DISCOVERY

The Oregon Sea Grant Program Report

Contents

Cover Photo: The process of discovery is a major element of the Oregon Sea Grant program. More than half of our budget goes to research projects. Microbiologist John Rohovec is one of several dozen scientists engaged in Sea Grant research. At the fish disease laboratory on campus, he checks to see the effect of a common fish virus on cultures of salmon cells.

Preface

It began in Minneapolis in 1963. At the annual meeting of the American Fisheries Society, Athelstan Spilhaus, dean of the University of Minnesota's Institute of Technology and inventor of the space clock, offered a vision of the future. Lamenting the dismal state of ocean fisheries in the United States, he suggested that "the time has come for sea-grant universities. In addition to land-grant universities for the study of agriculture, let's have sea-grant universities for the study of the sea."

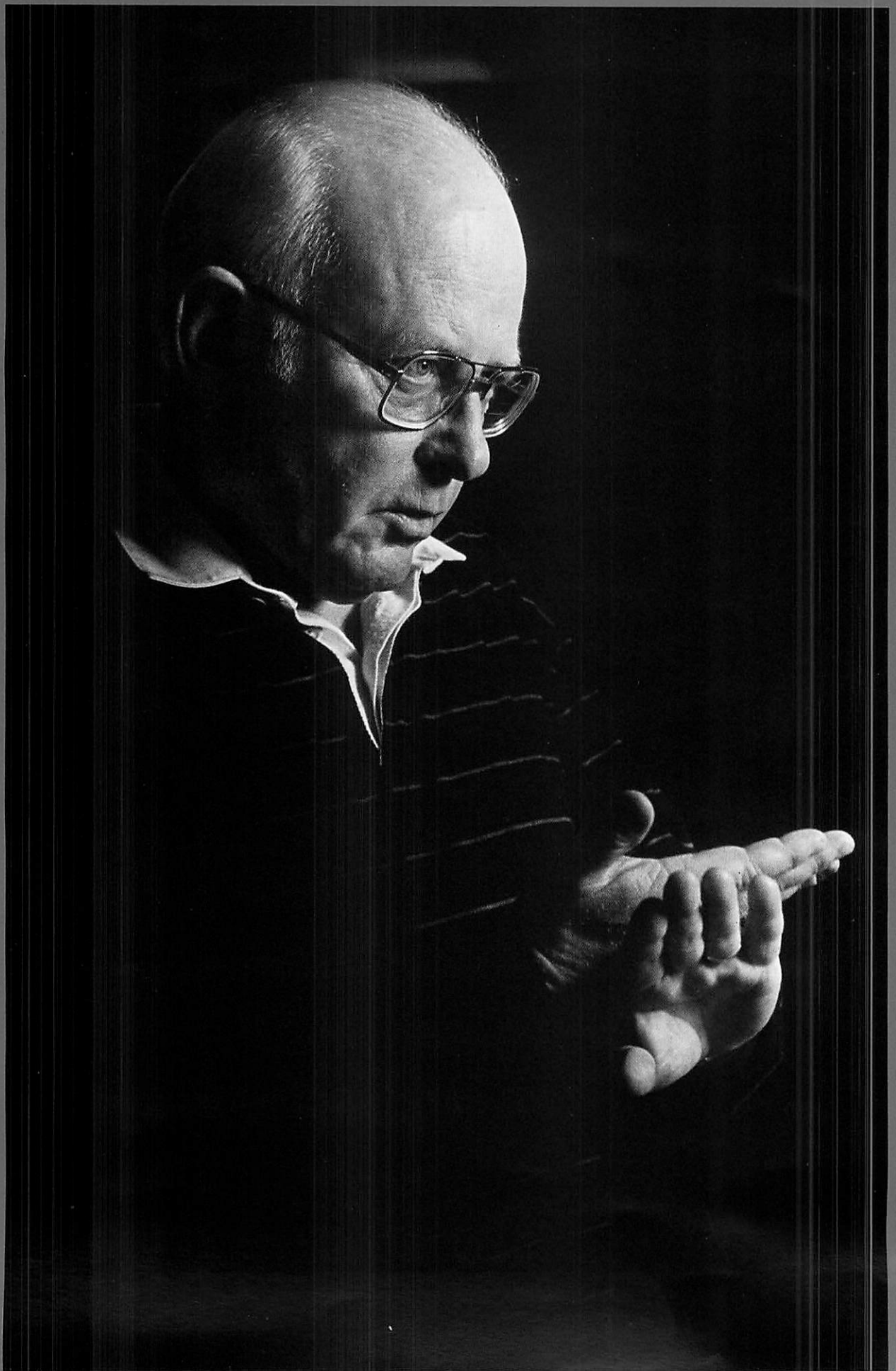
The idea caught hold, and in 1966 the Sea Grant Act was passed. The new Sea Grant colleges were patterned after the 100-year-old Land Grant system of universities, and just as its older "brother" did, the Sea Grant system has become an essential part of American universities.

Congress intended that Sea Grant become a catalyst for scientific discovery, technology transfer, and economic and social growth. The program was to employ research, extension, and education in a coordinated effort to help society use and understand the vast oceans.

In a relatively short time, the marine program conceived by Congress has spread across the United States. Today, there are more than 300 participating academic institutions.

Oregon was one of the first states to receive a Sea Grant designation. Twenty years have passed and there are many things to look back at with pride. But there is also a good deal happening today and a great deal to look forward to.

This publication is a brief overview of Oregon Sea Grant as it is today.



Letter from the Director

For the past two decades, Oregon Sea Grant and 28 sibling programs in the coastal and Great Lakes sections of the United States have been asserting that Sea Grant exists to "help put America's oceans to work" and that Sea Grant is "the headquarters for the conservation and development of America's coastal ocean." And we have meant it.

In this program report we offer some of the proof that Sea Grant is becoming an American institution. As an American institution, we're not yet as familiar as baseball and apple pie, but some remarkable Sea Grant people are becoming essential parts of the American consciousness.

Take, for example, Jon Jacobson, Dick Hildreth, and Mike Blumm—law professors all. Each has provided some landmark contributions in areas such as law of the sea, coastal zone law, and the restoration of salmon populations.

And then there is Bob Jacobson, the first among many Extension/Sea Grant agents, men and women who are known by name and appreciated in the ports and on the docks of America.

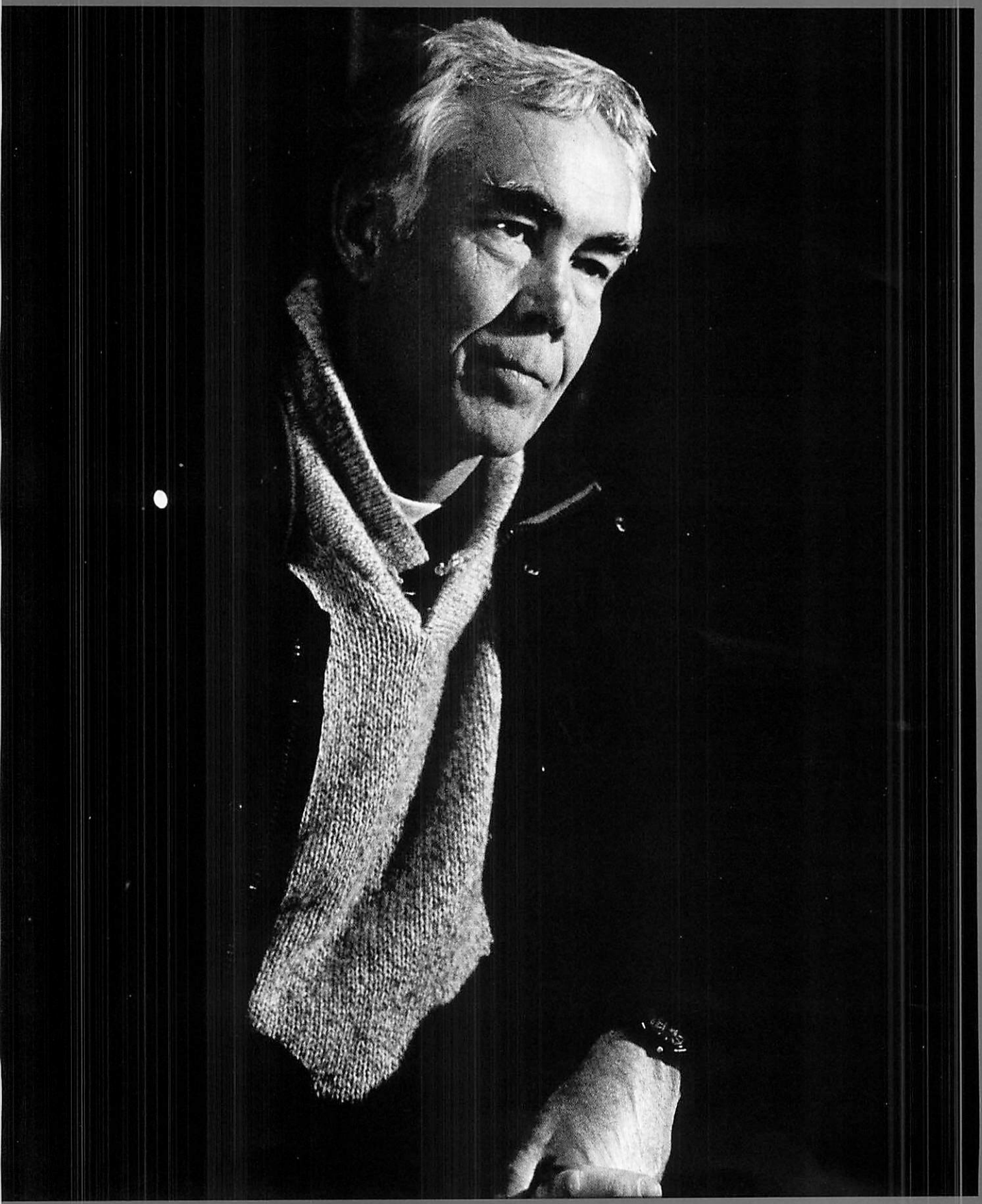
Come with us for an up-to-date look at the Hatfield Marine Science Center in Newport—a remarkable and sophisticated nucleus of marine research, education, and public participation.

Oregon Sea Grant has played a role in the creation of the law program, the Extension/Sea Grant system, the Marine Science Center, and much more. The list of Sea Grant accomplishments is long and these are only vignettes from the larger portrait of Sea Grant activity in Oregon, the Northwest, and the nation. In fact, Oregon Sea Grant reaches the world through its international projects.

In its brief history, faced with severe budget pressures, Sea Grant has become an accepted and valued part of the marine community of America.

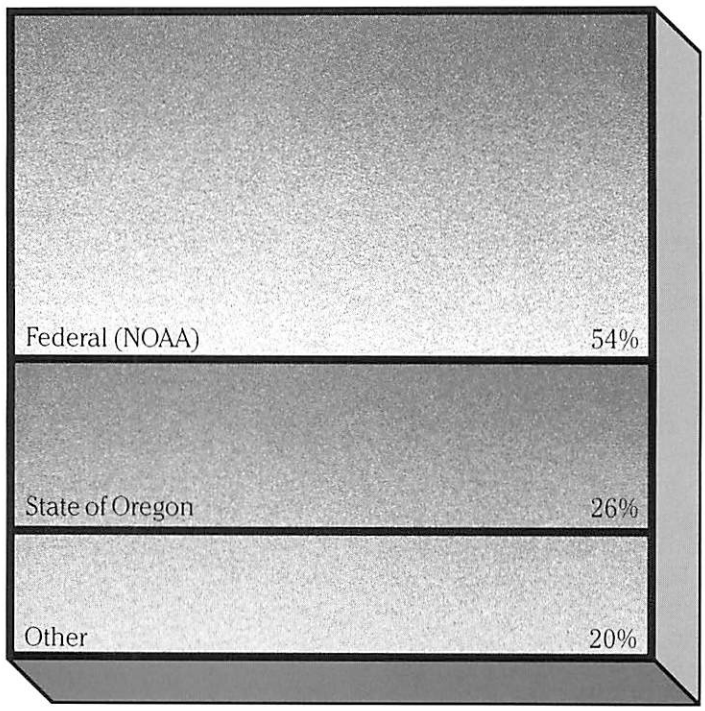
William Q. Wick, Director
July 1988

Oregon Sea Grant was one of the first, and is one of the largest, programs in the nation. Bill Wick has been its director since 1973. In the last 15 years, he has sought to make Sea Grant the headquarters for the conservation and development of America's coastal ocean.

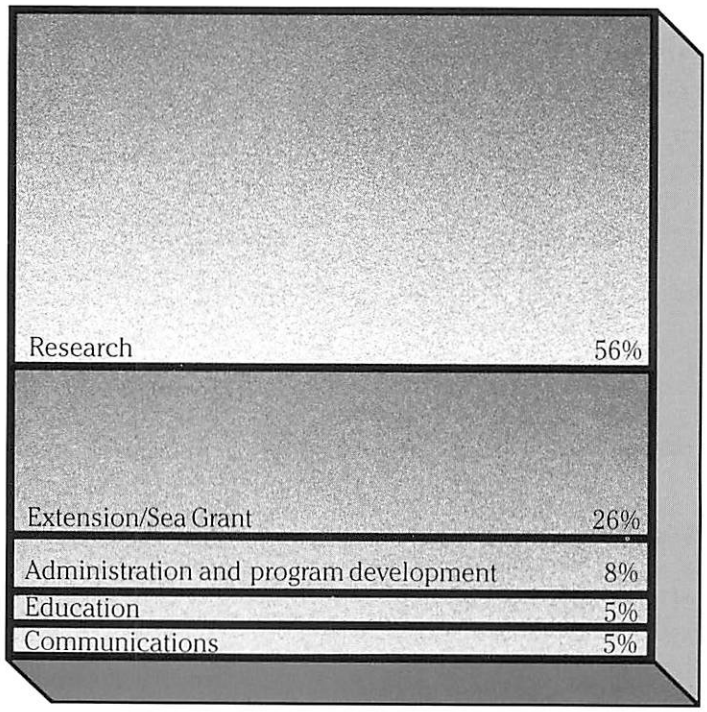


Budget

Income



Expenditures



Total income/expenditures $4,472,000

Fisheries and Wildlife professor Jim Lannan devoted much of the 1970s to the study and propagation of chum salmon. He demonstrated the efficacy of a streamside hatchery system. And from a small run of fish at the Whiskey Creek hatchery, he was able to distribute the species to many northwestern streams where chum salmon had, over time, died out.

"Ask Jake" by Sheila Shafer

In less than 20 years Extension/Sea Grant has grown from 2 to 18 agents and specialists. Some are housed along or near the coast in county Extension offices, and others are found on campus in six academic departments: fisheries and wildlife, oceanography, agricultural engineering, agricultural and resource economics, science education, and forest recreation resources. This diversity, in expertise and appointments, gives the program a netlike character. It extends across many communities and disciplines; and, like a net, it sweeps through both, bringing problems and solutions together.

One of those two original coastal agents was Bob Jacobson of Newport. Over the years Jake has come to embody the best of what Extension/Sea Grant offers: knowledge, commitment, involvement. The public rewards these qualities, and Extension/Sea Grant staff and faculty have received recognition numerous times for the work they do. This profile of Jake captures his qualities and this work. Written by Sheila Shafer, it appeared in the November 1987 issue of Pacific Fishing Magazine *as "Bob Jacobson, Fisherman and Marine Extension Agent" and is here reproduced in part, by permission of the author and publisher.*

Curious about a new fishery? The word along the docks in Newport is, "Ask Jake."

Bob Jacobson, or Jake, as he's called, is a lot of different things to a lot of different people. To the guys on the docks, he's a fellow fisherman, competition on the grounds, an established highliner, both as a salmon troller out of Newport and a halibut longliner in Alaska. With these same fishermen, as Oregon State University's marine extension agent for Lincoln County, Jake plays another role. Over the years, Jake has established his office as the place for professional fishermen to initiate whatever inquiries they may have about their fishing businesses.

Curious about a new fishery? The word along the docks in Newport is,"Ask Jake." Wondering about the dates of a halibut opener, a salmon season? "Call Jake." Interested in some particular new gear? New safety equipment? New insurance possibilities? "Go see Jake!" Fishermen will tell you that if he can't answer your questions, he can most likely get you together quickly with someone who can. Furthermore, the industry workshops Jake frequently presents on such topics as experimental fisheries, sea safety, and business management techniques often provide answers for fishermen before it's even occurred to them to formulate the questions.

Jake also provides a unique service for the community which he serves. For the media, for legislators, for local educators, for researchers and students, and even for the public in general, Jake's office provides access, not only to information about the local fisheries, but perhaps more importantly, to the fishing community itself. Newspaper reporters in search of an informed source regarding a fisheries issue frequently call Jake looking for the name of a fisherman who can articulate the industry's point of view. Legislators do the same when looking for user group feedback on some pending fisheries-related legislation.

"He was the toughest son of a gun under the basket I ever saw."—former Newport High basketball coach Ted Johnson

For members of the fisheries regulatory bodies, such as the Oregon Department of Fish and Wildlife or the Pacific Fishery Management Council, Jake functions as a liaison or "interpreter" between these individuals and the fishermen whose businesses they regulate. While this aspect of Jake's job, given the often adversarial nature of these relationships, may be the most difficult, the consensus is, nobody does it better. . . .

Raised in the little town of Glasgow near North Bend, Oregon, Jake's earliest memories include fishing on the Coos River for bass and trout and watching his dad's fishermen friends unload their boats at the docks in Charleston. When he wasn't fishing, Jake recalls, he was down shooting baskets at the neighborhood basketball hoop. It was a pastime that paid off when, as a 6' 6" all-state senior at North Bend High, he attracted the attention of Oregon State University freshman coach, Don Megale. He was offered a full OSU basketball scholarship and was, by his sophomore year, an important part of the renowned Slats Gill's varsity lineup.

While working in a plywood mill the summer following his junior year, Jacobson lost the fingers on his right hand in an industrial accident involving a glue edger. Though the accident effectively ended any hopes Jake might have had for a career in basketball, he nevertheless continued to play as a senior. "He might have lost a little off his shot," says fellow fisherman and retired basketball coach Ted Johnson, who frequently watched Jake play that year, "but he was the toughest son of a gun under the basket I ever saw. Guys couldn't *score* against him! What a competitor!"

Those who know Jake well will tell you that he didn't leave his desire to compete on the basketball court. Jake's drive to excel not only plays a crucial part in his success as a fisherman, but it's also provided him with the wherewithal to pioneer a career on land as the first fisheries extension professional in the United States.

As an undergraduate at OSU, Jacobson majored in fisheries and business administration and after graduation continued field and course work in fisheries. During this time he had a series of fisheries-related jobs which included teaching conservation and game management to YMCA and church camps for the old Oregon Game Commission and being part of the Fish Commission team out of Newport that planted the first red abalone in Whale Cove. He also worked for the U.S. Fish and Wildlife Service tagging perch and flounder, and at the Columbia River Clackamas Research Lab in their salmon program, aging fish.

Though these jobs gave Jacobson the opportunity to check out the various career possibilities in the area of fisheries management, it wasn't until 1967 that the direction that Jake was to take his fisheries career became clear. At that time Howard Horton, who was then a fisheries instructor at OSU, and Bill Wick, then director of the Marine Advisory Program, suggested to Jake that since there was federal money available for a university extension position, why not make it a *marine* extension position rather than the traditional agricultural one. . . . Both Horton and Wick, who together wrote the initial funding grants for the marine extension program, offered Jake the encouragement and autonomy that he needed to put together a program that was truly responsive to the needs of fishermen. As Wick recalls, when he hired Jake, he told him, ". . . go where fishermen are, hang around, listen and look for an educational opportunity." Jacobson didn't have to be asked twice. The docks became Jake's real office, and it was there that the ideas for the significant contributions Jacobson's program has made to the industry were born. . . .

In the area of improved fishing techniques, in the hook and line fisheries at least, Jake has been able to provide information and suggest innovations based on firsthand experience. Early on, as he established himself in Newport (a site chosen because of its central location and its proximity to the OSU Marine Science Center), Jacobson endeavored to get out on boats. He went dragging, shrimping, tuna fishing, and salmon fishing with respected Newport skippers such as Craig Cochran and Terry Thompson.

For a guy as competitive as Jacobson, the thrill of the kill, the lure of "getting 'em," especially if you "got 'em" better than the next guy, was too much to resist. In 1970 Jake bought an 18-foot dory which he fished with a vengeance on weekends. Larry Kosoff, then fishing out of Newport, used to refer to Jake's first rig as "double masted," the 6' 6" Jacobson looking like nothing less than the "second mast" as he drove the little boat out under the bridge and through the jaws.

Bob Jacobson, or "Jake," as he is known to fishermen along the Oregon coast, was the first full-time marine agent in the U.S.

Whatever amusement Jake may have provided at first quickly turned into respect as, weekend fisherman or no, he began to gain a reputation as a real contender in the king fishery. In 1973 he bought a tidy little 32-foot troller, the *Dolly Ann,* and by 1975 he had begun to take a three-month summer leave without pay during which he sharpened his "whole bait" fishery skills and became one of the highline chinook fishermen in the port. . . .

Fishermen are notoriously scornful of people who "talk fishing" without ever having experienced it and Jake's stock with the local fleet rose immediately when he became "one of them" and was able to address topics related to his own fisheries and the "on-ocean experience" in general with an authority that only comes from "being there." Jacobson was subsequently able to share the knowledge he's acquired firsthand, in areas such as whole bait fishing, the importance of controlling trolling wire voltage while salmon fishing, and strategies for "selective" salmon fishing, with fellow fishermen.

At every turn, Jacobson's on-ocean experiences have informed him in a very direct way of fishermen's needs, his own included.

Jake's experience with fishing selectively for salmon was of particular importance in the early '80s as the silver stocks in Oregon began to be perceived, by state biologists, as "threatened." As a former fellow biologist, Jacobson's credibility with the Fish and Wildlife staff was high. His ability to document that fishermen could catch chinook while by-and-large avoiding coho, no doubt contributed to heading off a total closure of the salmon fishery in Oregon at that time.

In 1976, Jake's fishing enterprise moved up another notch to the 40-foot *Rosella* and in 1979 Jacobson commissioned Ross Troyer to build him the 44-foot *Sagacious.* Late in November of 1981 the *Sagacious,* while leased to another skipper, capsized. Though he replaced her in 1983 with the 40-foot *Gal,* a move away from salmon fishing was in the offing. After he lost the *Sagacious,* Jacobson began spending his "fishing sabbbaticals" up in Alaska, crewing on the back deck of his brother Bill's boat, the 96-foot combination crabber/longliner, *Atlantico.* By '85 Jake was ready to enter into a partnership with Bill, Spike Jones, and Jack Hill in order to purchase the 86-foot *Jeanoah.* The agreement was that Jake was to skipper the vessel in Alaska during what had evolved into a five-month leave of absence from the extension program, while for the balance of the year, alternative skipper Jerry Bongen would run the boat. Jacobson has been pleased with this move which has given him the opportunity to explore new fisheries and new territory and rise to the challenge of participating in some highly competitive fisheries with good success. While the *Jeanoah* is capable of entering any number of fisheries from black cod to Dungeness to tanner crab, Jacobson soon found that he enjoyed longlining for halibut the most. The big-fish, big-poundage fishery with the heightened intensity born of extremely short seasons and frequently miserable weather suits Jacobson's personality to a T. That he has become extremely successful at it over the last couple of years suits him even better.

At every turn, Jacobson's on-ocean experiences have informed him in a very direct way of fishermen's needs, his own included, and have provided fodder for the workshops and ongoing project commitments that make his program of such significant benefit to the commercial fleet. Early on Jake embraced sea safety as a special focus. . . .

In the early '70s, partly with the promotion of his ideas on sea safety in mind, and partly to help create a "volunteer base" similar to those attached to the 4-H extension and family living programs, Jacobson helped organize the very first fishermen's wives' group on the coast.

Jake has worked with the Newport Fishermen's Wives to help them accomplish a number of safety related projects which include the construction of a helipad at the local hospital and the raising of $30,000 to purchase supplementary sea safety equipment for the Coast Guard. . . .Additionally, Newport Fishermen's Wives have worked under Jake's guidance on marketing projects which have included a Fish-in-Schools program funded by a West Coast Fisheries Development Foundation grant and a coast wide effort to work with supermarkets to improve the quality of seafood in retail outlets.

Jake's experiences as an independent boat owner/businessman have also fostered an interest in some less dramatic but equally important aspects of commercial fishing. Jacobson has, over the years, presented workshops on such disparate topics as stress management, fishing economics (with OSU marine economist and *Pacific Fishing* contributor Fred Smith), insurance pools, and groundfish management. The "Fishing for Answers" seminar, which Jake organized and chaired, dealt with the limited entry controversy. Participants from all strata of the industry, from fishermen to processors to resource managers, called it one of the "best think tanks" they've ever attended.

If Jake has a claim to fame besides his sea safety work and his fishing prowess, it has to be his ability to bring seemingly inharmonious groups together for rational discussion. Jake, early on in his career as a marine agent, identified a major fisheries problem, one that he resolved to ameliorate. "Fishermen and managers," he recalls, "were two groups that needed to talk and weren't." In the early '70s Jacobson began organizing a series of "town hall" meetings pulling together fishermen and fisheries biologists and managers for purposes of sharing information and exchanging points of view. The early meetings were sometimes heated and things weren't always resolved to fishermen's satisfaction, but at least a precedent had been set. Fisheries managers now routinely include user groups on advisory committees and even, occasionally, incorporate their suggestions and their data into the decision-making process. . . .

Jake's commitment to his extension job and his involvement with fishing do keep him hopping. It should be pointed out that when Jake isn't meeting fishermen's needs, he's attending to his other duties as a marine agent. These include running Seatauqua "hands on" recreational workshops on clam digging, bay crabbing, and bay and jetty sportfishing; taking youngsters, from grade school through college, on fisheries related field trips; running seminars and lecturing in fisheries classes at the university; and providing information for or organizing workshops for people in fisheries support industries such as marina personnel and fish buyers.

Jake's secretaries can testify to the fact that going in 20 directions at once eventually takes its toll. They remember Jake walking into the office last winter, shortly after the first of the year, holding a check in his hand and shaking his head. He'd apparently gotten a call from his bank (where he is, incidentally, a stockholder) notifying him that he'd signed the check he'd just written "Bob January."

Jake acknowledges that 20 years of service as a marine agent is a long time to be moving at full speed. He definitely sees a future with more leisure time and more time to fish in the offing. This year Ginny Goblirsch was hired as a second marine agent for Newport. She holds down the fort at the extension office in his absence and provides a continuum for ongoing projects.

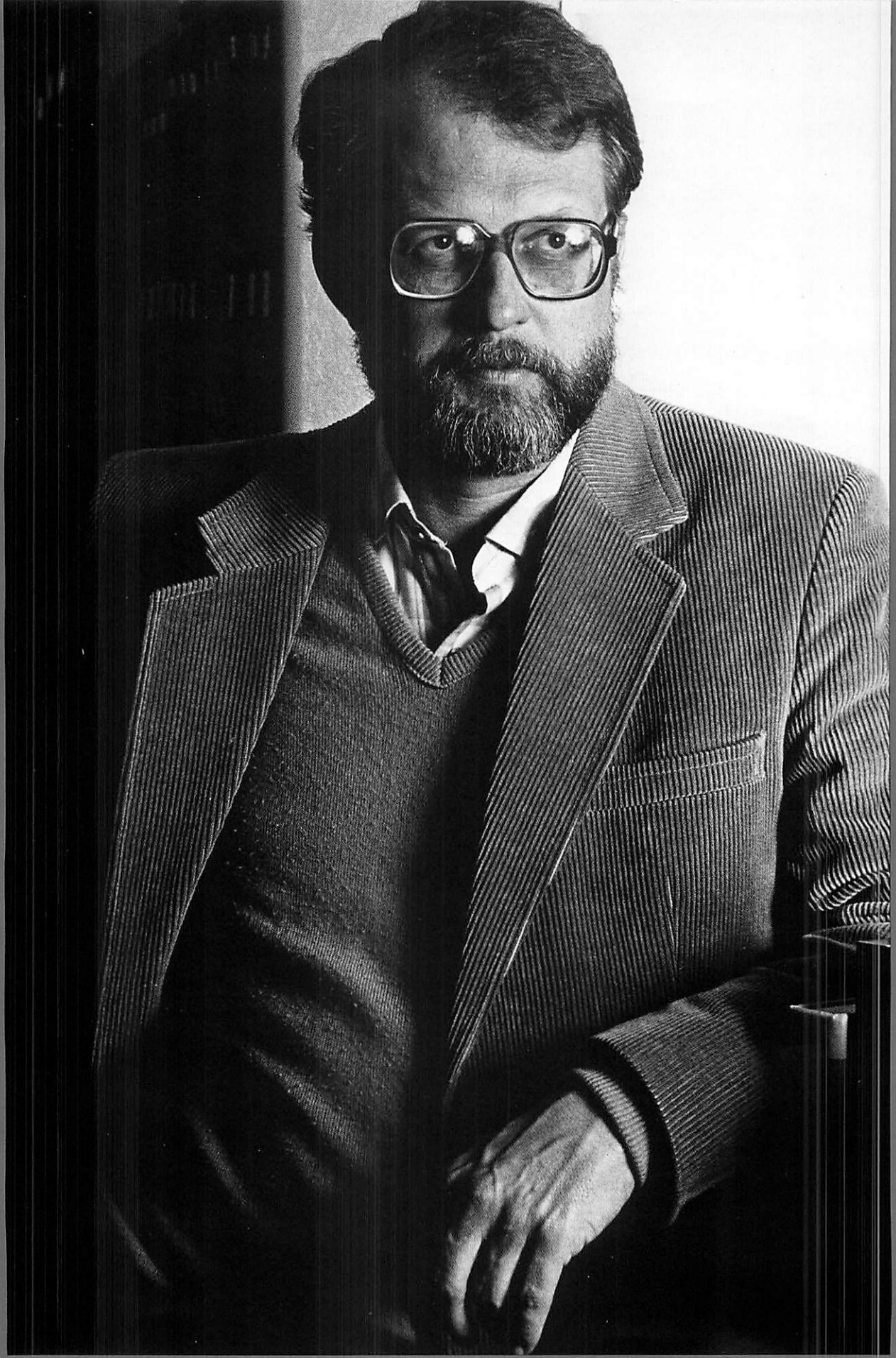
Chances are, though, given Jake's nature and his willingness to "take things on," every minute he manages to free will be filled with still another obligation. Recently, much to the delight of fishermen who've worked with him over the years, Jacobson was asked by Oregon Governor Neil Goldschmidt to serve on the Oregon Fish and Wildlife Commission. Jake, while pleased at the honor, admits it will be an added responsibility. He reckons, given his background, he'll be able to do a "decent job." Those who've watched him operate over the last decade or two certainly wouldn't bet against it.

Extension/Sea Grant

The outreach component of Oregon Sea Grant—Extension/Sea Grant—has its roots in agriculture's Extension Program. Well before 1968, when OSU became a Sea Grant as well as a Land Grant institution, county agents were working with coastal fishermen and with the Hatfield Marine Science Center at Newport. In the mid-1960s the man who would become director of Oregon Sea Grant, Bill Wick, was a Tillamook County agent specializing in mole control and estuary protection. Wick's philosophy of attempting the practical with one hand and the ideal with the other set the tone for what was to follow.

The nature of Extension/Sea Grant today is suggested by the following samples of what its agents and specialists do:

- ❑ *work with public and private sectors to draft resource management plans,* such as the Pacific Fisheries Management Council's limited entry plan for groundfish and Oregon's 1987 Senate Bill 630—the nearshore ocean management plan
- ❑ *assure marine safety* through navigation workshops, community college courses, Extension publications, and participatory events such as survival suit races
- ❑ *publicize innovations in fisheries,* from advances in the design of trawl nets to the creation of self-insurance programs
- ❑ *offer summer and winter Seatauqua Programs* that use films, talks, workshops, tours, and dock walks to inform tourists and residents about our natural marine resources
- ❑ *write and introduce marine curicula for grades K-12*
- ❑ *encourage waterfront revitalization* by analyzing the potential of interested towns and writing handbooks on the subject
- ❑ *improve productivity of ports* by team critiquing port operations and persuading port employees to test their management responses against a sequence of computer-assisted, interactive videos
- ❑ *demonstrate to the 350,000 people* who visit the Hatfield Marine Science Center every year that public support of marine research and education is justified



Advocates by Joe Cone

The year is 1985:

Responding to the call of the sea, a young chinook salmon swims down the Columbia and arrives behind the high wall of a dam. Blocked there, it begins to be drawn, struggling, into the powerhouse and down through the massive, whirling turbines.

The same year, in Portland, Oregon:

A timetable drawn up by the U.S. Department of the Interior means that giant oil companies could drill in waters off the Oregon coast in the early 1990s. In a staff meeting one state agency responsible for issuing permits realizes that the state is illprepared for this event. How can the agency begin to address its information needs?

Meanwhile, in another office high-rise:

A partner in a downtown law firm takes a phone call. It is the consulate of a foreign country. One of that nation's boats has just been cited for fishing within U.S. waters. Will the lawyer be able to advise them in their case? The lawyer agrees to discuss the matter. Hanging up, he walks over to a bookcase and retrieves a three-ring binder. Federal Fisheries Management: A Guidebook, *it says on the cover.*

Salmon protection on the Columbia River, state management of the Oregon coast, fisheries law in the open ocean, river, coast, sea. In each of these arenas, so vital to the life of Oregon and its livelihood, the law programs funded by Oregon Sea Grant have played significant roles during the 1980s. Their contributions have ranged from the analysis of legal issues, to the discussion of public policy, to the dissemination of information to the public.

There are two programs, which collectively represent nearly 30 years of program experience. They are the specialized anadromous fish law project at Lewis and Clark College and the comprehensive Ocean and Coastal Law Center at the University of Oregon.

Toward Global Cooperation

Jon Jacobson had just joined the law faculty at the University of Oregon in Eugene in 1968 when a request came from Herbert Frolander of OSU. Would he, Frolander asked, be willing to develop a course in ocean law to complement the activities of a new program he was directing at OSU, called Sea Grant? Jacobson agreed, and with a $5,000 grant, the UO Ocean and Coastal Law Center was born.

In the first decade, Jacobson researched and taught what he describes as "anything and everything" that had to do with either international or domestic ocean law. But increasingly, his own research came to specialize in the international scene, where something important, even momentous was happening. An ambitious international plan to manage the oceans was being conceived. It responded to an urgent need.

"If you had a time-lapse film," Jacobson says, "that showed national jurisdiction in the world's oceans over the last three centuries, nothing much would happen until the 1950s. Then all of a sudden in the '50s and '60s—Whomp!—countries woke up and began grabbing." By the 1970s, it had become clear to many countries that their mutual interests could best be served by an international code of law.

Observers call the United Nations Conference on the Law of the Sea the most complex and important international legal endeavor since the establishment of the United Nations itself. Virtually all the countries of the world were involved in the negotiations. Under the treaty the offshore rights of coastal nations were to be defined and limited. The seabed beyond national jurisdiction would be "the common heritage of mankind."

"As the most significant ocean nation in the world, the United States has the greatest interest in a shared understanding of international law."—Jon Jacobson

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For much of the decade of negotiations the United States was the leader and advocate of this idealistic vision. Jacobson himself was closely involved with the discussions, as a member of both the U.S. State Department's public advisory committee and the U.S. delegation to the United Nations Law of the Sea conference sessions from 1978 to 1982. "My personal feeling is that the Law of the Sea conference was our generation's best opportunity to do something on a very large scale that promoted global cooperation," Jacobson says.

But in 1982 the Reagan administration refused to sign or ratify the treaty. Instead, President Reagan unilaterally proclaimed the separate U.S. Exclusive Economic Zone (EEZ), extending U.S. jurisdiction and rights into formerly international waters. The momentum for international agreement was stymied, and some observers now believe that the treaty will never become international law.

Jon Jacobson started the ocean and coastal law program at the University of Oregon Law School more than 20 years ago. He and Dick Hildreth have trained more than 122 marine law students in the years since.

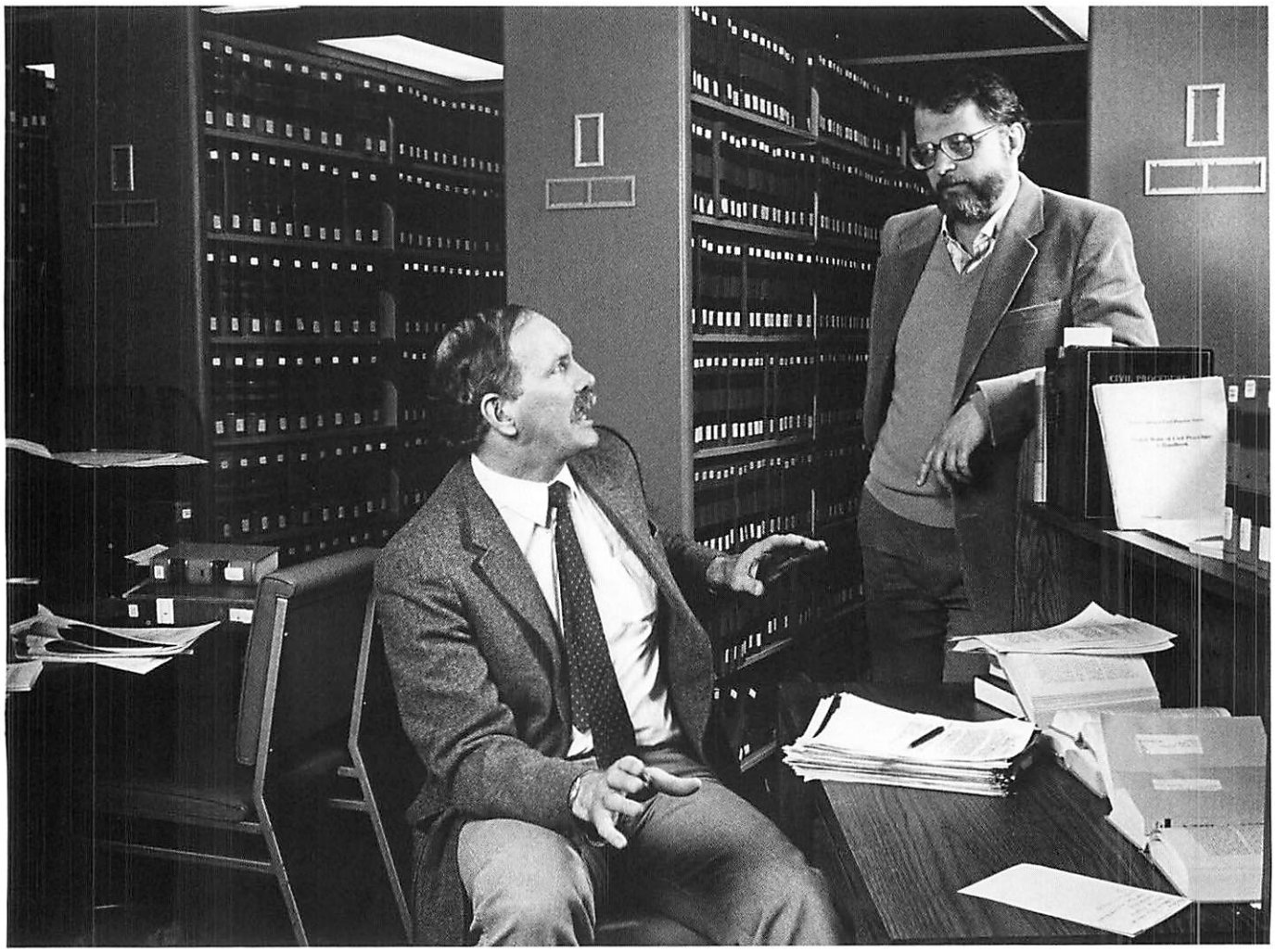
Jacobson has learned to adjust to this change in the U.S. position and in the international scene, and he has sought ways to be a constructive force in ocean policy discussions. He is a member of both the Henkin Panel on the Law of Ocean Uses and the EEZ Committee of the National Association of State Universities and Land Grant Colleges. In August 1987, Jacobson was invited to address the Law of the Sea Institute at its annual meeting.

Since the U.S. rejection of the treaty, Jacobson has taken the strategy of urging U.S. policymakers to uphold the nonseabed parts of the U.N. treaty. If we uphold them in concert with other nations, Jacobson argues, they will achieve the status of "customary law."

"As the most significant ocean nation in the world, the United States has the greatest interest in a shared understanding of international ocean law," the legal scholar says. One element of his 1987-89 Oregon Sea Grant research is a study of how the still active "ocean enclosure movement" operating outside of the principles agreed to by the signatories to the Law of the Sea treaty may jeopardize U.S. interests. Jacobson's goal is to suggest specific actions the United States may need to take.

Advancing the States' Interests

Just as international ocean law has become more complex since the 1970s, with nations jockeying for position, so too has U.S. domestic ocean and coastal law become more contentious in the 1980s. The federal government, ocean resource developers, and coastal states all have attempted to advance their interests, often at the expense of the others. The states, says Dick Hildreth, have frequently been at a disadvantage. Hildreth joined the faculty at the UO law school in 1978 following a Fulbright grant spent studying coastal management. He notes that the early 1970s were heady days for coastal states, as passage of the federal Coastal Zone Management Act gave them an incentive and a framework for resource management planning. But the 1980s have put them into a kind of "double-bind," the law professor says.



Under the Reagan administration, federal support for ocean and coastal management programs has dwindled, Hildreth notes, while pressures on ocean and coastal resources have increased. Reagan's declaration of the EEZ increased the stakes by adding 3.9 *billion* acres of offshore "wet territory" to the United States. This is half again as much space as the U.S. has on land.

Oregon's 1976 landmark land-use planning law established resource management principles that are "a model for any coastal government."—Dick Hildreth

Oregon has not escaped the pressure. The possibility that the U.S. Department of the Interior would offer leases for oil and gas drilling offshore in 1992, and that seabed mining might occur even sooner, prompted the governor's office to want to assess the state's readiness to deal with such increased pressures on the coast. Hildreth and Jim Good of OSU were awarded the contract to review the state's ocean management laws and agency practices. Good is the Extension/Sea Grant marine resources management specialist at OSU.

Oregon has been considered a leader in coastal zone management ever since the public beach law of 1967. And Oregon's 1976 landmark land-use planning law established resource management principles that Hildreth considers "a model for any coastal government." He commends particularly Goal 19, which specifies that whenever a conflict arises between a renewable resource, like fish, and a nonrenewable resource, like oil, the renewable resource takes priority.

During their year-long review of the state's laws and administrative rules, Hildreth, Good, and their student assistants found "no blatant gaps," according to Hildreth. But, he adds, there were "certainly readily identifiable improvements that could be made to the statutes." The 400-page "Oregon Territorial Sea Management Study" was a worthwhile activity for all concerned, Dick Hildreth believes. The state benefits, he suggests, from the impartial view of an outside contractor. The university and Sea Grant gained credit for a job well done. And the eight students who participated in the year-long project gained the experience of doing research that may have—Hildreth smiles in saying it—"real world effects."

In the last two decades the territorial jurisidiction of the United States has doubled. Our sovereignty has expanded to include everything out to a distance of 200 miles from shore. But how will this vast new territory be governed? At the University of Oregon Law School, Jon Jacobson and Dick Hildreth have used Sea Grant funding to build an internationally respected ocean and coastal law program. At the center, Jacobson and Hildreth are addressing the basic constitutional and legal issues raised by this new age of the ocean.

Developing Educational Opportunities

The practical education that research assistants in the Ocean and Coastal Law program receive makes the assistantships highly sought after by second- and third-year law students. But the marine program offers broader educational opportunities as well. Center codirectors Jacobson and Hildreth teach courses in, respectively, international law of the sea and domestic ocean and coastal law as part of their regular nine-month appointments as full professors of law. Since the two feel strongly that Oregon law students should have the opportunity to be exposed to marine law, they devised a program whereby a student who takes their two core courses, plus other courses approved by them, is acknowledged with a "statement of completion" in ocean and coastal law study. One hundred twenty students have earned this recognition since 1976, and many of them are now working in positions where their preparation in marine legal matters has been valuable. At present, two of these UO graduates are employed in the office of general counsel in the National Oceanic and Atmospheric Administration.

Supporting the academic activities of the center is a library unique to the Northwest, a separately housed collection within the law school library. Andrea Coffman, who holds a bachelor's degree in earth sciences as well as a master's in library science, is the center's librarian and has overseen the growth of the library to 4,500 book titles and 130 periodical and newsletter subscriptions. One element of the library's growth has been its provision of services to a broadening group of users.

Sea Grant supports publications of the center itself. The *Ocean Law Memo* has had 32 issues since 1973; the *Coastal Law Memo*, five since 1980. The center also publishes special volumes, like the twice-revised, ring-bound *Federal Fisheries Management: A Guidebook to the Magnuson Fishery and Management Act*, for use by both the legal profession and the public.

In addition, Jacobson, Hildreth, and their students have published over 60 law review articles, monographs, book chapters and other articles in marine law during the course of the program.

Restoring the Columbia

Perhaps no change in the Pacific Northwest is more symptomatic of this century than the decline of the salmon populations. The salmon of the Columbia River basin were, in 1900, legendary in their abundance, a force of nature seemingly beyond people's ability to diminish. But their numbers were reduced by two-thirds as a result of the construction of the system of hydroelectric dams.

Then in 1980, Congress passed the Northwest Power Planning Act, one part of which addressed the fish losses due to the dams. At the time, it was the most progressive federal wildlife law ever enacted in this country, Mike Blumm recognized, because the law required not only protection of depleted animal populations but also a restoration of those populations back to historic levels. A new era was at hand for the Columbia, Blumm felt sure, and the young law professor at Lewis and Clark College determined to focus his skills in legal research and public policy analysis on the ferment.

In 1979 Blumm began, with Sea Grant funding, the anadromous fish law project. In the years since, Blumm has edited more than 40 issues of the *Anadromous Fish Law Memo* and has frequently written articles for the publication.

The 1980 Northwest Power Planning Act was the most progressive federal wildlife law ever enacted in the country. —Mike Blumm

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The *Memo* has gained the respect of participants in this arena of public policy. As one reviewer of Blumm's Sea Grant project, an attorney for a national environmental organization wrote, "I can say, without question, that the analysis and information provided by the *Anadromous Fish Law Memo* is an invaluable tool both for me and for everyone else I know who is working in this field. That list includes government employees, concerned citizens, and those who represent the region's resource users, such as hydroelectric project operators and commercial fishermen in the region."

Given the divergent uses of the Columbia River for hydroelectric power, agricultural irrigation, ship navigation, recreation, tourism, and fishing, the potential for conflict over river priorities is great. As a result, insightful research and analysis from an outside, and scholarly, observer becomes even more valuable.

Perhaps because he sees that substantial benefits could be derived from the power planning law, Blumm and the *Memo* have become a kind of conscience for the participants in the continuing struggles over implementation of the salmon restoration program.

Blumm himself has tended to be a strong advocate for the fish enhancement goals that were envisioned by the Power Planning Act and that the Northwest Power Planning Council was charged to fulfill. He has published over 30 articles in other law journals as well as in the *Memo*; he has acted as a knowledgeable source for the mass media; and he has delivered speeches in public workshops concerning Columbia salmon restoration.

As with the University of Oregon program, the Lewis and Clark College anadromous fish law project has provided unique educational opportunities for law students, in both legal research and publication.

The year is 1995:

A young salmon arrives at the powerhouse; out of sight, the turbines are roaring. The flow of the Columbia carries the salmon closer toward the noise, when abruptly a moving screen catches it and shunts it to a channel. The salmon bypasses the powerhouse.

The sparing of this fish and thousands of his kin was a public policy decision. It was clarified in the pages of a small periodical called Anadromous Fish Law Memo. *People involved in commercial fishing groups and government agencies read the publication.*

The same year, along the southern Oregon coast:

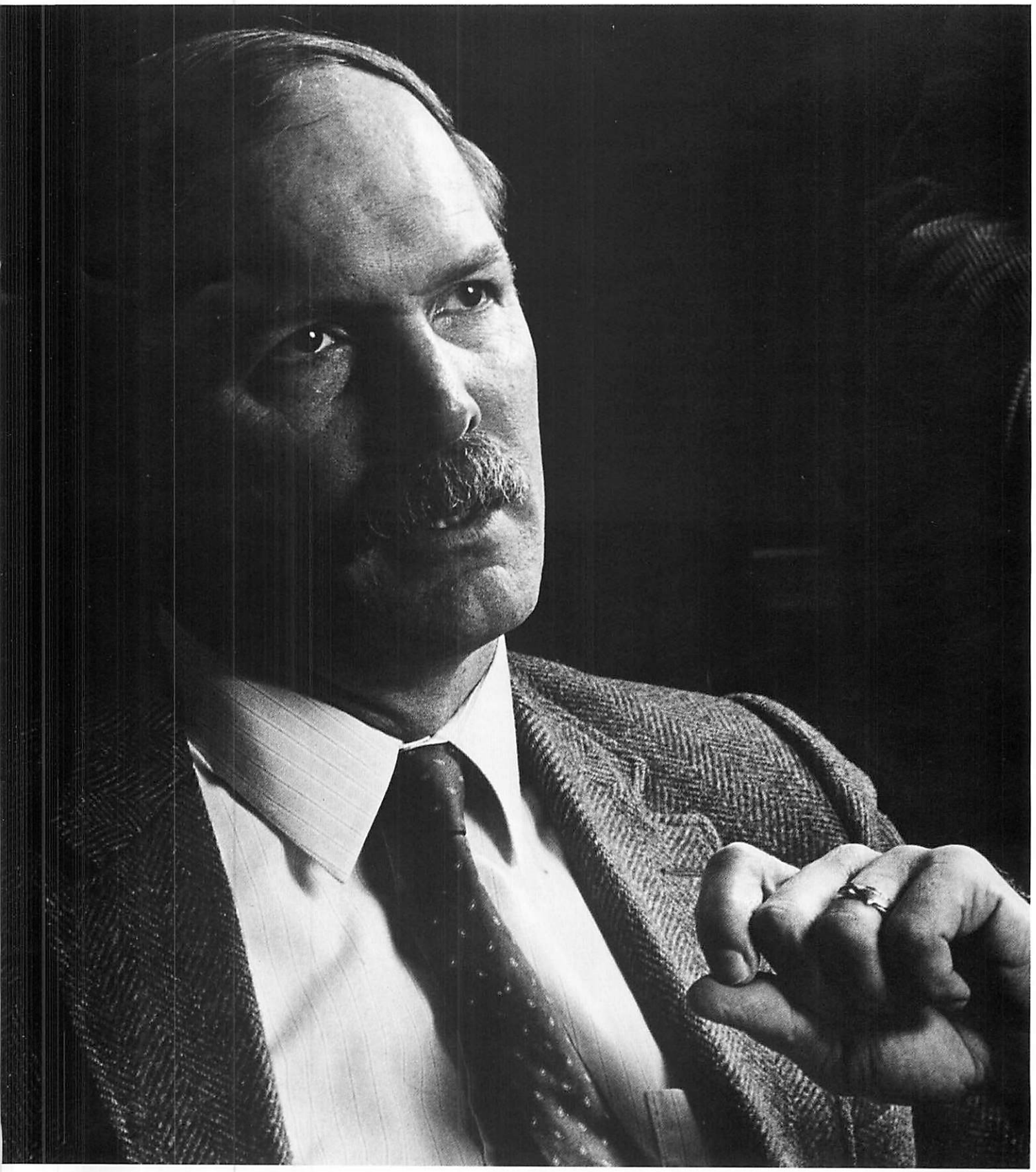
Privately, over dinner, the lawyer for the oil company admits that he's impressed; the agencies of the state "have their act together," he says. He is talking about the company's lease on a tract of seabed offshore Coos Bay, where recent exploratory drilling has found oil. But, he adds, the company is going to have to think carefully about whether other states might not be "a bit easier for the company to work in."

"Too bad, I like it here in Oregon," he says and smiles, taking another bite of troll-caught Chinook.

He's never heard of a big report conducted at two of the state schools of higher education almost a decade before, something called the "Oregon Territorial Sea Management Study." But he recognizes some of its effects.

And in an office high-rise in Portland:

When she gets the call, the junior partner, trained at the University of Oregon, knows the source to turn to. The federal incentives to develop the domestic fishery and eliminate foreign fishing are new, but the legal sourcebook on the topic is updated regularly. She goes to her computer and checks the directory of her on-line database. Up on the screen comes the guidebook she's looking for. Seventh revised edition, it reads. She's ready for business.



Dick Hildreth joined the Ocean and Coastal Law Center in 1978 as a specialist in coastal law. Recently, at the Governor's request, he assessed Oregon's readiness to deal with increased pressures on the coastal zone, including potential federal oil and gas leasing.

The Face of Curiosity by Dan Guthrie

At the Hatfield Marine Science Center, the people's expression differs from what's seen in most crowds. Theirs is not the glee of sports fans, nor the determination of mall shoppers, nor the anxiety of airport lines. Theirs is, instead, the face of curiosity.

The Marine Science Center has heightened the curiosity of more than 6 million visitors since its doors opened in 1965. In the last decade the visitors have numbered around 350,000 annually. All of them arrive with the correct admission fare: the desire to enter. Once, administrators at Oregon State University suggested that a modest fee of 25 cents be levied. But the supervisor of the center's marine education program, Bill Wick, now director of Oregon Sea Grant, argued convincingly against the proposal. The Marine Science Center, he said, should be a place where taxpayers who fund marine research and education can come for free to learn and to enjoy themselves. (Wick also pointed out that it would cost 50 cents a head to collect the two-bit admission fee. In such matters it's always helpful to combine the ideal with the cost-effective.)

Located on 49 acres alongside Yaquina Bay, the Marine Science Center is home to several enterprises. Its 110,000 square feet include about 8,000 square feet in the public education wing. The rest is taken up by classrooms, laboratories, offices, and a field library with over 10,000 volumes plus subscriptions to 350 journals. The *Wecoma,* a 177-foot research vessel financed by the National Science Foundation through OSU, is stationed at the center. These facilities, along with a filtered seawater system and proximity to the Pacific, continue to attract researchers and teachers. For the same reasons, government agencies maintain offices here, notably the Environmental Protection Agency, the National Coastal Resources Institute, and the Oregon Department of Fish and Wildlife.

When the center opened in 1965, carloads of tourists and busloads of school children began arriving unannounced. By the end of the year, 50,000 people had stopped in to look around. No preparations had been made to accommodate all these visitors, but the center's researchers did leave their labs to come up front and

The octopus tank is one of the most popular attractions in the public wing of the Hatfield Marine Science Center. Since the center opened in 1965, more than 7 million visitors have come through and enjoyed the many displays.

answer questions. That arrangement couldn't continue even though the researchers reportedly warmed to their new role as ambassadors to the public.

Bill Wick was hired in 1966 to "take the heat off" the scientists and to build a marine education program at the center. OSU's Extension Service backed a public education program and soon hired marine education specialists Don Giles and Vicki Jones Osis. During this period the marine extension work was turned over to what would become the Extension/Sea Grant Program.

Giles began offering talks, films, beach walks, and workshops in the summer of 1966. His, at first, modest offerings eventually became the Seatauqua Program.

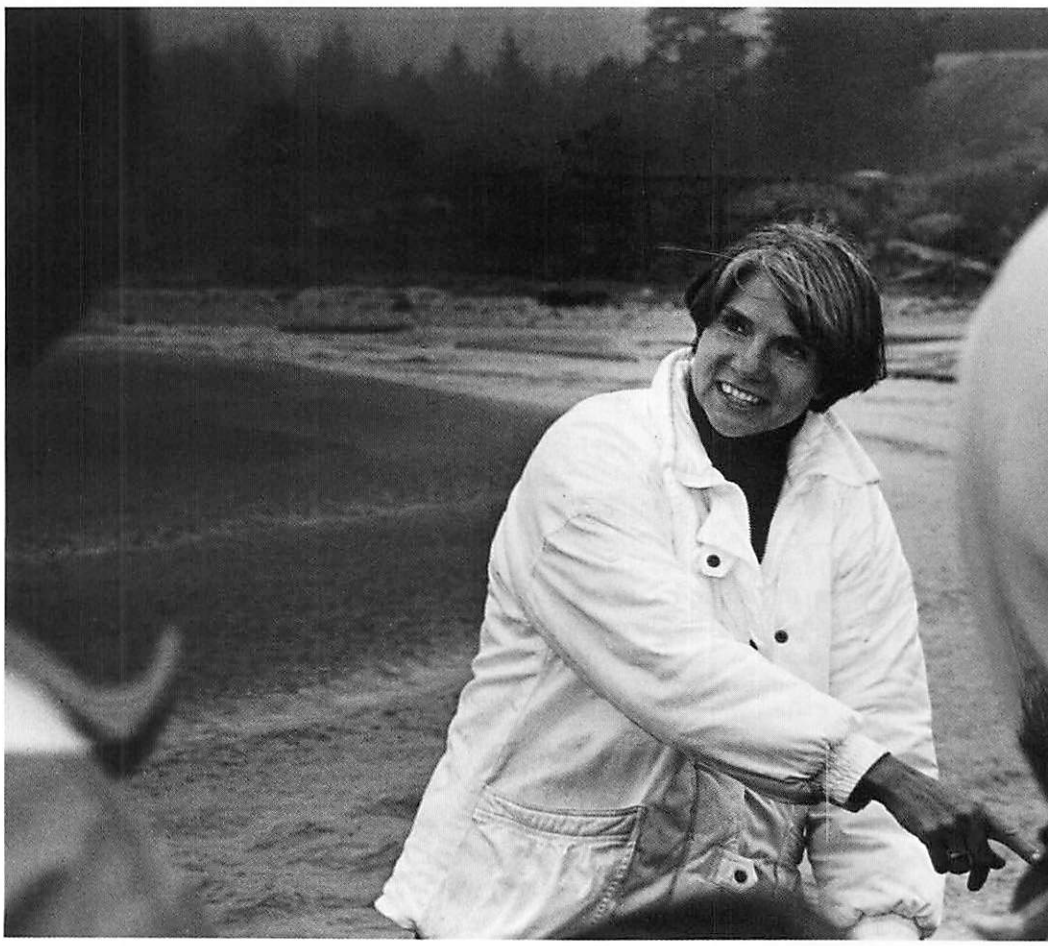
Seatauqua grew to include winter workshops and tours in 1975. By the 1980s Seatauqua comprised an entire summer of activities plus a 10-week winter session. Its films now attract 40,000 viewers annually, while the tours, workshops, lectures, and tank talks bring marine knowledge to another 10,000 people. There are a lot of tanks to talk about. The center began with one 1,000-gallon and eight 500-gallon aquaria and over the years has added a 2,500-gallon and eight 35-gallon tanks, plus opens pools for the octopus and the touchable tidepool animals. The public may enjoy these exhibits every day of the year except Christmas.

An offshoot of Seatauqua that has come to stand on its own is the whale-watching program. In 1983 the Marine Science Center began publicizing the biannual migrations of gray whales along the Oregon coast. To assist tourists, the center also began training volunteers to staff whale-watching posts.

By 1988, even in the foul weather of January, the eight-day event drew 5,906 whale watchers to 15 sites. These people represented every state in the union except Rhode Island and Minnesota. They saw 2,075 gray whales, according to the 114 volunteers who staffed the sites during the vigil. Meanwhile the volunteers were busy distributing fact sheets, answering questions, and teaching eager eyes to recognize whale spouts. The economic importance of all this to the coast was recognized by the Oregon State Tourism Division, which paid for wooden signs to identify whale-watching locations. As for the news value, every major paper in the Northwest has featured stories on the event. It has also been written up in national magazines and televised extensively.

The Marine Science Center immediately affects the lives and values of some people through its public programs—through whale watches, nature walks, and tank talks (encounters at the octopus tank, for example, figure prominently in notes and letters from visitors who want to voice their appreciation). The center also reaches a greater public by meeting the needs of K-12 teachers. Here is where the curricula and teacher workshops developed by Vicki Osis figure so prominently.

Osis organizes one- to five-day teacher workshops throughout the year, with the majority offered in the summer. They carry OSU credit and attract teachers from around the Northwest, most of them repeaters from past courses. The Marine Science Center is proof of the adage that "once is not enough." One summer, there might be workshops on intertidal ecology, coastal geology,



The teacher's teacher: On nature walks, in classrooms, and with teacher's guides that she coordinates, Vicky Osis helps teachers build the ocean into their curricula. She offers workshops on marine mammals, fish, geology, biology, birds, and invertebrates.

Don Giles frequently takes classes on nature walks to the shoreline. He teaches about tide pool life and helps students understand the ocean's role on our planet.

marine biology, and coastal natural history. Other summers steep participants in marine botany, estuaries, marine mammals, and frontiers in marine research.

Teachers who take these workshops tend not only to come back for more, but to bring their classes for tours. In an average year, about 2 percent of the state's children in grades K-12 visit the center in classes. Still more students fall under the center's influence through course curricula developed by Osis and her coworkers. Beyond that, about six percent of the state's children in grades K-6 are visited by Mr. and Mrs. Fish, an outreach program Osis designed, in which trained interns present skits telling marine stories. The ripple effect goes out from Newport to Portland, Eugene, and Roseburg and crosses over the Cascades to reach children from Wasco to Ontario, whetting their interest in sea gulls and sand dollars, and charging them with respect for our oceans.

In 1988, Osis arranged to make marine science education an optional area of concentration for the master's degree in science education. Two or more courses, each lasting four weeks and carrying six hours of graduate credit, are to be offered every summer at the center. Early enrollments indicate that these courses will attract educators from around the country who want to experience the Newport environment while earning an advanced degree.

The Hatfield Marine Science Center has come to be recognized as the hub of marine education in the Northwest. Teachers with questions, needs, and requests for presentations turn first to this institution. Its spacious lecture hall and meeting room are booked continually for educational events. And Osis has served as president of the Northwest Association of Marine Educators, whose newsletter she continues to publish.

In an average year, about 2 percent of the state's children in grades K-12 visit the center in classes.

Osis and Giles are not the only members of Extension/Sea Grant to hold forth at the Marine Science Center. All of the present staff of 17 agents and specialists have offered talks, given workshops, led tours, or taught short courses there in recent years. In 1988, another marine education specialist, Dr. Kathleen Heide, was added to the program. She brings research

strength in geology and a history of inspired work with volunteers and the public. Already she has beefed up the volunteer corps threefold—they now number more than 45. Heide draws extensively on campus-based professors to help train these volunteers. Every member of the OSU faculty has, on paper, a commitment to teaching, research, and extension, and Heide is helping them meet that third obligation.

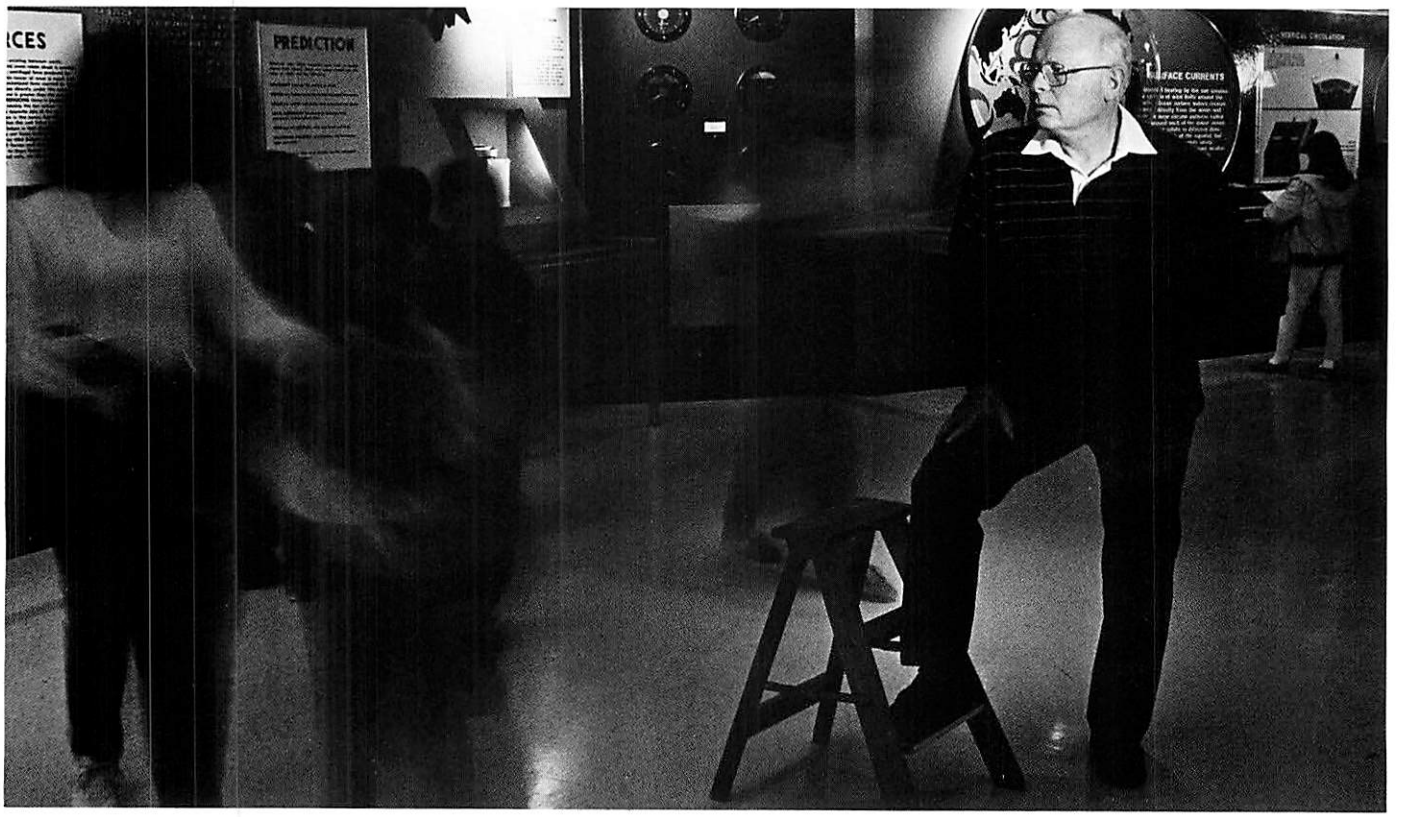
The Hatfield Marine Science Center has been described as a bigger window on Oregon State University than the school's football team.

Since the days in 1965 when researchers at the Marine Science Center came up front to mingle with the public, their presence has been no secret. Some are on the Extension/Sea Grant staff. Bruce Mate, a specialist who helps train whale-watch volunteers and is a resource for many Seatauqua activities and workshops, is also a researcher recognized globally for his use of satellites to track marine mammals. In addition Mate has pioneered acoustic harassment of seals and sea lions as a means of resolving conflicts with fisheries. Not only does he design and carry out innovative studies, but he presents the results on a weekly basis to audiences ranging from fishermen, to environmentalists, to bench scientists.

Extension/Sea Grant's seafood specialist, Steve Berntsen, splits his appointment between research and outreach activities. One day he may teach a workshop for retailers on good food-handling practices, and the next day he proposes advances to seafood processors, such as quick-freeze techniques for Dungeness crab.

As for other researchers at the Marine Science Center, many of whom are conducting projects funded by Oregon Sea Grant, the results of their work are carried to the waterfront by Extension/Sea Grant personnel. This "information transfer" role will expand as OSU develops the marine branch of its Agricultural Experiment Station at the center. Authorized in 1988, and partially funded, the Marine Experiment Station began with a seafood marketing economist and is in the process of adding a seafood scientist and a fish pathologist.

The Hatfield Marine Science Center has been described as a bigger window on Oregon State University than the school's football team. It is also a place of peace and a piece of the place, since Oregon's diverse marine habitats are represented in its aquaria. Finally, it is a true center, because here is where children, adults, researchers, students, and educators come together to enjoy and understand the marine world.



In the early days of the Marine Science Center there was no visitors' wing. When guests came, scientists would drop whatever they were doing and come up front to answer questions about the ocean, the coast, and the plants and animals. But in 1966 Bill Wick was hired to "take the heat off," so to speak. He created the visitors' center much as it is today.

Sea Grant Research by Joe Cone

Introduction

These summaries of Oregon Sea Grant research for the years 1985-87 highlight some program activities and accomplishments and place them in the context of the long-term development of the Sea Grant program. This is not a complete listing; enlightenment, not exhaustion, was the goal.

Although the projects are divided into the familiar Sea Grant categories of research, education, and advisory services, nearly every project encompasses elements of all three categories. For example, a research project will usually involve the education of a graduate research assistant and will normally result in information presented both to specialized academic audiences and to the broader public.

Aquaculture

From its beginnings in 1968, Oregon Sea Grant has worked to realize the potential of aquaculture. The program has naturally chosen to concentrate on species of importance to the Northwest, primarily salmon and oysters. The emphasis of salmon aquaculture research has evolved over time, though interests in salmon propagation, nutrition, and disease control have remained central to our efforts.

The program's contributions to salmon aquaculture practice have been numerous. For example, some of the earliest research projects attempted to see if some of the labor and material costs involved in salmon hatchery production could be reduced. Two of the innovative approaches experimented with at this time were streamside incubation in hatch boxes and accelerated rearing of juveniles in warm water. These areas of experimentation have since become well-established practices in public salmon enhancement efforts, on the one hand, and in private salmon ranching efforts, on the other.

Research into the prevention of disease at salmon hatcheries was a component of three research projects in 1985-87. In their project Carl Schreck and Stephen Kaattari examined the effects of stress on immunity and disease resistance in hatchery-raised salmon. The researchers uncovered elements of the biological mechanism of stress and its timing. This knowledge should guide hatchery managers to adopt handling practices that are less stressful to the animals.

John Fryer and his colleagues continued their critical work in fish health management. Their well-established diagnostic and certification service, operated out of both OSU's Hatfield Marine Science Center in Newport and the Corvallis campus, again provided benefits to both public and private aquaculturists. A disease-free certification on fish eggs, for example, is necessary for them to be imported or exported. The OSU service examined 50 lots of eggs.

Fryer and his colleagues have been among the first to apply biotechnology to fish health management. They have produced monoclonal antibodies to aid in the rapid and precise diagnosis of two particularly virulent diseases of salmonids, bacterial kidney disease and IHN, infectious hematopoietic necrosis. Meanwhile, in her project, Jo-Ann Leong produced a genetically engineered vaccine and demonstrated that it could confer protective immunity against another common fish virus, IPN, infectious pancreatic necrosis.

Ocean Productivity and Fisheries

Oregon's ocean productivity appears to have recovered from the downturn of the late 1970s and early 1980s. Commercial harvests of both groundfish and salmon were at robust levels in 1987. The fisheries' experience of the early 1980s in general and the El Nino of 1983 in particular, however, made it clear that the ocean off Oregon was not some limitless cornucopia.Research attention, accordingly, focused on some of the natural constraints to productivity.

One well-known hypothesis relating to fish abundance is that populations are limited by the abundance of food prey. But the reliability of a standard measure of production for the prey of salmon had come into question. The technique, known as gut fluorescence, can be used rapidly in the field to measure the feeding rates of copepods. In their project, Lawrence Small and Steven Ellis demonstrated that this technique is valid. This feeding information on salmon prey species, in conjunction with other biological data, might aid salmon hatchery managers in deciding when to release salmon into the estuaries and nearshore areas where copepods are found.

In one part of William Pearcy's project, it was learned that the important factor about the principal prey for chum salmon was not their simple abundance but their

Marine mammalogist Bruce Mate leads his profession in the development of satellite telemetry systems. He's applied these small electronic packages to manatees in Florida and to humpbacks and pilot whales in the North Atlantic. At the Hatfield Marine Science Center, he and his students assembled this skeleton of a minke whale.

At the Hatfield Marine Science Center, Cathy Lannan has been a key staff member of what has become the Northwest's premier fish disease laboratory. This facility is largely responsible for detecting and helping to control diseases in aquaculture facilities throughout Oregon and the Northwest.

behavior. Research assistant John Chapman discovered that chum salmon eat only what they can see, and their mud-dwelling prey—the larvae of mudshrimps and crabs—for the most part are available only at night. In consequence, the salmon ate primarily those individuals that were still in the water column during daylight. The chum, Chapman found, also fed most successfully when the tide was coming in. From this information, Chapman suggested that chum production in Oregon, which used to reach several million pounds a year, might well be increased beyond the current level of thousands of pounds if hatcheries timed their releases carefully. The groundfish fishery off the Oregon coast grew rapidly in the 1970s, exceeding the salmon fishery in number of pounds landed and occasionally in dollar value. But the rapid growth of the 1970s was not sustained in the 1980s, and the groundfish fishery came under intensive management by the regional management agency. The consequence of management actions on fishing behavior and on fish stocks has not always been well understood by managers, however. In her project, Ellen Pikitch has sought to identify the biological risks and economic consequences of alternative management strategies. Her findings in some fisheries point to different management strategies that would accomplish both the managers' objective of resource preservation and fishermen's interests in harvesting fish.

Marine Product Development

Since about 1940 Oregon State University has played an important role in helping industry produce better seafood products. At that time the university joined with Clatsop County and the seafood industry to establish a seafoods research laboratory in Astoria. Research in the ensuing years has tried to be timely, to respond to needs and opportunities.

In the 1970s, for example, Sea Grant-funded research at the Astoria lab focused on shrimp, which was becoming a major fishery off the Oregon coast. The laboratory had some notable successes in improving the yield of shrimpmeat from raw shrimp, successes which translated into new procedures and economic benefits for shrimp processors. According to lab director Dave Crawford, the techniques have added $64.5 million to the value of Oregon's shrimp fishery since 1980.

In the 1980s, Sea Grant efforts at the laboratory have concentrated on developing acceptable products from underused Oregon fish species. Dave Crawford experimented with adapting elements of surimi processing to the abundant but largely unused Columbia River shad. Products made of surimi—which is washed, deboned, minced fish flesh—have enjoyed a phenomenal market growth in the 1980s, and Crawford demonstrated that it is possible to make surimi from shad. Pacific whiting, however, appears to be a more likely candidate than shad from which to prepare surimi-based products, and Sea Grant research at the Seafoods Laboratory has turned to this underused and highly abundant groundfish species.

Marine organisms are usable by humans not only as a welcome source of high-quality food. In recent years, renewed attention has focused on natural medicinal products that may be derived from marine organisms. Researcher William Gerwick began studying the pharmaceutical properties of marine algae at the University of Puerto Rico in specimens that he isolated there. When he moved to OSU in 1985, he conducted the first systematic examination of seaweeds of the Oregon coast for their pharmaceutical properties. In both the Puerto Rican and the Oregon collections Gerwick discovered a number of chemical extracts with promising characteristics. He isolated 12 antimicrobial, toxic, or otherwise potentially valuable secondary metabolites from 91 species of Oregon seaweeds and 103 species from Puerto Rico. As a result of his discoveries, several industrial companies are actively collaborating with Gerwick; the potential anticancer drug activity of several natural products is under investigation.

Coastal Environments

In itself it is a struggle of water and rock. Humans are drawn to it by the spectacle. But the Oregon coast is a place where nature clashes not only with itself but with human will. In some places humans may not belong. As Sea Grant director Bill Wick has observed, "Where, when, how and whether to develop, protect, subdue or exploit the coast are continuing questions." People do live at the coast, however, and they make their livelihoods there; and it's been Sea Grant's role to develop knowledge so that Oregonians have the ability to choose their appropriate relation to the coast and its diverse resources—economic, recreational, scientific, and aesthetic. Sea Grant research in 1985-87 illuminated several hidden dimensions of this dynamic environment. Paul Komar and Curt Peterson completed their research into the formation of black sand deposits on coastal beaches. The black sands, which are enriched in heavy minerals like chromite and the titanium-bearing ilmenite, are concentrated by waves. Deposits of the black sands tend to occur at the back of beaches and to the south of headlands. The mineralized sands are not limited to the beaches but are also in the terraces adjoining the beaches and offshore in the continental shelf.

Some mineral companies have expressed interest in mining these black sand deposits, and Komar and Peterson's research is expected to put their search, should it be permitted, onto a scientific foundation.

People who live in homes at the beach often use stone or seawalls to stabilize their property from the onslaught of the sea. Despite the common use of riprap and seawalls, the consequence of this sort of beachfront development activity on adjacent property had never been studied directly. Responding to a request for a study by the Oregon State Parks and Recreation Division, civil engineer William McDougal sought to fill this information gap and perhaps help prevent the further erosion of Oregon beach property. In laboratory and field studies, McDougal observed that seawalls cause additional erosion in adjoining properties and the erosion is related to seawall length. Initial laboratory findings indicate that the depth of excess erosion is 10 percent of the wall length, while the erosion to either side is 70 percent of this length.

Another previously hidden dimension of the Oregon coast was the long-term history of marine mammals prior to the settlement of the coast by Europeans. Anthropologist Lee Lyman analyzed marine mammal bones recovered from three sites on the central Oregon coast. The sites had been occupied by humans during the past 3,000 years. Lyman found that the patterns of use of the coast by the animals had changed significantly over time.

Apparently, sea otters were once apparently common on the coast. However, they were hunted to extinction locally about 1900. Northern fur seals also apparently used the coast for breeding and giving birth to their young, which they no longer do.

Lyman and OSU anthropologist Richard Ross also examined the history of Oregon coast archaeological research and wrote a detailed critique of the efforts to date. This is expected to aid in the conduct of future research.

Public Policy Analysis

Since the 1960s, the trend among coastal nations has been to declare property rights over the ocean off their shores. One particular version of this has been to declare jurisdiction over extended fisheries zones. As is the case with the United States' declared zone, this often results in the nationalization of fish populations out to 200 miles.

With the realignment of property rights, the world's patterns of fishery exploitation and of trade in seafood have changed markedly. Such changes have been felt by American fishermen and by many in the Pacific Northwest. OSU economists Richard Johnston, Frederick Smith, and Bruce Rettig set out to understand the new realities of buying and selling seafood, primarily in those markets where the United States trades.

Instead of discovering a world in which property rights determined economic activity in some simple way, the researchers found that the new reality was complex. That is, it might have been supposed that nationalization of fisheries would have resulted in major new roles for trading nations. The reality has been that international seafood trade has indeed been affected, though not necessarily increased, by extended fisheries jurisdictions. U.S. seafood exports, especially salmon, have risen, though changes in both global and U.S. economic conditions generally were judged to probably outweigh the effects of extended jurisdiction.

Extended jurisdiction has led to potential gains from coastal nations and losses for "distant water" nations. However, contractual arrangements make it possible for distant water fleets, such as those of Japan, which are highly efficient, to operate as successfully as they have in the past.

One of the motives for nations to declare sovereignty over their own fisheries was to gain control over the extraordinary growth in fish-harvesting abilities, which began to occur in the 1950s. Globally, the harvest growth measured 6-7 percent per year until the 1970s, when the catch began to level off. In the United States, concerns about the overexploitation of some fisheries led to discussions about limiting the amount of fishing effort in them. During his research project, Bruce Rettig had the opportunity to present discussions about limited

entry programs in a variety of public settings, including an international conference and with a government-industry working group.

The Sea Grant-supported law programs at the University of Oregon and Lewis and Clark College (described in a feature article elsewhere in this report) were reviewed by a team of legal specialists who visited the Oregon schools in December 1987. Both programs received high marks from the reviewers, and they stated in the conclusion of their seven-page report, "The Oregon legal program has produced significant high quality contributions to the field of marine law throughout the period of Sea Grant funding."

To highlight only the UO program here, during the 1985-87 biennium it scored successes in each of the three main Sea Grant program areas. In research, Richard Hildreth's comparative study of federal-state management of exclusive economic zones in three countries was published and also presented at a national conference. In education, 25 law students received certificates of completion in ocean and coastal law, while three students participated in one-semester externships with the NOAA Office of General Counsel. And in advisory-related activities, the Ocean and Coastal Law Center library not only expanded its holdings but made them available to an increasingly broad group of users.

The UO library was in fact singled out for praise by the legal review team, who wrote, "Clearly, it is a significant local and regional resource."

Marine Resource Management

Overfishing. Sewage outfalls and toxic chemicals. Plastic pollution. Erosion and property loss. Pressures on the marine environment worldwide have grown alarmingly in recent years. The need for professionally trained marine resource managers has grown accordingly.

OSU is one of several institutions in the United States to offer a graduate program in marine resource management (MRM). Sea Grant support during 1985-87 materially strengthened this program, and cooperative relationships with other organizations led to unique educational opportunities for program students. These opportunities, in turn, produced significant benefits for the state and region. Three individual projects, among many, stand out.

In 1985 the governor of Oregon requested a study to determine the state's readiness to deal with management issues affecting the Oregon coast and ocean. MRM faculty member Jim Good joined the program's capabilities to those of the Ocean and Coastal Law Center at the University of Oregon to produce the much-needed analysis. A team composed of MRM graduate students and law research assistants, led jointly by Good and Dick Hildreth of UO, researched the topic for a year and produced a 400-page report, the "Oregon Territorial Sea Management Study."

Bill McNeil (right) was one of the early pioneers of Sea Grant in Oregon. In Whiskey Creek, at Netarts Bay, he envisioned and then built a streamside chum salmon hatchery to help restore depleted fish populations. The experiment went on to produce thousands of chum and to provide a learning opportunity for dozens of students and faculty.

Extension

Advisory activities have been a basic part of Sea Grant in Oregon since the program's beginnings. During any biennium, Extension/Sea Grant (E/SG) is the biggest single component of the program overall.

Seventeen specialists and agents make up the staff of Extension/Sea Grant, and their activities touch on virtually every facet of marine affairs in Oregon. And not just touch. The average number of years in their position for these 17 individuals is 12 years. Their sustained performance in their areas of expertise has made many of them leaders in the marine community.

The activities of such a large, knowledgeable, and diverse group are difficult to portray in a short summary, but perhaps verbal snapshots of key moments in the work of several individuals during recent years will at least suggest the outlines of a portrait.

- Winter affords few occasions at the Oregon coast more festive than the annual Newport Seafood and Wine Festival, and one of the displays most popular with merrymakers at the 1988 bash was the E/SG booth. There, seafood technology specialist Steve Berntsen introduced hundreds of nibblers to the Pacific promfret, a virtually unknown but abundant fish that is also the subject of Sea Grant research by William Pearcy. For this festival Berntsen smoked hundreds of pounds of the fish; virtually all of it was consumed, with gusto.
- Before 1971, towboat operators and crab fishermen were often getting in each other's way in prime crabbing areas off the coast. Then Sea Grant got involved in negotiating an agreement between the two parties, and the losses in terms of fouled propellers, lost pots, and bad feelings have gone down dramatically. Agent Gib Carter has been the architect of the continuing voluntary agreement during the 1980s. According to a 1987 study by the Survey Research Center of Oregon State University, the crabber-towboat agreement has saved the fishermen about $250,000 annually. Regulators like and endorse the agreement, too.
- It's described as the time-honored Extension method: work behind the scenes for worthy causes, but let the control and the credit belong to others. Newport agent Ginny Goblirsch helped the Newport Fishermen's Wives Association lobby for a helicopter at the Newport Coast Guard station. The helicopter will save fishermen's lives for a number of years. What better reward could someone who works for the public want?
- Much of the Columbia River Basin is range country, where water is in demand for many purposes. One of the primary uses of river water in rangeland is for livestock, but in the past, stockmen have not always been sensitive to how livestock can degrade riparian areas. Specialist Dan Guthrie met with cattlemen in places like LaGrande, Oregon, to raise the awareness that river management would benefit salmon and ranchers' interests. The OSU Extension Service began its own Riparian Initiative in 1987.
- Groundfish fishermen and fishery managers have had a rather embattled history in recent years over allotments of fish and lengths of seasons and the like, but the issue underlying the arguments is usually suspicion and mistrust, often based on lack of knowledge. Paul Heikkila, who has been the marine agent in Coos County since the early 1970s, has a long knowledge of the needs and communications styles of both fishermen and managers, and he has been active in bringing the parties together for fruitful discussions. Heikkila also is seeking to play a constructive role on a subcommittee of the Pacific Fishery Management Council that is considering "limited entry" options for overexploited groundfisheries.

Communications

Communications has long played a key role in the success of Sea Grant. Take, for example, Sea Grant's efforts in promoting aquaculture.

The Sea Grant program nationwide has invested heavily in aquaculture techniques and practices. But in many cases there is a gap between what is known and what is being applied. One problem is public acceptance. In 1984, communications director Jim Larison produced a program about aquaculture for the PBS science series NOVA. *Farmers of the Sea* showed 15 million Americans just how important aquaculture was becoming to other countries and how far behind the U.S. was in these important food production practices.

Communicators are also producing classroom educational materials. In 1988, Jim and Elaine Larison and Sea Grant writer Joe Cone produced an educational film entitled *The Living Ocean.* The film, funded by the National Geographic Society, was designed for school audiences.

Wherever appropriate, the communications staff likes to advance its educational objectives with other people's money. As an example, editor Sandy Ridlington worked on a joint project with the Oregon Department of Land Conservation and Development to produce *The Oregon Oceanbook.* Ridlington has also prepared a diverse group of educational publications. The Columbia River curricula for grades 5-8 and for grades 9-12, for example, were produced with her editing and design assistance.

To inform the public but also to gain exposure for Sea Grant and its researchers, Joe Cone has written science articles, radio news and feature reports, and magazine stories.

Publications for the Biennium

Institutional Publications

1985-86 Oregon State University Marine-related Publications. ORESU-L-85-001.

1986-87 Oregon State University Marine-relatedPublications.ORESU-L—86-001.

1987-88 Oregon State University Marine-related Publications. ORESU-L-87-001.

Oregon Sea Grant Proposal for 1987-89, volume 1. ORESU-P-87-001.

Oregon Sea Grant Proposal for 1987-89, volume 2. ORESU-P-87-002.

Oregon Sea Grant Proposal for 1987-89, volume 1, revised. ORESU-P-87-003.

Oregon State University Sea Grant College Program Biennial Report 1983-1985. ORESU-Q—85-002.

Oregon State University Sea Grant College Program Project Directory 1985-87. ORESU-D-85-001.

Oregon Sea Grant Directory of Projects for 1987-89. ORESU-D-87-001.

Newsletters and Memos

Anadromous Fish Law Memo
- No. 30, Restoring Columbia Basin Salmon under the Northwest Power Act: A Report on the Experiment and a Look at Some Storm Clouds on the Horizon
- No. 31, Cumulative Impacts of Hydropower Development under the National Environmental Policy Act: the Requirement of a Basin-wide Approach
- No. 32, Workshop on the Late, Great Columbia River Fishery (Part I)—History of the Fishery and Ongoing Restoration Effort
- No. 33, Workshop on the Late, Great Columbia River Fishery (Part II)—"Salmon and the Law"
- No 34, The Failure of the Fish Passage Provisions of the Columbia Basin Fish and Wildlife Program and Some Suggested Remedies
- No. 35, Small Scale Hydropower and Anadromous Fish: Lessons and Questions from the Winchester Dam Controversy
- No. 36, Ninth Circuit Upholds Constitutionality of the Northwest Power Planning Council
- No. 37, Livestock Grazing in Riparian Zones: Ensuring Fishery Protection in Federal Rangeland Management
- No. 38, The Failed Promise of the Columbia Basin Fish and Wildlife Program and What To Do About It
- No. 39, Restoring the Columbia's Upriver Runs: A Variety of Perspectives, Part 1
- No. 40, Restoring the Columbia's Upriver Runs: A Variety of Perspectives, Part 2
- No. 41, National Forest Planning and Anadromous Fish Protection: A Trilogy of NEPA Cases
- No. 42, Fish and Wildlife Preservation, Environmental Protection, and the Northwest's Electric Power System: A Panel of Views
- No. 43, Fish and Power in the Columbia Basin: Past and Future
- No. 44, Habitat Protection and the Magnuson Fishery and Conservation and Management Act Amendments of 1986

Coastal Law Memo
- No. 5, Federal Consistency under the Coastal Zone Management Act Revisited

Marine Mammal Information, Summer 1986

Northwest Fish Hatchery Newsletter
- Vol. 1, No. 1
- Vol. 1, No. 2
- Vol. 2, No. 1
- Vol. 2, No. 2
- Vol. 2, No. 3
- Vol. 3, No. 1
- Vol. 4, No. 1

Ocean Law Memo
- No. 27, Boat Foreclosures: Securing the Supplier's Interest in Durable Goods
- No. 28, Recent Developments in Ocean and Coastal Law, 1984-85
- No. 29, Recent Developments in Ocean and Coastal Law, 1986

Oregon Sea Pen
- Vol. 1, Nos. 1 and 2
- Vol. 2, No. 1

Educational Material

Hastie, B. 1986 revised. Water, Water Everywhere: Marine Education in Oregon. EM 8303.

Osis, V., M. Frost, J. Komar, P. Bellamy, P. Wilson, and D. Guthrie. 1986. Gateway to the Pacific: the Columbia River. Teacher's Resource Book. Grades 5-7.

Proceedings

Cook, S., ed. 1987. Sharks: An Inquiry into Biology, Behavior, Fisheries, and Use. Proceedings of the Conference. Portland, Oregon, October 13-15, 1985. EM 8330.

The Future of Northwest Maritime Industries XII: Proceedings of the Conference. 1986. SR 758.

The Future of Northwest Maritime Industries XI: Proceedings of the Conference. 1985. SR 722.

Limited Entry: A Fishing Industry Information Exchange. Proceedings of the Conference Fishing for Answers: An Industry Information Exchange. Newport, Oregon, March 7-8, 1985. 1987. EM 8332.

Mate, B. R., and J. T. Harvey, eds. 1987. Acoustical Deterrents in Marine Mammal Conflicts with Fisheries. Proceedings of a workshop held February 17-18, 1986 at Newport, Oregon. ORESU-W-86-001.

Posters

Coos Bay Estuary Public Access Guide. 1986. SG 80.

Sharks of Oregon. 1987. EM 8349.

Other Publications

Boating in Oregon Coastal Waters. 1987 revised. Manual 3.

Brodeur, R. D., W. G. Pearcy, B. C. Mundy, and R. W. Wisseman. 1986. ORESU-T-87-001.

Fisher, J., and W. G. Pearcy. 1985. Studies of Juvenile Salmonids off the Oregon and Washington Coast, 1985. College of Oceanography Cruise Report 85-14. ORESU-T-85-004.

Gyotaku—Japanese Fish Painting. 1986. SG 81.

Heikkila, P. Bottom Fishing Off Oregon. 1986 revised. SG 14.

Hilderbrand, K. Albacore Tuna: A Quality Guide for Off-the-Dock Purchasers. 1986. SG 82.

Hilderbrand, K. Surimi: Some Observations on Trawler Production. 1986. SG 762.

Hudspeth, R. T., F. Mazenot, W. G. Carter, and T. H. Gentle. 1986. Using the Rolling-Period Test to Estimate Stability in Small Fishing Vessels. SR 779.

Jacobson, R. W., P. Heikkila, and K. Hilderbrand. 1987 revised. Oregon's Captivating Clams. SG 28.

Kulm, L. D., C. D. Peterson, and M. C. Stribling. 1986. Inventory of Heavy Minerals and Metals—Southern Washington, Oregon, and Northern California Continental Shelf and Coastal Region. ORESU-T-86-001.

1986 Oregon Saltwater Fishing Regulations. 1986. EM 8319.

Parmenter, T., and R. Bailey. 1985. The Oregon Oceanbook. The Department of Land Conservation and Development. ORESU-B-85-001.

Wilson, C. D., and W. G. Pearcy. 1985. The Utilization of Netarts Bay by Juvenile Chum Salmon, 1985. Oceanography Field Report 85-22. ORESU-T-85-005.

Reprints

Adu-Asamoah, R., R.B. Rettig, and R. Johnston. 1986. Regional policy analysis of the U.S.A. Pacific coast groundfish fishery: post extended fishery jurisdiction considerations. Pages 7-13 *in* International Conference on Fisheries. Rimouski, Canada: August 10-15, 1986. ORESU-R-86-029.

Blumm, M.C. 1985. NEPA meets the Northwest Power Act (and prevails): the Ninth Circuit orders an EIS on the Bonneville Power Administration's power sales contracts. Natural Resources Journal 25:1005-1024. ORESU-R-85-27.

Blumm. M.C. 1986. Reexamining the parity promise: more challenges than successes to the implementation of the Columbia Basin Fish and Wildlife Program. Environmental Law 16:461-515. ORESU-R-86-020.

Blumm, M.C. 1986. A trilogy of tribes v. FERC: reforming the federal role in hydropower licensing. The Harvard Environmental Law Review 10(1):1-59. ORESU-R-86-013.

Blumm, M.C. 1986. Why study Pacific salmon law? Idaho Law Review 22(3): 629-656. ORESU-R-86-037.

Blumm, M.C., and B. Kloos. 1986. Small scale hydropower and anadromous fish: lessons and questions from the Winchester Dam controversy. Environmental Law 16:583-637. ORESU-R-86-021.

Brodeur, R.D. 1986. Northward displacement of the Euphausid *Nyctiphanes simplex* Hansen to Oregon and Washington waters following the El Nino event of 1982-83. Journal of Crustacean Biology 6(4): 686-692. ORESU-R-86-025.

Chapman, D., and R. Hildreth 1985. Coastal erosion management in Australia and the U.S. Pages 91-106 *in* Proceedings of the Fourth Symposium on Coastal Ocean Management "Coastal Zone' 85," ASCE/Baltimore, MD, July 30-August 1, 1985. ORESU-R-86-013.

J.E. Clark and R.S. Johnston. 1986. Open access, market structure, optimality and entrepreneurship in the fishery. Pages 429-437 *in* International Conference on Fisheries. Rimouski, Canada: August 10-15, 1986. ORESU-R-86-032.

Colon, M., P. Guevara, and W.H. Gerwick. 1987. 5' Hydroxy-isoavrainvilleol, a new diphenylmethane derivative from the tropical green alga *Andrainvillea nigricans*. Journal of Natural Products 50(3):368-374. ORESU-R-87-019.

Diamond, N. 1987. Limited Entry. Pages 222-233 in Conference on Gulf & South Atlantic Fisheries: Law and Policy, March 18-20,1987. ORESU-R-87-017.

Erickson, D.L., and E.K. Pikitch. 1987. First Oregon record for the cowcod, *Sebastes levis*. California Fish and Game 73(3):192.ORESU-R-87-020.

Fitzpatrick, M.S., J.M. Redding, F.D. Ratti, and C.B. Schreck. 1987. Plasma testosterone concentration predicts the ovulatory response of coho salmon, *Oncorhynchus kisutch*, to gonadatropin-releasing hormone analog. Canadian Journal of Fisheries and Aquatic Sciences 44(7):1351-1357. ORESU-R-87-025.

Fitzpatrick, M.S., C.B. Schreck, F. Ratti, and R. Chitwood. 1987. Viabilities of eggs stripped from coho salmon at various times after ovulation. ORESU-R-87-026.

Fitzpatrick, M.S., G. Van Der Kraak, and C.B. Schreck. 1986. Profiles of plasma sex steroids and gonadotropin in coho salmon, *Oncorhynchus kisutch*, during final maturation. General and Comparative Endocrinology 62:437-451. ORESU-R-86-014.

Gerwick, W.H., A. Lopez, R. Davila, and R. Albors. 1987. Two new chamigrene sesquiterpenoids from the tropical red alga, *Laurencia obtusa*. Journal of Natural Products 50(6):1131-1135. ORESU-R-87-027.

Gerwick, W.H. A. Lopez, G.D. Van Duyne, J. Clardy, W. Ortiz, and A. Baez. 1986. Hormothamnione, a novel cytotoxic styrylchromone from the marine cyanophyte, *Hormothamnion entermorphoides* Grunow. Tetrahedron Letters 27(18):1979-1982. ORESU-R-86-006.

Gerwick, W.H., S. Reyes, and B. Alvarado. 1987. Two malyngamides from the Carribean cyanobacterium, *Lyngbya majuscula* Phytochemistry 26(6):1701-1704. ORESU-R-87-011.

Good, J.W. 1987. Mitigating estuarine development impacts in the Pacific Northwest: from concept to practice. The Northwest Environmental Journal 3(1):93-112. ORESU-R-87-013.

Good, J.W., and R. G. Hildreth. 1987. Territorial sea management by the state of Oregon. Pages 3404-3413 *in* Coastal Zone '87 WW Div/ASCE, Seattle, Washington, May 26-29, 1987. ORESU-R-87-009.

Hankin, D.G., and M.C. Healey. 1986. Dependence of exploitation rates for maximum yield and stock collapse on age and sex structure of chinook salmon, *Oncorhynchus tshawytscha*, stocks. Canadian Journal of Fisheries and Aquatic Sciences 43(9):1746-1759. ORESU-R-86-017.

Hildreth, R.G. 1987. EEZ Governance in Australia, Canada, the United States and New Zealand. Pages 3414-3429 *in* "Coastal Zone'87" WW Div/ASCE, Seattle, Washington, May 26-29, 1987. ORESU-R-87-008.

Hildreth, R.G. 1986. Legal column—intergovernmental relations in outer continental shelf development. The Coastal Society Bulletin 9(3):8-14. ORESU-86-019.

Hildreth, R.G. 1985. Ocean resources and intergovernmental relations in the 1980s: outer continental shelf hydrocarbons and minerals. Pages 155-196 *in* Ocean Resources and U.S. Intergovernmental Relations in the 1980s. A Workshop held in Woods Hole, Massachusetts, September 12, 1985. ORESU-R-85-016.

Hildreth, R.G. 1987. Public access to shorelines and beaches: alternative approaches and the taking issue. *In* Water as a Public Resource: Emerging Rights and Obligations. A conference at the Natural Resources Law Center, University of Colorado School of Law, June 1, 1987. ORESU-R-87-014.

Hildreth, R.G., and A. Ivanovici. 1985. Conservation of marine and estuarine areas in a federal system. Pages 2014-2025 in Proceedings of the Fourth Symposium on Coastal and Ocean Management "Coastal Zone '85," ASCE/Baltimore, Maryland, July 30-August 1, 1985. ORESU-R-85-014.

Hildreth, R.G., and R.W. Johnson. 1985. CZM in California, Oregon, and Washington. Natural Resources Journal 25(1):103-165. ORESU-R-85-010.

Hudspeth, R.T., J.H. Nath, and P. Komar. 1988. Wave phase/amplitude effects on force coefficients. Journal of Waterway, Port, Coastal, and Ocean Engineering 114(1)34-49. ORESU-R-88-001.

Jacobson, J.L. 1985. International fisheries law in the year 2010. Louisiana Law Review 45(6):1161-1199. ORESU-R-85-026.

Johnson, R.S. 1985. Book review of *Marketing in Fisheries and Aquaculture* by Ian Chaston. Marine Resource Economics 2(2):197-201. ORESU-R-85-018.

Jones, J., K. Casavant, and C. Kim. 1986. Maritime constraints and international trade: case study of the impact of cargo preference on U.S. wheat trade. Pages 795-807 *in* Proceedings of the World Conference on Transport Research. ORESU-R-86-038.

Kelly, S. 1986. Diversification in trading partners—a spatial equilibrium-MOTAD approach. Pages 129-133 *in* International Conference on Fisheries, Rimouski, Canada, August 10-15, 1986. ORESU-R-86-031.

Kim, T-I., 1986. Circulation kinematics in nonlinear laboratory waves. Pages 381-395 *in* 20th Coastal Engineering Conference Proceedings CER Counsel ASCE/Taipei, Taiwan, November 9-14, 1986. ORESU-R-86-039.

Kolbe, E., C. Crapo, and K. Hilderbrand. 1985. Ice requirements for chilled seawater systems. Marine Fisheries Review 47(4):33-42. ORESU-R-85-028.

Kolbe, E., G.W. Robertson, M.J. Cashin, and J.H. Merritt. 1987. Submersible structures for shellfish culture. Aquacultural Engineering 6:111-126. ORESU-R-87-010.

Kolbe, E., G.W. Robertson, and J.H. Merrit. 1985. Refrigeration loads and insulation requirements for holds on wooden fishing vessels. Pages 243-249 *in* Technology Advances in Refrigerated Storage and Transport, held in Orlando, Florida, November 17,1985. ORESU-R-85-029.

Komar, P.D. 1986. The 1982-83 El Nino and erosion on the coast of Oregon. Shore and Beach (April 1986):3-12. ORESU-R-86-008.

Komar, P.D. 1987. Selective grain entrainment by a current from a bed on mixed sizes: a reanalysis. Journal of Sedimentary Petrology 52(2):203-211. ORESU-R-87-002.

Komar, P.D., and K.E. Clemens. 1986. The relationship between a grain's settling velocity and threshold of motion under unidirectional currents. Journal of Sedimentary Petrology 56(2):258-266. ORESU-R-86-005.

Komar, P.D., and D.B. Enfield. 1987. Short-term sea-level changes and coastal erosion. Sea Level Fluctuation and Coastal Evolution. Special Publication # 41:17-27. ORESU-R-87-024.

Komar, P.D., and R.A. Holman. 1986. Coastal processes and the development of shoreline erosion. Annual Review of Earth Planetary Science 14:237-265. ORESU-R-86-012.

Komar, P.D., and Z. Li. 1986. Pivoting analyses of the selective entrainment of sediments by shape and size with application to gravel threshold. Sedimentology33:425-436. ORESU-R-86-015.

Krygier, E.E., and W.G. Pearcy. 1986. The role of estuarine and offshore nursery areas for young English sole, *Parophrys vetulus* Girard, of Oregon. Fishery Bulletin 84(1):119-132. ORESU-R-86-009.

Li, Z., and P.D. Komar. 1986. Laboratory measurements of pivoting angles for application to selective entrainment of gravel in a current. Sedimentology 33:413-423. ORESU-R-86-016.

Lin, B-H, R.S. Johnston, and R.B. Rettig. 1986. U.S. demand for selected groundfish products, 1967-80: comment. American Journal of Agricultural Economics 68(4):1021-1024. ORESU-R-86-026.

Lopez, A., and W.H. Gerwick. 1987. Two new icosapentaenoic acids from the temperate red seaweed, *Ptilota filicina* J. Agardh. Lipids 22(3):190-194. ORESU-R-87-005.

McDougal, W.G. 1985. Hinged floating breakwater. Journal of Waterway, Port, Coastal and Ocean Engineering 3(5):895-909.ORESU-R-85-017.

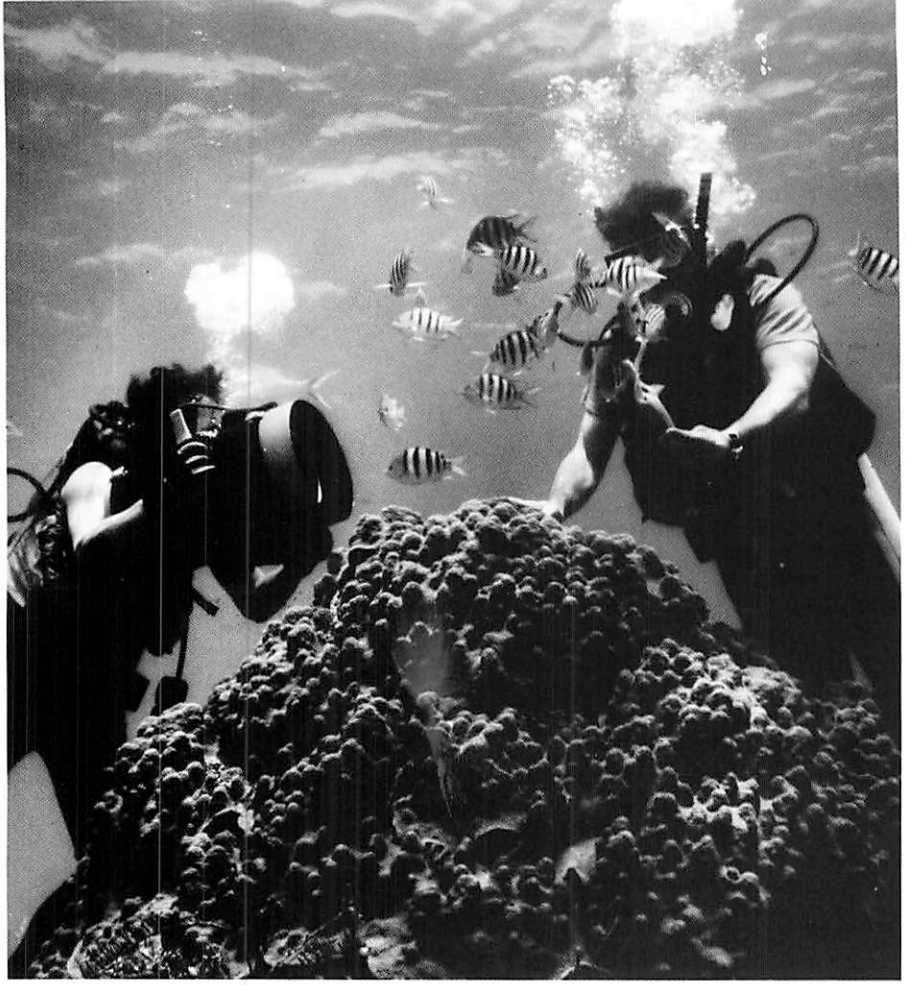
McDougal, W.G. and R.T. Hudspeth. 1986. Influence of lateral mixing on longshore currents. Ocean Engineering 13(5):419-433. ORESU-R-86-024.

McDougal, W.G., M.A. Sturtevant, and P.D. Komar. 1987. Laboratory and field investigations of the impact of shoreline stabilization structures on adjacent properties. Pages 961-973 in "Coastal Sediments '87" WW Div/ ASCE. New Orleans, Louisiana, May 12-14. 1987. ORESU-R-87-006.

Mate, B.R. 1985. Incidents of marine mammal encounters with debris and active fishing gear. Pages 453-457 *in* Workshop on the Fate and Impact of Marine Debris, 26-29 November, 1984. Honolulu, Hawaii. ORESU-R-85-024.

Nath, J.H. 1983. Vertical vs horizontal cylinders in waves. Pages 704-721 *in* Proceedings of the Conference on Pipelines in Adverse Environments—Pipeline Division/ASCE, San Diego, California. November 14-16, 1983. ORESU-R-83-046.

Nelson, J.S., J.S. Rohovec, and J.L. Fryer. 1985. Location of *Vibrio anguillarum* in tissues of infected rainbow trout, *Salmo gairdneri*, using the fluorescent antibody technique. Fish Pathology 20(2/3):229-235. ORESU-R-85-025.



On location in the Cayman Trench, south of Cuba, Jim Larison shoots a portion of the educational film, The Living Ocean, *sponsored by the National Geographic Society.*

Nelson, J.S., J.S. Rohovec, and J.L. Fryer. 1985. Tissue location of vibrio bacterin delivered by intraperitoneal injection, immersion and oral routes to *Salmo gairdneri.* Fish Pathology 19(4): 263-269. ORESU-R-85-011.

Olson, R.E. 1986. *Ichthyophonus* infection in a Pacific staghorn sculpin (*Leptocuttus armatus*) from Oregon. Journal of Wildlife Diseases 22(4): 566-569. ORESU-R-86-023.

Olson, R.E. 1986. Marine fish parasites of public health importance. Pages 339-335 *in* Seafood Quality Determination. D.E. Kramer and J. Liston editors. Proceedings of an International Symposium, Anchorage, Alaska, November 10-14,1986. ORESU-R-86-040.

Patino, R. and C.B. Schreck. 1987. Interrenal secretion of corticosteroids and plasma cortisol and cortisone concentrations after acute stress and during seawater acclimation in juvenile coho salmon, *Oncorhynchus kisutch.* General and Comparative Endocrinology 68:431-439. ORESU-R-87-023.

Patino, R. and C.B. Schreck. 1986. Sexual dimorphism of plasma sex steroid levels in juvenile coho salmon, *Oncorhynchus kisutch,* during smoltification. General and Comparative Endocrinology 61:127-133. ORESU-R-86-001.

Patino, R., C.B. Schreck, J.L. Banks, and W.S. Zaugg. 1986. Effects of rearing conditions on the developmental physiology of smolting coho salmon. ransactions of the American Fisheries Society 115:828-837. ORESU-R-86-034.

Patino, R., C.B. Schreck, and J.M. Redding. 1985. Clearance of plasma corticosteroids during smoltification of coho salmon, *Oncorhynchus kisutch.* Comparative Biochemical Physiology 82A(3):531-535. ORESU-R-85-021.

Peterson, C.D., G.W. Gleeson, and N. Wetzel. 1987. Stratigraphic development, mineral sources and preservation of marine placers from Pleistocene terraces in southern Oregon, U.S.A. Sedimentary Geology 53:203-229. ORESU-R-87-012.

Peterson, C.D., P.D. Komar, and K.F. Scheidegger. 1986. Distribution, geometry, and origin of heavy mineral placer deposits on Oregon beaches. Journal of Sedimentary Petrology 56(1):67-77. ORESU-R-86-003.

Pikitch, E.K. 1986. Impacts of management regulations on the catch and utilization of rockfish in Oregon. Pages 369-382 *in* Proceedings of the International Rockfish Symposium, Anchorage, Alaska, October 20-22, 1986. ORESU-R-86-035.

Pikitch, E.K. 1987. Use of a mixed-species yield-per-recruit model to explore the consequences of various management policies for the Oregon Flatfish fishery. Canadian Journal of Fisheries and Aquatic Sciences 44(Supp.2):349-359. ORESU-R-87-021.

Rehnberg, B.G., L. Curtis, and C.B. Schreck. 1985. Homing of coho salmon, *Oncorhynchus kisutch,* exposed to morpholine. Aquaculture 44:253-255. ORESU-R-85-009.

Rehnberg, B.G., B. Jonasson, and C.B. Schreck. 1985. Olfactory sensitivity during parr and smolt developmental stages of coho salmon. Transactions of the American Fisheries Society 114:732-736. ORESU-R-85-019.

Rehnberg, B.G., and C.B. Schreck. 1986. Acute metal toxicology of olfaction in coho salmon: behavior, receptors, and odor-metal complexation. Bulletin for Environmental Contamination and Toxicology 36:579-586. ORESU-R-86-007.

Rehnberg, B.G., and C.B. Schreck. 1987. Chemosensory detection of predators by coho salmon, *Oncorhynchus kisutch:* behavioral reaction and the physiological stress response. Canadian Journal of Zoology 65:481-485. ORESU-R-87-007.

Rehnberg, B.G., and C.B. Schreck. 1986. The olfactory L-serine receptor in coho salmon: biochemical specificity and behavioral response. Journal of Comparative Physiology A 159:61-67. ORESU-R-86-022.

Rehnberg, B.G., and C.B. Schreck. 1987. Olfactory sensitivity of coho salmon, *Oncorhynchus kisutch* Walbaum: can salinity play a role? Journal of Fish Biology 31:305-307. ORESU-R-87-022.

Rettig, B. 1987. Bioeconomic models: do they really help fishery managers? Transactions of the American Fisheries Society 116:405-411. ORESU-R-87-016.

Rexstad, E.A.,and E.K. Pikitch. 1986. Stomach contents and food consumption of Pacific hake, *Merluccius productus.* Fishery Bulletin 84(4): 947-956. ORESU-R-84-002.

Riçe, D.W., A.A. Wolman, B.R. Mate, and J.R. Harvey. 1986. A mass-stranding of sperm whales in Oregon: sex and age composition of the school. Marine Mammal Science 2(1):64-69. ORESU-R-84-036.

Robinson, A.M., and W.P. Breese. 1984. Spawning cycle of the weathervane scallop *Pecten, (Patinopecten) caurinus,* Gould along the Oregon coast. Journal of Shellfish Research 4(2):165-166. ORESU-R-84-036.

Rose, R.E., and V.T. Neal. 1985. Report of the 1984 marine affairs/marine resource management faculty workshop. Coastal Society Bulletin 8(4): 16-25. ORESU-R-85-015.

Schlenk, D. and W.H. Gerwick. 1987. Dilophic acid, a diterpenoid from the tropical brown seaweed *Dilophus guineensis*. Phytochemistry 26(4):1081-1084. ORESU-R-87-003.

Schreck, C.B., R. Patino, C.K. Pring, J.R. Winton, and J.E. Holway. 1985. Effects of rearing density on indices of smoltification and performance of coho salmon, *Oncorhynchus kisutch*. Aquaculture 45:345-358. ORESU-R-85-012.

Scott, P. H. 1986. A new species of *Adontorhina* (Bivalvia: Thyasiridae) from the northeast Pacific, with notes on *Adontorhina cycla* Berry, 1947. The Veliger 29(2):149-156. ORESU-R-86-028.

Siaway, A., and R.S. Johnston. 1986. The impacts of extended fisheries jurisdiction on seafood trade among selected countries: market share and product substitution. Pages 45-60 *in* International Conference on Fisheries, Rimouski, Canada, August 10-15, 1986. ORESU-R-86-030.

Skillman, G. 1987. Summary of significant court decisions regarding federal-state offshore resource ownership, management and boundary questions. Appendix *in* proceedings: National Conference on the States and an Extended Territorial Sea, Texas A&M University Sea Grant College Program, December 9-11, 1987. ORESU-R-85-030.

Smith, C.L. 1984. Evolution of the Pacific canned salmon fishery. Pages 951-963 *in* The fishing Culture of the World. B. Gunda, and A. Kiado, editors. Budapest, Hungary. ORESU-R-84-035.

Smith, C.L. 1986. The life cycle of fisheries. Fisheries 11(4):20-25. ORESU-R-86-018.

Smith, C.L., and R. McKelvey. 1986. Specialist and generalist: roles for coping with variability. North American Journal of Fisheries Management 6:88-99. ORESU-R-86-011.

Smith, F.J. 1986. Fisheries research in Chile: opportunities for the future. Pages 831-839 in International Conference on Fisheries, Rimouski, Canada, August 10-15, 1986. ORESU-R-86-033.

Sulisz, W., R.T. Hudspeth, and T-I Kim. 1987. Nonlinear estimation of return flow in wave basins. Pages 423-434 *in* 20th Coastal Engineering Conference Proceedings/CER Council ASCE/Taipei, Taiwan, November 9-14, 1986. ORESU-R-87-015.

Tanaka, Y., and R.T. Hudspeth. 1988. Restoring forces on vertical circular cylinders forced by earthquakes. Earthquake Engineering and Structural Dynamics 16:99-119. ORESU-R-88-002.

Temte, J.L. 1985. Photoperiod and delayed implantation in the northern fur seal (*Callorhinus ursinus*). Journal of Reproductive Fertility 73:127-131. ORESU-R-85-008.

Temte, J.L., and S. Spielvogel. 1985. Serum progesterone levels and reproductive status of incidentally killed female Dall porpoises. Journal of Wildlife Management 49(1):51-54. ORESU-R-85-007.

Teng, C.-C., and J. H. Nath. 1985. Forces on horizontal cylinder towed in waves. Journal of Waterway, Port, Coastal and Ocean Engineering 3(6):1022-1040. ORESU-R-85-022.

Tester, P.A., and A.G. Carey, Jr. 1986. Instar identification and life history aspects of juvenile deepwater spider crabs, *Chionoecetes tanneri* Rathbun. Fishery Bulletin 84(4)973-980. ORESU-R-86-027.

Tison, D.L., M. Nishibuchi, R.J. Seidler, and R.J. Siebeling. 1986. Isolation of non-01 *Vibrio cholerae* serovars from Oregon coastal environments. Applied and Environmental Microbiology 51(2):444-445. ORESU-R-86-004.

Tripp, R.A., A.G. Maule, C.B. Schreck, and S.L. Kaattari. 1987. Cortisol mediated suppression of salmonid lymphocyte responses *in vitro*. Developmental and Comparative Immunology 11:565-576. ORESU-R-87-018.

Wandschneider, P.R. 1984. Managing river systems: centralization versus decentralization. Natural Resources Journal 24:1043-1066. ORESU-R-84-034.

Wang, D.Q., and E. Kolbe. 1987. Measurement and prediction of freezing times of vacuum canned Pacific shrimp. International Journal of Refrigeration 10:18-21. ORESU-R-87-001.

Wang, C., and P.D. Komar. 1985. The sieving of heavy mineral sands. Journal of Sedimentary Petrology 55(4):479-482. ORESU-R-85-023.

Washington, B.B. 1986. Systematic relationships and ontogeny of the sculptins *Artedius*, *Clinocottus*, and *Oligocottus* (Cottidae: Scorpaeniformes). Proceedings of the California Academy of Sciences 44(9)157-224. ORESU-R-86-010.

Winton, J.R., C.N. Lannan, J.L. Fryer, R.P. Hedrick, T.R. Meyers, J.A. Plumb, nd T. Yamamoto. 1987. Morphological and biochemical properties of four members of a novel group of reoviruses isolated from aquatic animals. Journal of General Virology 68:353-364. ORESU-R-87-004.

Winton, J.R., C.N. Lannan, D.P. Ransom, and J.L. Fryer. 1985. Isolation of a new virus from chinook salmon, *Oncorhynchus tshawytscha*, in Oregon U.S.A. Fish Pathology 20(2/3):373-380. ORESU-R-85-020.

Thesis and Dissertation Abstracts

Berntsen, S.E. 1987. Development of a restructured seafood product from squid, *Loligo opalescens*. M.S. thesis abstract. Oregon State University. Corvallis: ORESU-X-87-004.

Lu, Y. 1987. Establishment and characterization of three new cell lines from carp, *Ctenopharyngodon idellus*. M.S. thesis abstract. Oregon State University. Corvallis: ORESU-X-87-003.

Pipoppinyo, S. 1987. Biochemical and serological comparison of selected *Vibrio* SPP. isolated from fish. M.S. thesis abstract. Oregon State University. Corvallis: ORESU-X-87-002.

Siaway, A. 1986. The impacts of extended fisheries jurisdiction on seafood trade among selected countries: market share and product substitution. Diss. abstract. Oregon State University. Corvallis: ORESU-X-86-005.

Tsai, Y.T. 1986. Ocean wave-soil-caisson interaction. Diss. abstract. Oregon State University. Corvallis: ORESU-X-86-006.

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