

## Developing the sea's resources:

A small outboard motor boat breaks the early morning silence as it slips into Elkhorn Slough near the coastal community of Moss Landing. It's only 6 a.m., but for Tom Thompson the day is well under way. He is helping graduate student Dave Streig pull gill nets placed in the slough the previous evening to catch leopard sharks.

Thompson and Streig are studying the leopard sharks to see if they can provide an alternative source of income for local salmon fishermen. The sharks that are still alive will be measured, tagged, and put back into the slough. The dead ones will be brought in to the Moss Landing Marine Laboratory for analysis

of eating habits and age.

At Bodega Bay, Bruce Wyatt prepares for a day with nearly 100 youngsters attending 4-H summer camp. The day will be devoted to marine science education. Wyatt hopes the program will give the youth some knowledge and appreciation of the marine environment.

At the southern end of the state, Art Flechsig visits the San Diego office of the Western Fishing Boat Owners Association to discuss updating and reprinting a 10-year-old publication, "Fishing Vessel Rules of the Road."

In Santa Barbara, John Richards meets with a researcher studying the population dynamics of the sea urchin.

# MARINE ADVISORY PROGRAM

by Gary A. Beall

*Sometimes referred to as farm advisors in hip boots, University marine advisors devote their time to educational and applied research programs dealing with the development and use of marine resources.*



Trawler unloads channel rockfish at Bodega Bay.

Later he will stop off at a sea urchin processing plant that markets sea urchin eggs to Japan, where they are considered a delicacy, much like caviar. Richards wants to learn as much as possible about this fledgling industry to see if it can be expanded and properly managed to become profitable for more fishermen in his area.

Although the specifics of their work may vary, Thompson, Wyatt, Flechsig, and Richards have something in common—they're all University of California marine advisors. Sometimes referred to as farm advisors in hip boots, they are part of the Marine Advisory Program team that operates under the University's Cooperative Extension program structure but concerns itself with educational and applied research programs dealing with development and use

of marine resources.

Support for the Marine Advisory Program comes from the National Sea Grant Program, National Oceanic and

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Atmospheric Administration, U.S. Department of Commerce; U.C. Sea Grant College Program, Institute of Marine Resources; and Cooperative Extension, U.C. Division of Agricultural Sciences.

Sea Grant funds also support marine research programs of the University

of California and several other universities nationally. Some notable achievements since U.C. received its first Sea Grant funds in 1968 have included the first successful breeding of American lobsters on the West Coast, the development of a tethered float breakwater for shore protection, the successful breeding of experimental salt-tolerant strains of barley and tomatoes that are now being field tested, an examination of factors causing tuna fish spoilage and color changes in processed fish, assessment of antiviral compounds in marine algae, and other programs contributing to the development and conservation of marine resources.

One function of the Marine Advisory Program is to develop lines of communication between Sea Grant researchers and those who can benefit from the research. But the program also has many other responsibilities—providing consumer education, working with youth groups, conducting applied research, helping commercial and recreational fishermen and aquaculture firms stay attuned to programs and public policies that affect them, and working with local planning agencies to map the future of fragile coastal resources.

Covering some 1,100 miles of highly diversified and productive coastline is a big job for four area marine advisors (a fifth advisor is currently being recruited), two statewide specialists, and a statewide coordinator. But a lot has been accomplished in a short time—the program is less than five years old.

Bruce Wyatt, who serves Marin, Sonoma, and Mendocino counties and has seniority among the marine advisors, has been on the job for less than three years. One of his major accomplishments has been the coordination of a serious effort among commercial and sports fisheries groups and various government agencies to enhance the salmon fishery along the northern California coast. The project entails raising large numbers of silver salmon in saltwater holding pens and in freshwater ponds along coastal streams.

The fish raised in saltwater holding pens in San Francisco Bay (near Tiburon) and in Tomales Bay are sticking close to

Sea Grant researcher Steve Schroeter (right) gives marine advisor John Richards a progress report on research that may help determine whether sea urchins can support a heavy commercial harvest.



their rearing sites as adults and are expected to enhance fishing activities in these areas. Those raised in ponds along coastal streams are being released into the streams. They are expected to migrate to the ocean and return to these same streams as mature adults two years later. The fish grow rapidly, have few disease problems and are economical to raise in this manner. Because this technique is new, many of the fish are being tagged to evaluate their movement, growth rates, and survival once they have been released.

In keeping with the Marine Advisory Program philosophy of developing programs to meet local situations and needs, the salmon rearing project is a grassroots operation. In each case, initiative to get these projects under way came from local fishermen's organizations, and,

much of the time, labor and equipment needed to get the projects established has been donated by interested local groups and individuals. Special community fundraising events, such as salmon barbecues, are helping support these projects. Wyatt provides the leadership and coordination necessary to get the job done.

"If successful, these initial efforts to raise salmon in freshwater and salt-water environments along the coast could expand to involve several million fish annually," says Wyatt.

Wyatt also is helping Sea Grant researchers from Oregon State University determine how the noise made by fishing boats affects the amount of fish they catch. The hypothesis is that fish tend to stay away from high-frequency sounds that can be caused by worn shaft bearings

or a damaged propeller.

Sounds emitted by 50 fishing boats along the coast from Moss Landing to the Washington border have been recorded. A correlation between the sounds and the fishing success of these boats supports the concept that sound does, indeed, affect the catch. Fifteen boats had below-average catches, and 14 of them emitted sounds that generally were higher in frequency than those emitted by the boats with above-average catches. The research is being done only with albacore boats, but it also may have some application for the salmon industry, according to Wyatt.

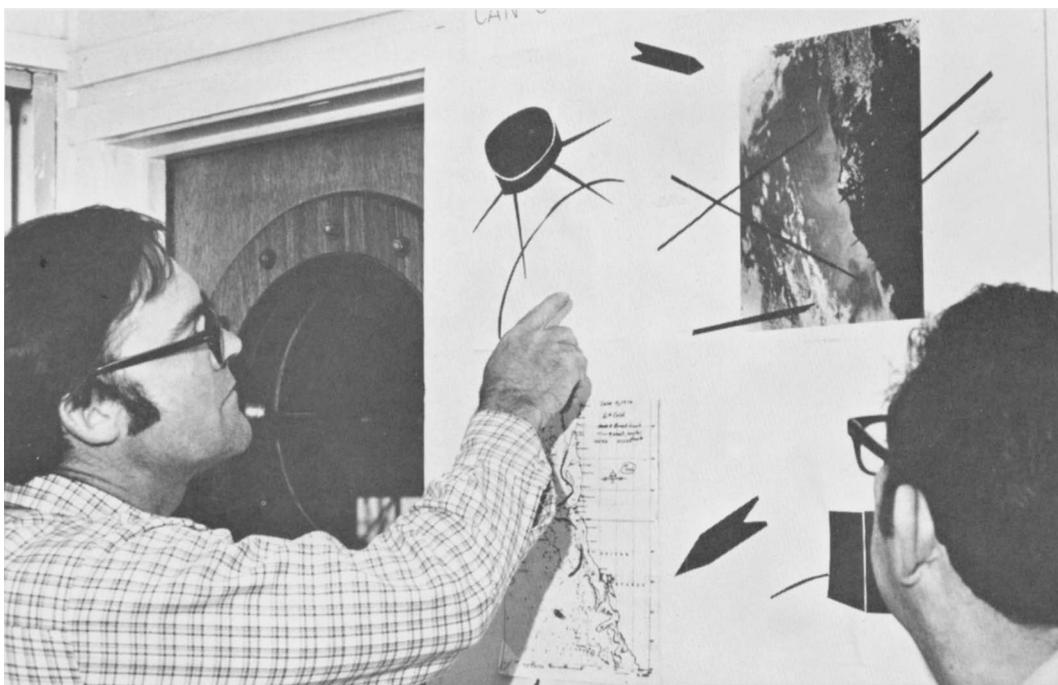
Technology also is helping fishermen in other ways. Three marine advisors—Wyatt; Tom Thompson, Santa Cruz and Monterey counties; and John Richards, Ventura, Santa Barbara, and San Luis Obispo counties—are using satellite imagery to help make fishing more efficient.

Fishermen have long believed that salmon and albacore concentrate along temperature fronts—areas where there are sharp changes in water temperature over short distances.

Marine advisor Tom Thompson (left) and trainee Dave Streig record data for Streig's study of growth rate and reproductive potential of leopard sharks.



Upper photo: Marine advisor Art Flechsig (left) has a waterfront office in San Diego and makes frequent dockside visits to keep abreast of local fishermen's concerns. Lower photo: Charts showing water temperature fronts, where fishing may be good, are relayed to marine advisors via satellite and are posted in several harbors.



"There is some scientific basis to this belief," says Thompson. "Winds often push warm surface waters offshore, allowing them to be replaced with deep, cold water that is rich in nutrients that provide an ample food supply for the fish."

These temperature fronts are generally found from 20 to 200 miles off-

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shore and, although many boats have equipment to sense temperature changes when they come across them, they have no way of knowing exactly where to look for them. This is where the satellite imagery comes in.

A polar-orbiting satellite with a sophisticated infrared sensing system that can detect water temperature changes as small as 1° F relays this information to a receiving center in Redwood City. From here it is accessible by telecopier in the form of special charts that show where

these temperature fronts are in relation to the coastline. Thompson receives his copies of the charts over a telecopier in the Monterey County sheriff's office, and Wyatt gets his from the sheriff's office in Sonoma County. Richards receives the charts from the Water Quality Control Board in San Luis Obispo and from the Xerox Corporation in Santa Barbara. The marine advisors are posting the information in harbors in their service areas for use by local fishermen. They also do followup work with certain boats to determine the usefulness of the information.

"Using these charts as roadmaps for finding fish is still in the experimental stage," says Thompson, who hopes to get the information to fishermen at least twice a week.

If using satellite imagery proves successful, Wyatt predicts that many fishermen will begin installing equipment in their boats so that they can receive the information directly.

Art Flechsig, in San Diego County, is exploring the possibility of providing some technological help to lobster fishermen.

"These fishermen have convinced me that theft of their lobster traps is a serious problem," says Flechsig.

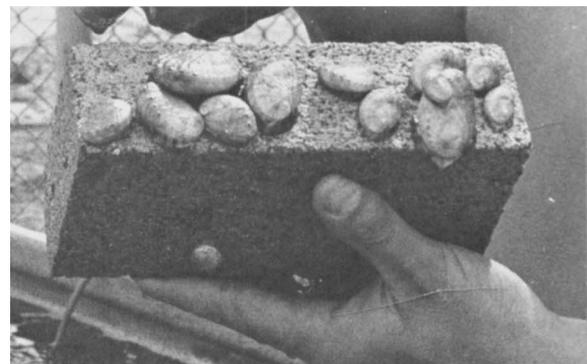
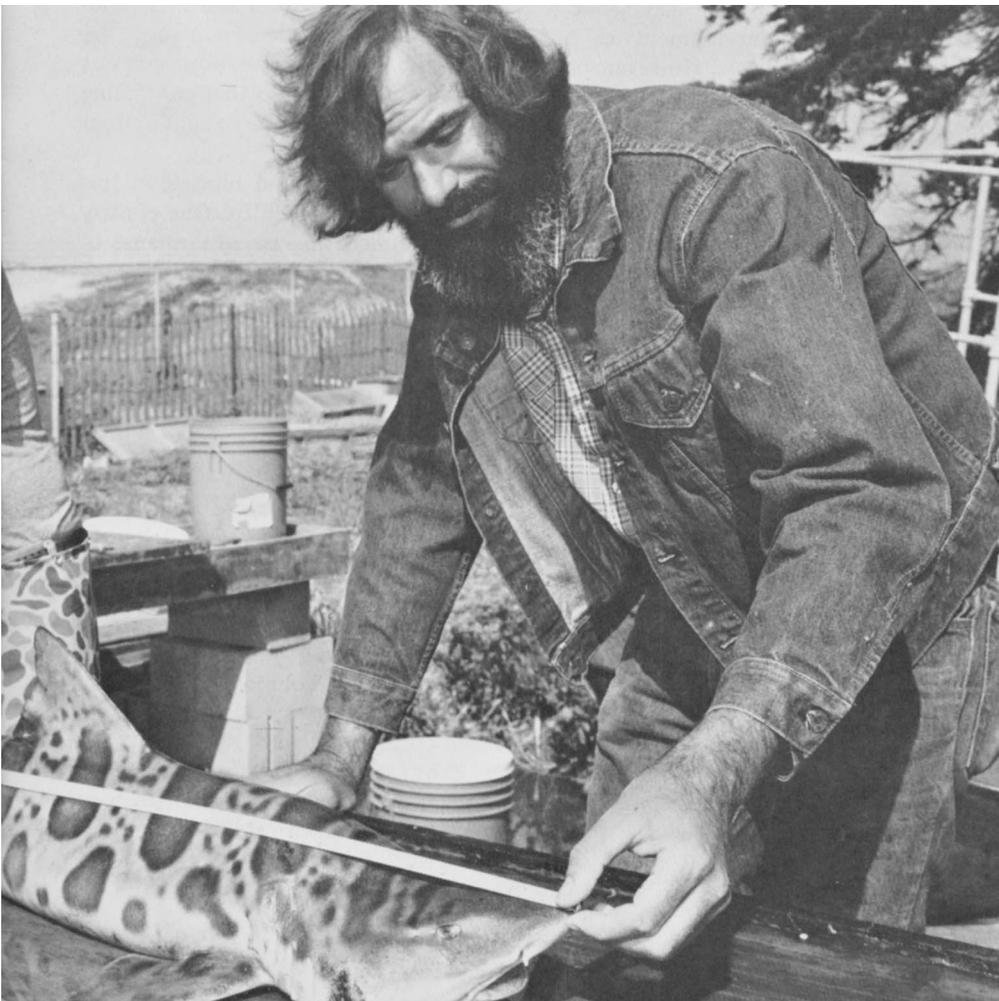
The traps, with their locations marked by floating buoys are easy prey for poachers. A solution: keep the buoys submerged until the fishermen are ready to collect the traps.

Flechsig thinks that modification of a sonic recall device used by oceanographers might do the job. The buoys could then be attached to the traps until the fisherman triggers their release with an electronic device in his boat. Working with engineers at the Scripps Institution of Oceanography, Flechsig plans to design, build, and test such a system that will be relatively inexpensive and easy for fishermen to use.

Corrosion of wire traps is another problem facing lobster fishermen, and Flechsig is working with them to test the feasibility of using large-mesh plastic for traps.

"The initial cost should be somewhat less, the traps are expected to have a longer life, and time spent building new traps to replace corroded ones should be reduced considerably," says Flechsig.

Richards is the newest member of



Upper photo: When properly prepared, the white, firm-textured meat of leopard sharks tastes like prawns. Lower photo: Thousands of young abalone like these are being reared in tanks.

the Marine Advisory Program team. He has been on the job for about six months. His initial challenge is to let people know who he is and what he can do for them. Wherever he goes, he identifies with the people he meets, learning their operations, listening to their concerns and problems, constantly taking notes, and offering assistance whenever he can.

One of the newest industries with which he is establishing rapport is the Ab Lab, a commercial enterprise that hopes to harvest some 120,000 abalone a month from oil drilling platforms off the Ventura County coast. The Ab Lab owner-operators are developing facilities to rear their own stock for the massive project and are experimenting with different species of algae to use as feed for the growing abalone.

Richards also works closely with Ervin Bramhall, Ventura County farm advisor, who has an active interest in the Marine Advisory Program. Bramhall pioneered some of the early Marine Advisory work in his county. One of the most notable early efforts was his work with county government, local service organizations, and industry groups to establish an artificial reef some 2½ miles off the coast. Made of old tires lashed together and weighted with cement, the reef is expected to become home for popular sports fish species, such as rockfish and calico bass. Success of the experimental reef may lead to establishment of more and larger man-made reefs along the coast and development of an active sports fishery.

Another thrust of the Marine Advisory Program is development of markets and consumer appreciation for underutilized seafoods, such as shark, sea urchin, octopus, and squid. The goal is to take some of the pressure off other overworked fisheries, make the sea a more productive food source, and give fishermen more alternatives for making a living.

There are many shark species along the Pacific coast, but most of the shark catch is incidental—fishermen catch them while fishing for something else. Although shark meat is finding acceptance in some retail outlets and restaurants (usually under the name of grayfish or something other than shark) the market is still small, and price offered fishermen is low.

Because shark has a pleasant-flavored white meat with good texture, Flechsig feels shark should be labeled as shark, but he does not expect that it will be easy to convince retailers of this.

Thompson sees a leopard shark fishery in his area as a possible alternative for the salmon fisherman who has been having an increasingly hard time turning a profit.

“Leopard shark meat tastes like prawns. Dogfish sharks are already used extensively in many European countries as the fish in fish and chips,” says Thompson.

He is working closely with Dave Streig—who is studying the reproductive potential and growth rate of these sharks, which average about 20 pounds and four feet long. They want to be certain the sharks can support a commercial fishery before the demand on them is increased.

Richards has the same interests and concerns with the sea urchin industry.

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Diving for sea urchin provides an alternate source of income for abalone fishermen, and Richards believes that utilization of the sea urchin can be expanded through its development as a gourmet item in California. However, he also is concerned about what might happen to the sea urchin if it is heavily harvested. Research by Steve Schroeter, graduate student at U.C., Santa Barbara, is providing some insight into this potential problem, and Richards hopes management programs can be developed and implemented to maintain the sea urchin population under an increased harvest.

Squid, as tasty as abalone when it is prepared correctly, has been the subject of Sea Grant research and a series of Marine Advisory Program workshops held cooperatively with local U.C. home advisors. The objective has been to increase consumer familiarity with squid and other underutilized seafoods. Handling, cleaning, and cooking demonstrations that culminated in audience sampling of the prepared seafoods highlighted these workshops.

Workshops also have been held on a variety of other subjects. These have included fish behavior, financial assistance and marine insurance information for commercial fishermen, commercial fishing business management, salmon

marketing, salmon aquaculture, artificial reefs, fishing boat refrigeration, albacore fishing, tax management for fishermen, fishery cooperatives, marine weather, fishery development, acoustics in albacore fishing, acoustics for fishing boats, the National Fisheries Plan, and seafood marketing and retailing. Usually these workshops are coordinated by the statewide marine specialists in cooperation with the area marine advisors and local home advisors. Sometimes they also are jointly coordinated with Sea Grant programs in other states.

Because they are knowledgeable about the coastal resource—including its people and needs—the area marine advisors also spend part of their time working with local, county, and state agencies involved with marine resources and their management.

Thompson serves on Monterey County's Technical Advisory Committee for the Big Sur Coast, which is looking at ways to coordinate statewide coastal planning with county and local plans. Flechsig is working with the city of Carlsbad in San Diego County helping city planners come up with a plan for management of the city's lagoon area. Richards assists county government with selection and funding of certain marine-related projects.

The marine advisors also often find themselves in the middle of controversies, where their role is to give both sides as many facts as possible so that conflicting viewpoints can be brought closer together.

Flechsig has found himself in this role at least twice recently. One controversy surrounded the use of airplanes to spot swordfish. Airplanes made fishing for swordfish more efficient, but they also offered unfair competition to the smaller boats that could not afford aerial spotting, and they sometimes conflicted with established etiquette regarding what boat had claim to the catch.

A second problem in Flechsig's area has been the entrapment of porpoises, which are used to locate tuna catches, in the large purse seine nets used by tuna boats. In this instance, Flechsig has been working with a local television station developing a film on the controversy. His value has been as a source of information and a contact with several groups doing research on the problem.

Program coordinator Maynard Cummings and the two Marine Advisory Program specialists with statewide responsibilities work from U.C., Davis.

Seafood technologist Robert Price works with consumers and food processors throughout the state. He organizes and participates in workshops on processing and handling seafoods, sanitation, waste management, and related areas. He also works with commercial processors, usually on an individual basis, providing information on new equipment, answering questions, sharing pertinent research results, and giving demonstrations. Involvement in several research projects related to seafood processing keeps him attuned to the latest developments. These projects have included treating fillets to improve their quality, developing uses for scrap fish and processing wastes, modifying a Japanese squid processing machine to see if it can be used on smaller squid

harvested along the California coast, and cooperating with other U.C. researchers on a study dealing with histamine formation in certain seafood species.

Also at the statewide level, marine resources specialist Chris Dewees develops educational materials and workshops, opens and maintains lines of communication with the many state and federal agencies concerned with regulation and use of the marine environment, and provides program coordination and support for many of the Marine Advisory Program's statewide activities carried out through the area marine advisors.

Price and Dewees have both been active in developing publications and other communications channels for reaching large numbers of individuals inter-

ested in various aspects of the marine environment.

This effort—supplemented with local newsletters published by each of the area marine advisors, workshops, meetings, and individual contact—has been instrumental in helping the Marine Advisory Program succeed in its primary function of transmitting information from a variety of sources to the marine community and to others with an active interest in managing and developing marine resources.

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Marine advisor Bruce Wyatt shows 4-H youngsters how to make drift bottles that can be used to study ocean currents.