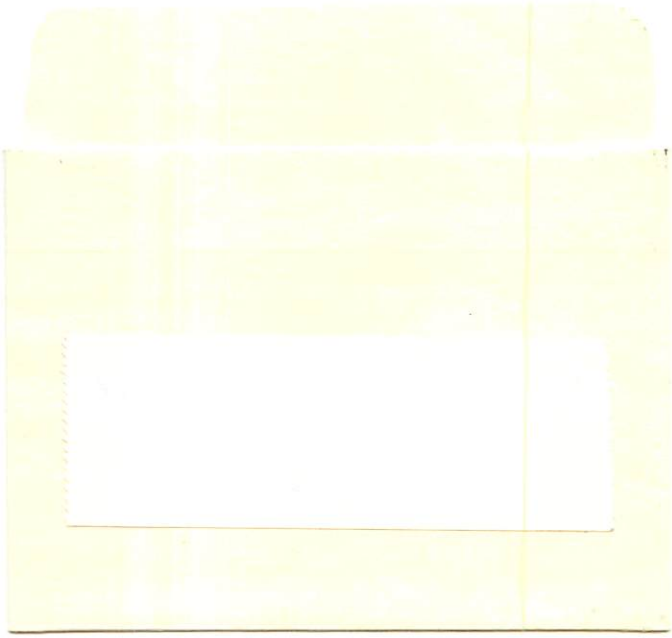

This 1986-1988 Progress Report was prepared by the Connecticut Sea Grant Program, Edward C. Monahan, Director. It was written and edited by Peg Van Patten,with assistance from Pat Beetham and Dee Chambers. Layout and design was done by Carmela Venti Rashan. Cover design and photography by Carmela Venti Rashan. Photo credits are due Bob DeGoursey, Patty Myers and Peg Van Patten.

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The Connecticut Sea Grant Program is a component of the Marine Sciences Institute, University of Connecticut.

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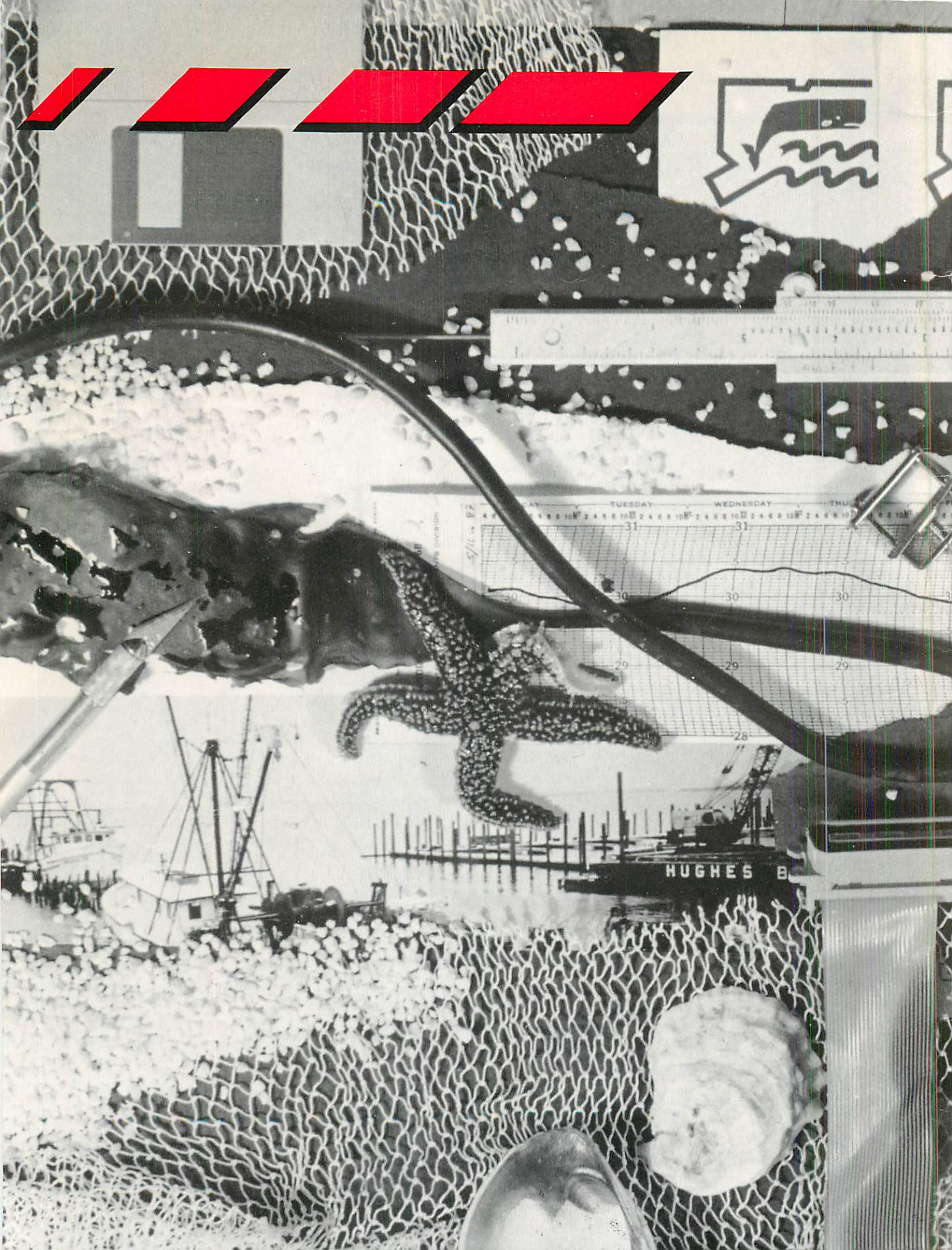
TUESDAY
WEDNESDAY
HUGHES