

sea grant college program

1979-81
program report

Sea Grant College Program
AdS 320
Oregon State University
Corvallis, OR 97331

***\$10 Million Annual Savings**

Study Aids Shrimp Industry

A possible savings of over \$10 million a year could be in the offing for Oregon shrimp processors if they all adopt new procedures in shrimp peeling operations developed by a Sea Grant researcher.

The savings would be a result of recent research conducted by Oregon State University food scientist Dave Crawford. The seafood technologist has developed new methods of

handling Pacific shrimp before they are peeled and processed that has already increased yield significantly for some 15 Oregon shrimp plants. Increasing yield in shrimp meat translates into dollars to an industry that has had plenty of financial ups and downs since its beginnings about 23 years ago.

Crawford, director of the Sea Grant supported OSU Seafoods Laboratory in Astoria, has used a mild phosphate salt bath in

conjunction with other handling methods, to increase the amount of resulting shrimp meat.

"When the shrimp are dipped into the phosphate, it penetrates through the shell and interacts with the surface protein," he explains. "What you have is a surface area that is sealed off by the action of the phosphates. It retards loss of soluble proteins during the cooking operations."

The Sea Grant scientist says he regularly tests the taste of the

product using taste panels. The panels try to determine differences between phosphate-treated shrimp and untreated shrimp. There have been no differences found so far.

Phosphates also make the shrimp meat firmer and therefore the shells are easier to remove, the food technologist says. Temperature control also helps, he adds, and processors should

See Increase, page 3.



OMB Wants To See Sea Grant Eliminated

Citing that the Sea Grant College Programs have "largely achieved their original purpose," the Office of Management and Budget (OMB) has proposed cutting the entire \$36 million program.

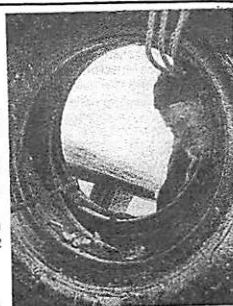
OMB says Sea Grant has already developed "State and local capability for addressing marine and coastal issues," and therefore it's up to state and private sources to continue ocean-related research and development.

Since most states are already strapped for funds themselves — particularly in light of federal cuts in other areas — it is unlikely that Sea Grant would remain intact under state administration. Many states would likely drop the 15-year-old program altogether, Sea Grant officials fear. They say the loss of Sea Grant College Programs (there are about 30 in all) means the loss of important research, development, educational and advisory programs.

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Sea Grant's Future—Is It a Dream?

By William Wick,
OSU Sea Grant Director

We alone, perhaps in all the universe, are dwellers on a water world. Yet, we scarcely pay attention to the oceans which cover 70% of the surface of our planet and contain 97% of the water.

The Apollo astronauts helped us to see our planet for the first time.

"— a bright world of blue water framed by the black of space and partly concealed by lovely patterns of white water vapor clouds. In the Polar regions is the glitter of frozen water. Through breaks in the cloud patterns the continents are visible, shapes of brown and green interrupting the blue of oceans. As the earth turns, it becomes evident that the continents are islands in the global sea. This circling sea is the source of water that makes possible all the life forms of earth." (1)

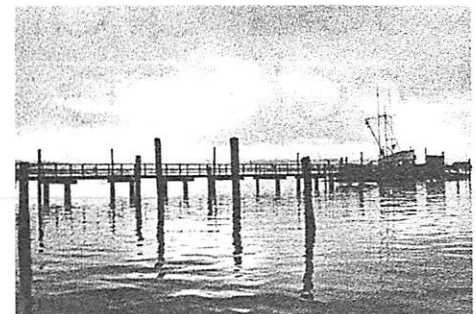
Serious study of the oceans is slightly more than a century old. Sea Grant, the university-based program to 'help put America's oceans to work' has been active for 13 years in Oregon and in the

other coastal and Great Lakes states. Sea Grant, combined with other ocean-related research and development programs, is beginning to point America toward the ocean.

In this biennial report, we are pleased to tell you about Sea Grant research, education and training, and extension (advisory) service programs in Oregon. These programs focus on present and future needs in the Northwest, but also address national goals.

Much of our Sea Grant work addresses the tried and true: developing better use of the historic foods from the sea, increasing the efficiency of coastal ports and the Columbia River waterway, and providing a better understanding of ocean processes for all who wish to learn about the sea. Still, the future may lie in areas of mystery.

- Let me dream with you:
- Energy from the sea — in the form of wind or thermal energy
 - Minerals from the fracture zones — billions of dollars worth
 - Food from species such as pomfret, sauries and grenadiers
 - Satellite tracking of the great whales and open ocean fishes
 - Self-supporting floating cities



"We alone, perhaps in all the universe, are dwellers on a water world. Yet, we scarcely pay attention to the oceans which cover 70% of the surface of our planet and contain 97% of the water." (Jim Bottom photo)

- Climate modification to improve land agriculture
- Sea farming and ocean ranching of more than the current handful of species
- World peace through multinational management of marine resources

As we approach the 21st century, these ideas and many more may find a role in our

national policy. The knowledge and the trained minds to address these opportunities will come from the fledgling ocean programs, like Sea Grant, which are active today.

Please share this dream with us.

1. Goodwin, H. L. and J. G. Schaadt. *The Need for Marine and Aquatic Education*, March, 1978 p. 3.

Hey, What's A Sea Grant?

One of the most frequently asked questions of Sea Grant administrators and researchers is "What is a Sea Grant?" And though there may be many ways in which to answer, the OSU version goes something like this:

Sea Grant Program

Sea Grant's mission, established with the National Sea Grant Program and College Act of 1966, is to generate new knowledge, train students to help understand and develop ocean resources and to put our knowledge of those resources to work for the benefit of all. In Oregon, Sea Grant is particularly concerned with developing an understanding and appreciation



of how to live with the ocean and how to manage the coastal zone. Toward this end, a variety of ongoing projects and programs are operated.

The Oregon State University Sea Grant College Program is supported by the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, by the State of

Oregon and participating local governments, and by private industry. It deals with primarily five areas: marine extension, education and training, research in foods from the sea, coastal environments and public policy analysis.



Advisory

Since the mid-1960's, Sea Grant management and funding support have developed marine advisory services at OSU. The advisory function of Sea Grant is a significant program fulfilling educational needs of Oregonians at the local level and contributing substantially to domestic and international educational programs throughout the Pacific rim.

Education

The need for educating and training personnel to understand and manage marine resources is obvious; the need to develop a society literate in marine matters is of equal importance. The OSU Sea Grant College uses the multidisciplinary skills of a major marine university to meet these

needs. The underlying philosophy is to request Sea Grant support for initiating university programs and courses where important needs are determined.

Food From the Sea

The Food from the Sea research division is large. It aims at programs that develop and provide new information needed to optimize the sustained yield and use of marine products beneficial to man and animals — either commercially or recreationally.



Coastal Environments

This division of research addresses conflicts between man and nature, which develop as coastal resources are exploited in Oregon and around the nation. The Sea Grant College Program maintains a strong scientific and engineering research, education, and advisory effort to improve public understanding and participation in the complex coastal environment.

Public Policy Analysis

The public policy analysis program within Sea Grant's research mission emphasizes the relations between ocean and coastal resources. The existence of the National Sea Grant Program is a recognition that



people in this country — and other countries — are turning more attention to the sea and its shores. People will remain interested in the oceans if the policies shaping its development are evaluated and improved. Sea Grant is taking part in this effort.

This report is intended to give you a better understanding of Sea Grant at OSU and why we say that it's our people's work that is valuable — it's our people, working with other people, that are invaluable.

This report prepared by
Oregon State University Sea
Grant College Program
Communications.
Jim Bottom, Editor
Sarah Ligon, Graphics
Jim Larson, Director



The Oregon State University Sea Grant College Program is funded by the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, by the State of Oregon and by participating local governments and private industry. For further information about Sea Grant, its people and programs, contact the Director, Sea Grant College Program, Administrative Services Building, Oregon State University, Corvallis, OR 97331.

Is There Oil in Oregon's Future?

For a while, at least, it looked to some as if the threat of oil "boom towns" might be looming once again on Oregon's coastal horizon.

The ballyhoo of one wildcat driller, claiming he'd struck oil near Depoe Bay on the central coast last year, generated renewed press interest in the state's potential as an energy producer. But it was not to be — at least not yet, say geologists, many of whom believe coastal oil finds are just a matter of time for Oregon.

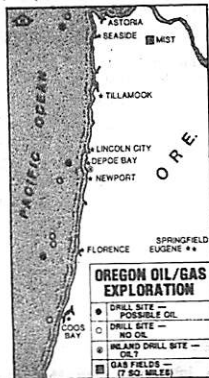
That liquid found oozing from the new coastal derrick was black and it was organic, but one thing it wasn't: crude oil, according to laboratory tests run on drilling samples from Buzz Ehrens' exploratory well. Ehrens originally claimed that he had struck oil 650 feet below the surface east of Whale Cove in Lincoln County. Though his claim was proven wrong (the stuff analyzed was probably coal-like lignite or kerogen, according to a state official), it refueled old questions about Oregon's onshore and offshore oil and gas potential.

State petroleum geologist Dennis Olmstead, skeptical about the Ehrens drill site, is not skeptical about the potential for oil discoveries somewhere on the Oregon coast. Furthermore, he said from what he knows of the geology of the area, the earth's strata "dips to the west" — the same geology continues under the water. That means if Oregon crude oil shows up along shore, it would likely be found offshore, too, according to Olmstead.

In fact, some eight holes drilled offshore in 1964 and 1965 did contain some oil, said Olmstead, though not enough to interest commercial production. But discovery in 1979 (and subsequent daily production of 21 million cubic feet) of natural gas at Mist in Columbia County has already sparked new exploration interest in Oregon, he said.

However, the geologist pointed out that holes drilled since the Mist discovery by such companies as Texaco, Quintana, and America Quasar have produced no oil.

According to an Oregon State University Sea Grant publication "Oregon and Offshore Oil," petroleum companies ranked Oregon and Washington lowest among potential petroleum producing areas and both areas were dropped from a 1977 leasing schedule. Co-author and researcher of the 54-page booklet, Jeffrey Stander, an assistant professor of anthropology, said



leases will not likely be scheduled for Oregon by the Department of Interior's Bureau of Land Management until after this year.

But, from his research, Stander predicted oil exploration will definitely begin off Oregon's coast in the next few years. He agrees with Olmstead that it will take only a small oil find to bring big oil companies to Oregon. He said small deposits are becoming

increasingly attractive because of soaring prices for petroleum products and U.S. dependency on imported crude.

"If Ehrens' find had proved to be crude oil, I'm sure it would have stimulated exploration here," Stander said.

When offshore leases are granted for Oregon's outer continental shelf, there may even be oil companies, waiting in line to drill, agrees Olmstead.

"Personally, I think it would be worthwhile," he said. "There's potential for oil on and offshore of Oregon."

He explained that in the last year or so, drilling activity has already increased a great deal in Columbia County (which now boasts five producing gas wells, but "numerous dry holes") and Clatsop County, both in northern Oregon. He credited the Mist gas discovery for much of the interest here, but said four (dry) holes were also drilled last year in Coos and Douglas counties to the south.

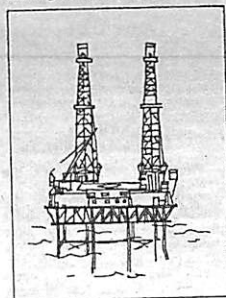
"For the first time, Oregon has natural gas production," said Olmstead. "It points out that there's a good chance of finding hydrocarbons offshore. I think exploration interest will spread down the coast."

If exploratory wells prove successful in future attempts, the Geological Survey states the success should come in the outer continental shelf area shared by both states near the dividing Columbia River. The Survey ranked this area, the Astoria Basin, highest for potential oil and gas finds offshore. The GS report claims the area "may contain suitable reservoir sands."

Sea Grant's Stander said he thinks gas and oil development on Oregon's coast would have a dramatic impact on the state's economy, with a danger of coastal communities becoming "boom," then "bust" towns.

"The flood of oil workers could crowd schools and strain other

community services and utilities," he said. "Such boom time would last no more than 25 years and the economy would then slump." He writes in "Oregon and Offshore Oil" that communities develop in cycles near offshore oil finds. The "development stage" shows fastest growth, with new families moving in to fill new jobs.



"Offshore support firms compete with local businesses for available manpower, driving up wage levels," he writes. "Demand for new housing and business sites can inflate property values, sometimes making it harder for the elderly and others with fixed or low incomes to retain their homes."

When full production of oil is attained, Stander says employment levels off and only a "modest permanent work force remains to handle oil rig servicing." The slowdown, and subsequent decline in expansion as the oil field is played out, brings about the "bust" situation in the cycle.

"No matter what size the oil or gas find, planning for management of offshore development's physical, economic, and

(See Oregon Oil, page 4)

OMB cuts—

Continued from page 1

At OSU loss of about \$2.1 million in federal funds (about 65 percent of the program) would have grave effects on Oregon's program, says OSU Sea Grant Director, Bill Wick.

"Sea Grant at OSU could not continue as we know it now," says Wick.

In defense of maintaining federal funding, Wick points to a number of OSU projects that pay their own way. Furthermore, criticisms by OMB that benefits of such projects only occur and accrue locally are unfounded, says Wick.

He says projects, like the following have a direct effect or implied application to other areas and states:

— Sea Grant-supported forsters have developed construction practices and fungus controls to drastically reduce decay losses to docks and piling

(a \$1 billion annual problem for the U.S.)

Seafood technologists working for the program developed a treatment and handling procedure for shrimp which increases yield significantly and promises to provide millions of dollars added revenue to the industry on the West Coast, more of a better product for consumers and new techniques that can be applied worldwide (See story page 1).

"Sea Grant is often in a 'Catch 22' position," says Wick. "Working locally, we are accused of being provincial. If we address national problems, local support groups sound off. But we can (and do) do both. Citizens in other states (where there are no Sea Grant Programs) reap benefits translated into better seafoods and more efficient weather forecasts — to name two unprovincial benefits."

Wick adds that now is the hour for those to act who want to see such resource-related programs spared the OMB axe. Hope lies, he believes, in a vigorous letter writing campaign to Congress.

Increase—

Continued from page 1

keep shrimp as cold as possible throughout processing.

"Temperature is also very much involved in increasing yield," he says. "If you take a shrimp and you hand peel it, you'll get between 37 and 40 percent net weight yield. Generally, processors figure on only getting about 20 to 22 percent yield."

Already, some Oregon processors have increased their yield by several percentage points using Crawford's methods, he says.

The Sea Grant scientist got involved in his shrimp processing studies three years ago. As a food technologist, he saw a lot of shrimp being wasted — literally "going down the drain," he says. He applied for funding in 1978 from OSU Sea Grant and began looking at ways to correct the problem.

The mild phosphate bath was

his first solution. Later he looked at temperature controls.

Phosphates are not new in food technology and are found naturally in shrimp, says Crawford. They're used widely in the food industry to help retain water in cooking and improve the taste and tenderness of cooked meats. The chemical has no effect on the taste of the shrimp and is used in such small amounts that it poses no human danger, he explains.

Phosphates combined with proper handling have increased yield from 22 percent to 31 percent in the OSU Astoria laboratory.

But Crawford claims the industry could do just as well.

"Now, without temperature controls and use of phosphates, the industry average yield is around 20 to 22 percent," he explains. "With proper procedures and temperature controls there is no reason why all shrimp processors shouldn't be able to acquire a yield of between 27 and 31 percent."

(Related Story, page 15)

OSU Sea Grant, Page 3a

During Low Tide on the Columbia

Estuary Table Set For Super Supper



(Jim Larison photo)

By Kit Bangs
Contributing Writer

When the tide goes out, the table is set.

"It's an old saying, but it's literally true when you talk about the Columbia River estuary," says filmmaker Jim Larison. "Native Americans and early white settlers alike depended upon estuaries for food, just as many species of animals do."

The scenic Columbia River and its multi-faceted estuary will be the subject of a documentary film to be released this summer by Oregon State University's Sea Grant College Program, of which Larison is Communications Director.

The estuary — birthplace and feeding ground for many commercially important ocean-going fish; stop-over for hundreds of thousands of migrating waterfowl; home of the largest fishing fleet in Oregon; transportation portal connecting the American interior with the Orient — is at a turning point, says Larison.

"It's being actively considered as a site for new development," says Larison. "At this time, no one really knows just how these proposed new developments would affect the estuary's ability to produce fish or other wildlife."

As demand for the estuary builds, conflicts between user groups also increase, according to Larison and scriptwriter Ed Chaney. That's why there is such a need for this film.

"While the film doesn't give specific answers to these numerous conflicts, it does make them a bit more understandable to the public," Chaney explains.

Larison calls the term estuary a "fancy name for bay," explaining that worldwide, estuaries have become the sites for large cities.

"In the early days, people settled around these saltwater and freshwater areas because they produced a lot of food," he says. More recently the need for these areas as transportation corridors has grown, he explains, while our use of them as producers of food seems to have diminished.

"It's true we don't depend on them for food like we used to — we don't all go out clamming for our supper," the filmmaker explains. "But the extent to which the entire ocean ecosystem — and hence all of the commercial fisheries — are dependent upon the estuaries and their productivity, is largely unknown."

The Columbia River estuary has not been affected too much by filling and urban growth. But Chaney points out that it is nevertheless being affected. Impoundments for flood control, power, navigation, irrigation, and recreation affects the river's natural flow.

"What happens to the water of the Columbia-Snake system in Idaho, Montana, eastern Oregon and Washington, has a lot to do with the health of the estuary," says Chaney.

Larison says, "All of these things are very important to the economic stability of the Northwest. He notes we are likely to see a significant amount of growth in the need for the river's water."

"The key is to find means of developing those resources in ways that are sensitive to biological needs of the river and the estuary," adds Chaney.

Much of the film shows and discusses the up-river uses of Columbia River water. Portions were shot on the Boise River in Idaho. Another section was shot inside the Martin-Mariette aluminum plant near Goldendale, Washington.

The film is being funded by OSU's Sea Grant Program and the U.S. Fish and Wildlife Service, and will be released to television stations in the Northwest.

This is the second in a series of documentary films being produced by Sea Grant. The first, "Mammals of the Sea" was produced last year, was transmitted by the PBS system and was named one of the best conservation films of the year by the National Wildlife Institute in Washington, D.C. As "Mammals of the Sea," the estuary film will be narrated by Richard Weinman.



A fawn rests in a grassy bed at the Columbia Whittell Deer Refuge in Cathlamet, Wash. on the Columbia River.

(Jim Larison photo)

Oregon Oil—

Continued from page 3

social impacts is essential at all phases of the field's life cycle," the booklet states. "Neither the boom town nor the ghost town are healthy options for a community that seeks long-term stability."

At the same time, however, Stander presents a positive side to boom towns. He points out that oil discoveries could bolster employment and diversify a limited coastal economy. He explains one purpose of his booklet is to give Oregonians information on which they can base decisions about managing the social and economic changes oil production would bring to the state.

"We can't afford not to develop easily accessible oil," he said. "At the same time, it's vitally important that oil production have a minimal impact on the things we value in Oregon."

Editor's note: "Oregon and Offshore Oil" describes the sources of offshore oil and gas, the industry that produces it and the potential impacts oil finds could have on the state. Free copies of the 54-page booklet are available from the Sea Grant College Program, Oregon State University, Corvallis, OR 97331.

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Mammal Film Wins Outdoor Writer's Award

An Oregon State University Sea Grant College Program film entitled "Mammals of the Sea" was named third place winner in the 1981 North American Outdoor Film Academy competition judged in March.

The film was among three selected for screening at the North American Wildlife Conference, meeting in Washington, D.C. this week.

"Mammals of the Sea," directed and photographed by Sea Grant filmmaker and Communications Director, Jim

Larison, was selected from 100 entries by the Academy — an arm of the Outdoor Writers Association of America, Inc.

Competition was open to any individual, private industry, public agency or organization that has produced a 16mm motion picture during 1980 that deals with conservation, outdoor recreation, ecology and related subjects. The competition was designed to stimulate exposure for such films and encourage excellence.



Filmmaker Jim Larison films elephant seals in Mexico for "Mammals of the Sea."

The half-hour Sea Grant documentary deals with whales, seals and sea lions and the brewing controversy between protectionists and fishermen over controlling marine mammals that compete with humans for seafoods. According to Larison, marine mammals are caught in the middle of the protectionists-fishermen fight on the West Coast, because the animals consume millions of pounds of fish annually.

"Many fishermen told our film crew that they'd like seals and sea lions strictly controlled, so that humans could harvest more from the sea," says Larison. "On the other hand, some environmentalists say we should not interfere with the ocean's natural checks and balances. Our film crew tried to depict the arguments fairly."

The film has been seen on a number of commercial television stations in the Northwest and on the public television network. Copies of the film are also available to the public from the Film Library, P.O. Box 1383, Portland, Or. 97207. The rental fee is \$5.

For further information, contact OSU Sea Grant, Corvallis, 754-2716.

Computer Plan Could Save Ports Millions, OSU Experts Say

By Kit Bangs
Contributing Writer

Coastal ports that deal in containerized shipping could save millions of dollars in loading time by the use of computers, say two Oregon State University engineers working for Sea Grant.

By computerizing the loading plan they have developed, researchers Edward McDowell and Tom West say the Port of Portland and other ports could save at least four percent of their handling costs at container terminals. That would save conservatively \$90,000 per berth per year. The figure could be greater they say, but they want to wait until more information is analyzed before revising it.

When a container is on the loading dock it must be moved by trucks and transainers, huge mechanical grabbers on wheels that stack the containers up to four high. Handling these takes time, which costs shippers, carriers and port a lot of money.

A loading plan for one ship carrying 1,000 containers takes up to five hours or longer to complete, McDowell said. He says it can be a big sequencing problem.

The Sea Grant researchers have estimated that the cost to

the West Coast for handling shipped goods runs about \$100 million a year. On top of that it costs about \$1,000 an hour for a ship to sit in port. With that kind of money at stake, it's easy to see why the Port of Portland wanted Sea Grant to conduct the time-labor study.

McDowell and West began working on the problem in June, 1979 at Terminal 6 and are completing the Sea Grant phase of the project this spring.

Currently, the computerized system is merely an inventory system. Four load-planners chart loading and storing arrangements for each ship. They use the assistance of a computer to check their plan, but not to formulate it. The computer basically keeps track of what containers are on the lot and where.

"The new system can not only locate the containers, but can choreograph the load plan," says McDowell. "The whole sequence is planned out, where the transainer goes, in what order, where the crane moves — everything."

The loading (or unloading) plan is then implemented by crews using the transainers, trucks and cranes. Each step along the way may be shortened by employing a computerized plan, McDowell said.



Sea Grant engineers Ed McDowell (foreground) and Tom West have been studying the way things are loaded and unloaded at the Port of Portland docks.

Consortium Plans Hunger Fight

Oregon State University's Harvey Moore says when the Consortium for International Fisheries and Aquaculture Development agreement was signed by five universities, there was a "strong commitment from participants to help people suffering from hunger and starvation."

Few have heard of the loosely linked organization. Fewer can even pronounce the name. But the consortium, CIFAD for short, still in its infancy, already has plans to reduce world hunger, says Moore.

CIFAD was set up in 1978 to help meet the requirements of the International Development and Food Assistance Act passed by Congress in 1975. OSU is the leader of the consortium, consisting of OSU, Michigan State University, University of Michigan, University of Arkansas (at Pine Bluff) and University of Hawaii. Moore is paid by Sea Grant to be CIFAD's Coordinator. He is also its founding father with plans for a big future.

"In essence we're competing with international consulting firms," he said. "But they're doing it for money and we're doing it to help people who are starving," Moore says. "The payoff is that at the same time, we're expanding the knowledge of our teaching staff."

The teaching staff, 175 in all, is well-known for the most part by those in the fisheries business. They come from some of the best-known fisheries schools in the world.

CIFAD is involved with three projects so far. It participates with the University of California (at Davis) and Auburn University in the Collaborative Research Support Program (CRSP) for aquaculture systems, an applied aquaculture research program to help protein-poor countries farm and market fish.

A second project taking shape will supplement Peace Corps work in aquaculture for Zaire.

A third project deals with commercial trout production in the higher elevations of Peru through a contract with an international engineering consulting firm, says Moore.

A fourth project with the Republic of the Philippines is in the negotiation stages, says Moore. CIFAD is being considered for a \$70 million fisheries education and training project there, he says.

With project possibilities such as this, Moore says he expects to see the program expand rapidly, with benefits accruing for all involved.

OSU Sea Grant, Page 5a

Unknown Before in Oregon

Bridge-Eating Gribbles Found

By Dan Himsworth
Science Writer

Dock Owners: Beware the gribbles.

Unexpected high populations of the tiny wood-eating tropic marine pest that has invaded Oregon and Washington waters have been found by Oregon State University scientists working on the OSU campus and on the Oregon coast.

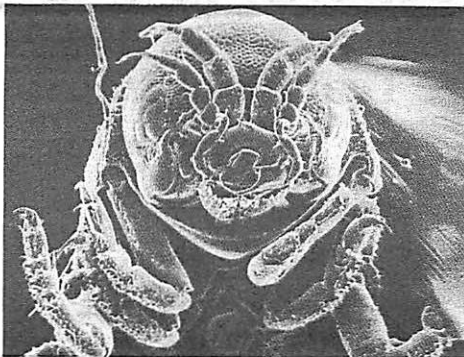
The pest, a crustacean identified as *Limnoria tripunctata*, originally damaged untreated piling in a highway bridge in Coos Bay, Or. and a privately owned dock nearby, reported Jeff Gonor, Sea Grant oceanographer at OSU.

He and his colleague, Robert Graham, a Sea Grant forest products professor, confirmed the first attack of tripunctata in Oregon waters.

They reported the first sighting of the tiny crab-like animal in upper Coos and Yaquina bays in January 1979. But since then, the marine pest has been found in Tillamook Bay and Dyes Inlet, Puget Sound. These new sightings and earlier reports indicate that this major economic pest is widespread and abundant from Los Angeles to British Columbia.

Prior to Gonor's sighting, scientists thought gribbles only survived in warmer waters. There they even eat creosoted wood, and more expensive preservative treatments must be used for protection, Gonor said.

The scientists strongly em-



This gruesome creature, scientifically known as a tripunctata, is a newly identified member of the gribble family that has attacked creosoted timbers and pilings of bayfront bridges and structures. This photograph, taken with a scanning electron microscope, magnifies the bug 100 times.

phasize that gribbles have done little or no damage to creosoted piles in Coos Bay.

Comparative work on populations of the pest from Los Angeles (where they attack creosoted wood) and populations from Oregon (where they do not), indicates no major biological or physiological differences. This suggests that attack on creosote-treated wood may be environmentally related, opening up a new approach to control of this organism.

Wood that had been improperly installed is susceptible to damage, the scientist claims.

"The pest only destroyed heartwood in timbers and piles that had cuts or holes," Graham said.

The damaged piles in the Coos Bay bridge and dock had been in service for about 40 years, Graham added.

The forest products professor recommends not using wood cross bracing if it must be submerged in saltwater. In wood pilings, care should be taken to avoid cuts and holes that will be submerged. Therefore, piles should not be lifted with sharp tongs that puncture the wood, says Graham.

Former White Fish Instructor

Lodge Teaching W. Coast Fishermen 'Volume Fishing'

ASTORIA — Anyone who thinks successful commercial fishing is simply a matter of luck, should take a lesson from the Japanese or Europeans, says Oregon State University Sea Grant professor Dennis Lodge.

Better yet, take a one-week fishery technology course from Lodge himself at Clatsop Community College in Astoria. Lodge, former senior instructor for England's White Fish Authority, has been teaching West Coast fishermen the latest electronic techniques in bottom fishing for seven months. The 30-year-old Authority is a governmental agency studying ways to improve fishing efficiency, then educating fishermen about its findings.

Lodge spent 17 years with the agency.

Lodge's specialty is trawl fishing, and his courses deal with such topics as basic theory of echo location, sonar, net sounder, and midwater trawl principles, to name a few.

It's the first coursework in advanced trawler techniques ever offered on the West Coast. Such techniques, used by European and Japanese fishermen, have produced tremendous catches.

"It's probably the only chance there is for West Coast fishermen to learn about the new 'volume fishing,'" explains OSU Sea Grant Director, Bill Wick.

Wick was instrumental, along with Clatsop's Dave Phillips, in getting Lodge to move to the U.S.

He says the coursework is a natural for the Astoria two-year school, since the college has been running a commercial fisheries course for about 10 years. But, what he is teaching doesn't relate just to local fishermen. The techniques apply worldwide to sophisticated gear that only a few U.S. fishermen have a full understanding of.

"The systems are advancing so fast that a fisherman, without attending any formal course in how to use the gear, can easily misuse it, not use it correctly or at least not get the full potential out of it," explains Lodge.

Most fishermen who have gone through the three to five-day seminar since it began in November would agree with Lodge on this point.

Others like the course for saving them money in purchasing new equipment.

"What you learn here might be worth thousands of dollars," says Port Orford fisherman Bob Eder.

It's too early to tell if Lodge's instruction has improved catches for West Coast fishermen. Some have come from as far away as Alaska to study under the 44-year-old fishing expert. In similar courses taught by Lodge in his native England, however, he says fishermen could usually

demonstrate a 25 percent improvement in fish catches following the instruction.

He explains the increased catches result partly from simply teaching fishermen to use the right equipment.

"Fish tend to live in a certain habitat," Lodge explains. "The equipment must be matched to the species we're fishing."

He says the full package of equipment needed "for any technologically based fishing system" usually consists of three pieces that can range greatly in cost: sonar, echo sounder and net sounder. These are what students, averaging 10 per class, are learning about in hands-on training at the college.

"There are literally tens of thousands of fishermen in the U.S. crying out for this new technology," he says. "And there's no way we can cater to all of them, unless it's through publicity in books, television, radio, magazines and newspapers."



OSU Sea Grant's Dennis Lodge

Fabrics Tested For Protecting Ocean Property

By Dan Himsworth
Science Writer

Thin, synthetic fabrics can tame the erosive power of ocean waves.

So say two Oregon State University Sea Grant coastal engineers searching for less expensive ways to protect valuable beachfront property from wave erosion, as well as erodible soil in the core of jetties and other costly structures built at sea.

William McDougal, a graduate student in coastal engineering, and Charles Solitt, his major professor, said the fabrics are relatively impermeable to water. When draped over soil, they keep waves from washing fragile soil particles out to sea.

Large rock, called armor rock, is placed on top of the fabric to break up the impact of oncoming waves.

McDougal said that the fabrics, and rock, can be used to build sea walls, jetties and breakwaters.

"Up to now we didn't know enough about how the fabrics behave under intense wave conditions," he adds. "So engineers often resort to more costly techniques of protecting soil."

To determine the needed information, the two engineers inserted various fabrics into a marine soil that they placed on the bottom of the OSU Wave Tank at the Corvallis campus.

By generating experimental waves in the tank, McDougal and Solitt determined how much of a beating each fabric could take before failing to provide protection.

These results were used to verify a computer model they developed to help coastal engineers choose an appropriate fabric for wave conditions at a site.

McDougal said the Sea Grant research will be helpful to pipeline engineers.

McDougal's participation in this Sea Grant research, as well as in other OSU coastal engineering projects, was honored by the American Oceanic Organization last month in Washington, D.C. The organization, a group of congressmen and industry representatives concerned about the wise use of the oceans, presented him its national scholarship, awarded to an outstanding student on an annual basis.



Research at Oregon State University shows that thin layers of synthetic fabric can prevent destructive soil erosion along

beaches. OSU graduate student William McDougal holds fabric used in tests at the University's wave tank facility.

Aquaculture Team Visits Zaire

By Martha Ellassen
Contributing Writer

"Ou sont les étangs à poissons?"

That's French for "Where are the fish ponds?" and that's one of the most important questions Oregon State University researcher Becky Lent asked during her three-week visit to Zaire.

Lent, an OSU doctoral candidate in resource economics, is part of a research team which conducted a feasibility study in Zaire this spring for establishing an aquaculture training program. Since the African country is a Francophone — a French-speaking country — Lent's work was conducted "en français."

The team is sponsored by the OSU-based Consortium for International Fisheries and Aquaculture Development, through the U.S. Agency for International Development. The league of universities includes OSU, the University of Arkansas at Pine Bluff, Michigan State University, the University of Michigan and the University of Hawaii.

"We looked at some of the aquaculture farms and spoke with the persons who are involved... the Peace Corps people as well as the farmers themselves," Lent explained. She said they tried to undo some of the aquaculture problems that stem from the days Zaire was a Belgian colony.

Although the Belgian colonists encouraged fish farming, their incentives took the form of threats or fines for villages that didn't have fish ponds.

"That was kind of a negative way to get things going," the graduate student said.

Fran Lowell, a fisheries biologist from the University of Arkansas at Pine Bluff, visited fish farms with Lent in neighboring Rwanda and Burundi, as well as Zaire, to review aquaculture programs. Lowell herself spent two years in French-speaking Cameroon near Zaire as a Peace Corps aquaculturist.

The project's purpose is to set up a program to train people from Zaire's Department of Rural Development to improve and maintain their own aquaculture systems. Trained personnel would carry out extension duties, encouraging and training people to raise fish in hopes of establishing a fish farming industry. Representatives from Rwanda, Burundi and possibly Congo will also participate in training.

Representatives from the U.S. AID Mission in Kinshasa, Zaire first approached Harvey Moore, OSU Sea Grant's CIFAD coordinator, about the project. They asked about existing aquaculture programs that use the French language. After some international search without success, Moore suggested

forming a French speaking training team from CIFAD.

"I was surprised to find that there are a lot of French-speaking, aquaculture-trained people in CIFAD — mostly former French speaking Peace Corps volunteers," Moore said. "We're particularly lucky to find someone like Lent, who also has an economics background. It's a very important part of aquaculture."

The program could mean the beginning of more extensive fish farming programs for Africa, Lent believes. She said the idea is to teach the people of Zaire to develop and manage their own resources.

Squid for Supper? You Bet!



ASTORIA — Pity the unsung squid.

Painfully shy, the most notorious this Pacific cephalopod has been able to garner in Oregon is what people remember from its brief, iniquitous role in the Jules Verne fiction epic "20,000 Leagues Under the Sea." Few Oregonians consider squid — a relative to the delectable clam — fit for the dinner table.

At the Oregon State University Sea Grant — sponsored Seafoods Laboratory here, seafood technologists claim the strange looking mollusk is vastly under-

rated as an entree. Besides being nourishing and a low-calorie protein source, Sea Grant researchers Duncan Law and Dave Crawford say squid are

economical and more savory than razor clams.

"Squid is very bland, but absorbs flavors very nicely," says Law, who along with lab director Crawford has helped develop a number of Oregon fish products like shrimp, a rockfish-shrimp patty that can be found in some restaurants. Law says he likes to saute squid, Chinese style and says orientals have been using squid in many different ways for a long time.

He adds that if "you are ad-

venturesome" deep frying the tentacles — all ten of them — can be delicious.

Most squid found occasionally in local supermarkets, however, come from Oregon's southern neighbor, Law notes. Like California, Oregon may have an ample supply of the species found in local waters, but no one "squids" here because fishermen have few, if any, Oregon buyers to sell to, he says.

Sea Grant fisheries expert and OSU oceanographer Bill Percy says no study has been done to determine how much squid is available in Oregon waters, but he found large numbers off the southern Oregon coast near Coos Bay during scientific purse seining studies.

"There are no estimates that I know of for the potential of squid, but we have the same species as

California and there are those who think there are enough to support a local squid fishery in Oregon," he says.

Even with enough numbers to support a fishery, Crawford says it's unlikely at present that one will develop because so far there is little market for the delicacy.

So Oregon State's Sea Grant Extension Marine Advisory Program is preparing a new consumer publication called "Squid for Supper" (SG62) which describes the delicacy and suggests ways to clean, prepare and serve the product. Single copies are available free by mail from the Bulletin Mailing Service, Industrial Building, OSU, Corvallis, Ore. 97331.



Professor Edwin Slack

of their seafood diet, OSU Extension Service Marine Advisory Program has a new publication containing 11 recipes for preparing mussels, as well as information on gathering and cleaning them. Single copies of "Oregon's Tasty Mussels," (publication SG 60) are free by mail from the Bulletin Mailing Service, Industrial Building, OSU, Corvallis, Ore. 97331.

Mussels Tasty Protein Source

In New Zealand they're fried, stewed, chowdered and pickled.

But in Oregon, mussels, those bluish bivalve mollusks that cover rocks and pilings along the surf swept coast, are more likely to be found on the end of a fisherman's hook as bait than on his table as dinner.

"It's purely a case of market development," says visiting Oregon State University Sea Grant professor Edwin Slack of Wellington's Victoria University. "Given proper marketing, you could get every kid in America asking his mom to serve mussels."

Slack, a protein and mussel expert who earned his doctorate at Cambridge's School of

Biochemistry, says New Zealanders eat about as many mussels as they do oysters. Furthermore, he says the market exists there because the indigenous green mussel has been found to have a therapeutic effect for some forms of arthritis. He says New Zealand has at least 20 full time mussel farmers.

Slack spent six weeks at the Marine Science Center in Newport. He was asked by OSU Sea Grant to talk to students and industry representatives on mussel farming and to conduct experiments that might aid development of mussel aquaculture in Oregon.

He says mussels are an excellent source of protein Oregon

could offer, particularly in light of increasing world hunger.

His mussel farming "tools" consist mainly of a variety of synthetic fiber ropes he has designed and tested for collecting mussel larvae. The larvae, or "spat", will attach themselves to any permanent, rough surface, if it is accessible at spawning time.

Slack, a native Englishman, used his time here to test ways of starting mussel culture in the laboratory. "If we prove we can do it in the laboratory, then we can get on to rearing mussels in a hatchery, just like oysters," he said.

For those many Oregonians who have not made mussels part

Food From The Sea

Fresh Oregon scallops.

Now that stirs the appetite of almost any seafood lover. But until now, fresh scallops from Oregon meant fresh from the supermarket or restaurant freezer. Most scallops have (and still do) come from the east coast. But a sudden discovery of those delicious shellfish delicacies off Oregon, means Oregonians can expect to see at least some of this product available locally, though Sea Grant researchers caution the resource may only be temporary.

"The bulk of the scallops they seem to be catching are of mostly a single year class," says Extension Seafood Technologist Ken Hilderbrand. "It means that when this harvest is gone, that could be the end of it."

Scallops are an ideal main dish



for extra special occasions says Carolyn Raab, Extension Foods and Nutrition Specialist. They are high in protein, low in calories, and delicate in flavor.

Although scallops are usually more expensive per pound than most red meats, there is no waste Raab notes. One pound of scallops will serve three to four people she points out.

Scallops may be broiled, sautéed, or poached, but she discourages deep-fat frying which masks the mild flavor of the shellfish.

Scallops in Wine

2 lbs. fresh or thawed room caps, frozen finely sliced
2 cups dry white wine
2 tbs. parsley, minced
1/4 cup butter
2 tbs. flour
1 onion, finely chopped

Wash scallops. Simmer in wine about 5 minutes until tender. Drain, saving the liquid. Melt butter and saute onion, mushrooms, and parsley. Stir in flour. Add the leftover liquid and cook over low heat, stirring. Add scallops to the hot, but not boiling, sauce. Makes 6 to 8 servings. Serve in bowls.



Scallops make excellent kebabs, as well, says Carolyn Raab, OSU Extension Foods and Nutrition Specialist.

Fried mussels

5 doz. mussel meats
4 eggs, beaten
3 to 4 cups soft bread crumbs
Vegetable oil for deep frying
Parsley
2 lemons, quartered
Cocktail sauce
Tartar sauce

Sort and scrub mussels. Trim byssus. Blanch mussels in 6-qt. kettle to open shells. Remove mussel meat with a sharp knife. Dip mussels in beaten egg and then in bread crumbs. Shake off excess crumbs. Fry in deep fat at 375 degrees until golden brown. Drain on absorbent paper and serve on a hot serving platter. Garnish with parsley and lemon quarters. Serve cocktail sauce and tartar sauce on the side.

Pan Fried Squid

2 lb squid
1 egg, beaten
1/2 cup milk
salt and pepper to taste
1 cup flour, bread crumbs, or corn meal
1/2 cup oil

Clean the squid. Combine the egg, milk, and salt and pepper to taste. Dip the squid in the egg mixture and roll in flour. Heat oil until very hot. Add squid and cook quickly 2 minutes on each side. Serve hot or cold. Makes 6 servings.

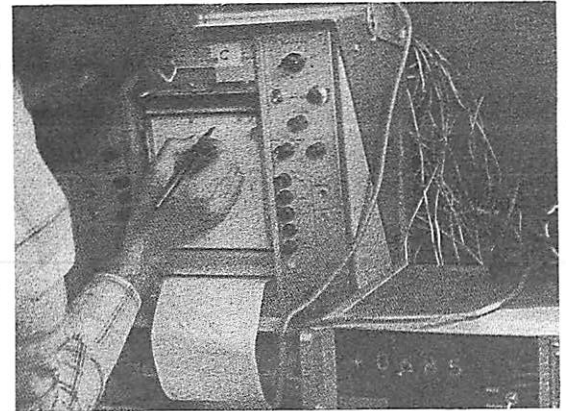
Squid with Tomatoes

2 lb squid
4 tbs. olive oil
2 cloves garlic
salt and pepper to taste
pinch of oregano
1/2 cup dry sherry
1 cup solid pack tomatoes
1 tsp parsley, chopped

Clean squid and cut into small pieces. Heat oil in a saucepan. Add garlic and brown for about 3 minutes. Add squid. Cover and saute for 10 minutes longer over low heat. Add tomatoes and parsley. Cover and cook 15 minutes or until tender. Serve on spaghetti or noodles. Makes 4 to 6 servings.



A shrimp made his home in an old tire.



Engineer Sollitt notes forces needed to raise experimental reef.

Life Out of the Blue

Scientists Raise Reef



WINCHESTER BAY — They raised the reef here this spring.

And now, there seems to be little doubt that a man-made reef of old tires about two miles west of this fishing community and 160 feet deep can work to bring new fish to the area. Two Oregon State University Sea Grant scientists think so at least, after spending two years and \$78,000 studying the appropriate engineering and biology for such a project.

Researchers Dan Hancock and Charles Sollitt have completed field testing of tire modules placed about two miles offshore last fall. As a result, the two say a new sports fishery could be developed by locating a half million tires in about 160 feet of water. The tires would attract bottom fish now not caught here.

With the research and initial field testing done, the Port of Umpqua and the appropriate state agencies can make the final decisions on constructing the reef.

"I see no stumbling block in pursuing the reef, either in science or engineering," Sollitt said following examination of about six tire modules a few days ago.

Keeping the tires in place with proper ballast was the major engineering obstacle facing the scientists. Oregon coastal winters can be extremely severe, with waves that could easily transport a half million tires onto the beach.

A second concern was whether wave and tidal currents and those from the Umpqua River would cause the tires to be buried with sand. But the modules were lifted aboard a 40-foot vessel for close examination with little resistance.

More importantly perhaps, the problem of whether microscopic life would begin to settle on the rubber reef, so that bottom fish — like ling cod, black rockfish

and China rockfish — would appear, seems to be no problem at all now. Tires hauled out had a variety of critters in and on them, indicating that the test reef was sunk at the proper depth along the smooth, sandy bottom that typifies the nearshore central coast.

The two found starfish, crabs, shrimp, sea anemone, and a variety of worms and barnacles.

"I'm surprised at the amount of nonplant life found on the modules," said Hancock. The ocean biologist said he suspected the lack of light might have held plant growth to a minimum, thereby reducing the number of animals coming to settle on the tires. He said he was pleased that this was not the case, and from the research he predicted about 18 different fish species would inhabit the reef, if built.

Hancock and Sollitt began their work when the port wanted to verify that a reef could be built and attract fish. Officials wanted to expand the sport fishing industry, which depends on the fluctuating salmon fishery. The port started by obtaining a \$44,000 grant by Douglas County, which came from moorage receipts, said Hancock. OSU Sea Grant supplied the rest.

Although man-made reefs are not new, with others found on the East Coast and in countries like Japan, Cuba and Taiwan, the Winchester Bay proposal is unlike any of those. If constructed, Hancock and Sollitt say it would be the only artificial reef constructed in unprotected waters. Here, it would have to withstand the tremendous stresses of winter storms that sometimes whip waves to heights above 30 feet.

The researchers say it is also the first proposed reef in the United States that would have engineering data available before



...And Predict New Fishery

Story and Photographs
by
Jim Bottom

construction — data regarding forces on tires of various sizes and modules of various shapes, for example.

"Our research provided information for designing the Winchester Bay reef, but it can also be applied more broadly," Hancock pointed out. "That's the real significance of this research project — we've got hard engineering data to back up a reasonable design."

Moreover, Hancock believes the Sea Grant/port project can set an ecological and environmental example for others to follow.

"It's solving several problems at once for society," he stated. "It's a good way to discard waste materials (tires), and the waste materials provide a nontoxic substrate for animals to attach to. By augmenting the food chain, we're increasing the local fish biomass — that is, increasing the number of fish without drawing them from other areas."

"That benefits not only sport fishermen, but commercial fishermen, too."



Netarts

Oregon State University salmon expert Jim Lannan claims he could have walked across Whiskey Creek on the backs of chum salmon last fall without getting his toes wet.

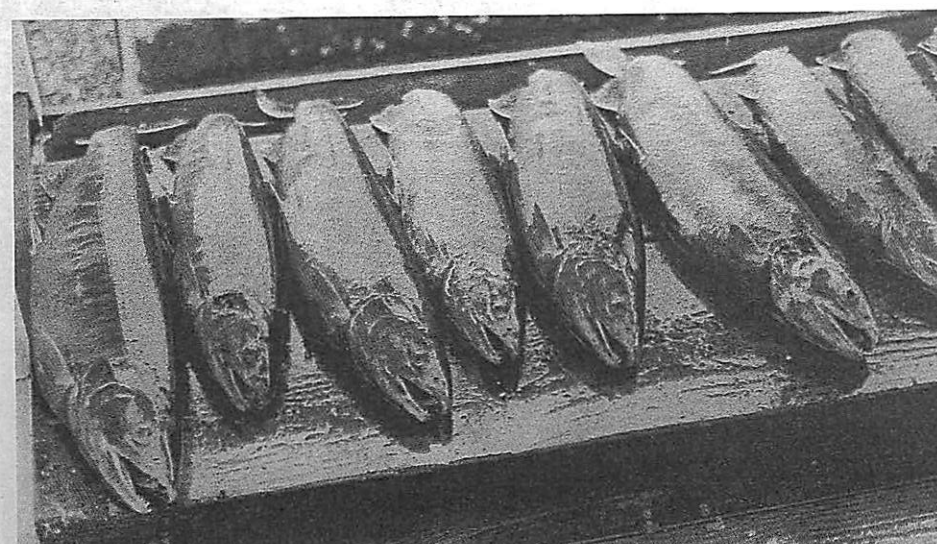
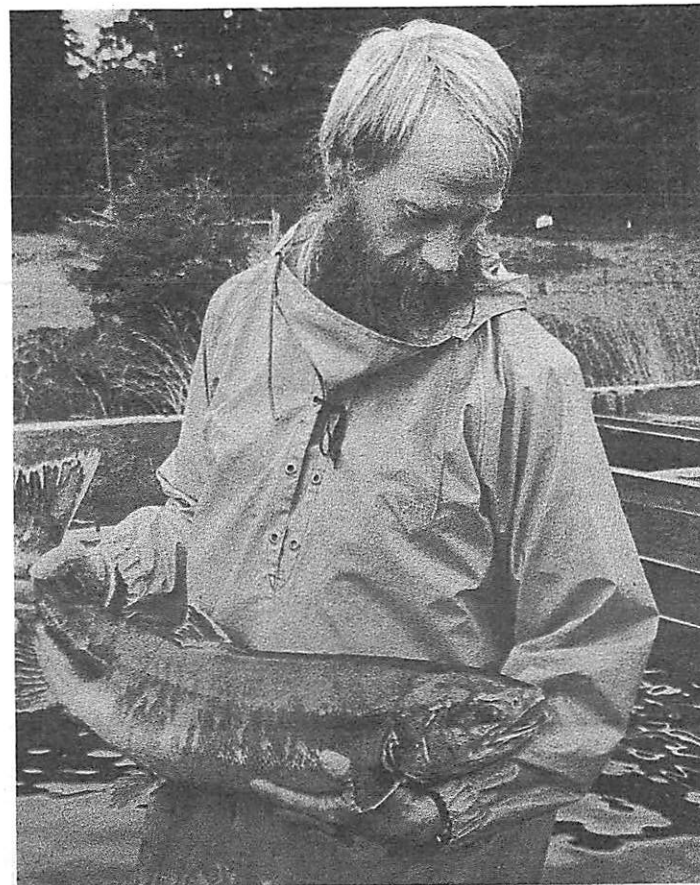
The claim, maybe somewhat exaggerated, describes the scene when hundreds of chum salmon jammed the shallow riffles of the tiny creek that serves as the OSU Sea Grant experimental fish hatchery.

In about two weeks, some 7,000 adult chum returned to spawn. It was the first time in years that Oregon has seen a large enough run of this salmon species to produce excess eggs for use in rebuilding a nearly depleted fishery. In all, some five million eggs were taken from returning females. That's a 10-fold improvement since the project began more than 10 years ago, says salmon expert Jim Lannan, project director.

In addition, it shows that the low cost technology used at the experimental hatchery to rear chum salmon really works. Not only does it work, but Lannan claims that these fish were produced at a cost of only about 10 cents per pound.

Chum salmon once enjoyed an active place in Oregon's fishing industry, at least until the 1950's, says the Sea Grant researcher. Pressures from urbanization and industrialization combined with overfishing in past years to almost decimate the chum population in Oregon by the end of that decade. Only 5,000

Oregon State University research assistant Phil Lamberson holds one of many salmon that returned to spawn this fall at the OSU experimental chum hatchery in Netarts Bay near Tillamook.



Finds Record Chum Run

pounds of the fish were landed in 1970 — about 500 fish.

"Historically, we had an important chum salmon fishery in Oregon," explains Lannan. "Our project is an investment to restore the resource."

Restoring the fish to Oregon is meaningful when you consider that chum salmon comprises the world's largest aquaculture-supported fishery. The Japanese release 1.5 billion salmon annually and the Russians release one billion. Most are chum.

The Whiskey Creek hatchery at Netarts Bay near Tillamook is operated cooperatively between OSU Sea Grant, OSU's Agricultural Experiment Station and the Oregon Department of Fish and Wildlife (ODFW). Lannan calls the hatchery a "low technology" project because he says it is "basically a hands-off system." Expensive pumps and other costly facilities aren't required.

"We've gotten one of the highest rates of return on this side of the Pacific this year," he says. Many said a two percent return wasn't possible. But it is possible, using fairly low technology."

He says the unusually large return of chum this season can be credited largely to a 30-day feeding period introduced to the

run prior to release three and four years ago. Feeding the young fish brings more of them back to the release site, he explains. They grow rapidly, then bypass feeding in the estuary, where Lannan believes smolts normally suffer their greatest mortality. Chances for survival of the fry are greatly increased when they skip their usual growing period within the estuary, he thinks.

But the concept is not new, he says. The Japanese have used the technique for years.

"Our production strategy was to hold the fish back, feed them, then release them at a large enough size so that they'd leave the estuary where they're subject to excessive predation," he explains.

About two million of the total eggs taken from the fall chum run are being used to continue the propagation of the Whiskey Creek stock, according to Lannan. The surplus will be used by ODFW for establishing new stocks.

The future of chum salmon in Oregon is unsure. But Lannan says if the Netarts project continues successfully, it could mean the state might reintroduce "a potentially very valuable food resource now not produced in Oregon."

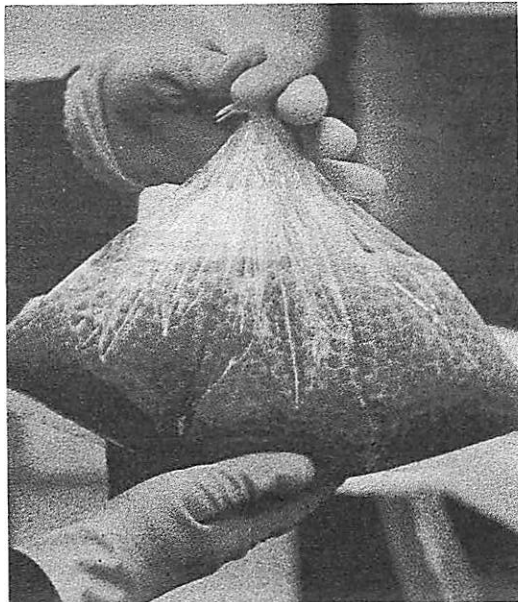
"Using what we've learned at Netarts, Oregon can participate in a greater share of the large world market for chum salmon," he says.



A hatchery technician removes eggs from female chum salmon. Extra eggs not needed at Whiskey Creek, were turned over to the Oregon Department of Fish and Wildlife.

Photographs by
Jim Bottom
and Jim Larison

(Related Story, page 15)



Chum salmon eggs are handled with rubber gloves and held in plastic bags for shipping. Incubation for the eggs, to be used at the

Oregon State University Sea Grant hatchery near Tillamook, is done at the OSU Marine Science Laboratory in Newport.



OSU Sea Grant experimental chum salmon hatchery technician Ken Prevett gathers chum at the Whiskey Creek weir for sorting males and females. Some 7,000

chum salmon averaging 10 pounds returned last fall—the largest ever seen since the hatchery project began 11 years ago.

Program

Food From the Sea



Aquaculture

Interrelationships of Dietary Lipid and Protein on the Growth, Quality and Production of Cold Water Cultured Fish (RIAQ-30)

R. O. Sinnhuber and T. C. Yu

Knowledge gained from this project benefits both fish culturists and fish food manufacturers by lowering production costs and improving quality of the Oregon moist pellet (OMP). OMP is a standard hatchery diet for trout and salmon in Oregon and elsewhere. About 20-million pounds were produced in 1976. Based on results of the study, costs per pound can be reduced by one cent with little or no loss of diet performance.

Biological Feasibility of Clam Hatcheries for Recreational Harvest in the Pacific Northwest (RIAQ-32)

W. P. Breese

Methods of hatchery production of five species of clam larvae were developed through adaptation of oyster larvae hatching technology. The five species, cockles, gaspers, little neck, butter and razor clams, are the important recreational clams of Oregon and the Northwest. These techniques will be of value to recreational and commercial clam diggers by facilitating commercial clam hatcheries and subsequent planting of larval clams on public and private beds.

Commercialization of Recent Advances in Oyster Technology (RIAQ-33)

W. P. Breese and J. E. Lannan

Results from this project will encourage commercial oyster growers and hatcheries to adopt new oyster culture techniques. Of major impact, the eyed larvae technique for seed production is being adopted by many oystermen in the Northwest. Seed production techniques for Kumamoto and other specialized varieties of oyster have been facilitated.

Relationships Between Institutional Arrangements and Aquacultural Development (RIAQ-34)

R. S. Johnston, R. B. Rettig, and F. J. Smith

Technological improvements in the aquaculture of salmon, trout, oysters and other species can be impeded by government regulations. The relationship between production and regulation was the basis of this research. Results will aid public policy decision-makers to correlate biological, economic and social objectives in aquaculture. Several reports are available.

Ocean Productivity & Fisheries Program

Pleuronectid Production System and Its Fishery (R/OPF-1)

W. G. Pearcy, A. G. Carey, A. V. Tyler, S. L. Richardson, C. E. Warren, and R. L. Demery

Many species of flatfish, soles and flounders, are caught by fishermen in the Northeastern Pacific. This major study addressed management problems in multi-species fisheries. Results will help the Pacific Fisheries Management Council to prevent overfishing of these stocks and lead to more effective use. A detailed, understandable report is available on this major advance in fishery management.

Fisheries Engineering (R/OPF-7)

E. R. Kolbe

Extended fisheries jurisdiction (to 200 miles offshore) has given American fishermen the opportunity to fish for more species. Results of this study will help fishermen improve quality and productivity. Emphasis was placed on refining refrigeration and chilling concepts for onboard preservation of fish, resulting in better fish for the table.

Control of Corrosion and Deterioration of Trawling Cables (R/OPF-11)

E. R. Kolbe and R. E. Meredith

Ocean perch, rockfish, sole, whiting and shrimp are caught by Oregon trawl fishermen. The large trawl net, dragged on the bottom and in the mid-water column, is connected to the boat by cables. These cables wear rapidly, partially through galvanic corrosion, and replacement is expensive. Methods were studied for reducing wear through cathodic protection, resulting in increased wire life and lower costs.

Marine Product Development

Microbial Quality Improvements of Seafoods (R/DP-29)

J. S. Lee

Fishermen, processors and consumers of seafood desire a clean and wholesome product for the table. Stringent microbial quality control in each processing step is vital for this. Through studies in the seafood handling chain, methods were developed to insure a better final seafood product.

Seafood's Role in Human Nutrition (R/DP-32)

D. T. Gordon, D. L. Crawford and J. K. Babbitt

In this project, researchers tried to determine the level of nutrients in seafoods and their availability in human diets. Specifically, the levels of vitamins A, C and E, in selected shellfish and finfish, were determined. Uses of this information relate to nutritional labeling, protecting the nutritional quality of seafoods and extending product shelflife.

Seafood Processing and Utilization (R/DP-33)

D. L. Crawford, J. K. Babbitt, D. T. Gordon, and D. Law

More than half of the fish caught at sea are discarded because there is no market. This project focused on development of new human food or industrial products from these underutilized species of fish. Several usable techniques were developed, including a phosphate dip for shrimp which increased meat production by about 15%. This result alone is worth several million dollars a year to Oregon processors and fishermen and provides a better product to the consumer.

Evaluation of Liquefied Fish Protein as an Animal Feed (R/DP-35)

D. C. Church and R. O. Kellems

Seafood processing waste was found to be a good alternative source of protein for livestock feed. Liquefied fish protein (LFP) was found to be equal or higher in performance to traditional protein supplements. LFP was found to be a good source of lysine and methionine, normally considered the two most limiting amino acids in feed formulations.

Coastal Environments

Coastal Processes

Biology and Conservation of Neritic Reef Fishes (R/CM-18)

H. F. Horton

A variety of fish species, including several rockfish, lingcod, cabezon and greenling, inhabit the nearshore reefs. Little is known about their life histories and few management regulations govern the increasing recreational and commercial harvest. This project, through a study of food habits and population movements, provided important data for improved management.

An Assessment of Sea Lions in the Rogue River Area (R/CM-19)

B. R. Mate

Increased protection of seals and sea lions, through the federal Marine Mammal



Protection Act, has concerned fishermen about the impact of marine mammals on salmon and trout populations. In this Rogue River study, we found that Pacific lamprey was the main food of both California sea lions and harbor seals. Salmon represented less than 6% of the diet of either seals or sea lions.

Population Growth and Feeding Habits of Harbor Seals in an Aquacultural-Enhanced Environment (R/CP-4)

B. R. Mate

Seasonal abundance of harbor seals in Netarts Bay peaks in October-November coinciding with the return of adult chum to the OSU experimental hatchery on Whiskey Creek. Populations of seals were estimated through radiotelemetry. Food habits were determined by collecting otoliths (ear bones) from seal feces. Pacific sand lance and several species of flatfish were common foods. The project will be extended, at no additional cost, to focus on radiotelemetry and to collect more data.

Harbor Entrance Visibility (R/CP-5)

W. H. Quinn, D. O. Zopf, and C. Creech

Techniques to predict the onset of marine fog would be very useful to fishermen and boaters, to increase the safety of ocean activities. So, Sea Grant developed prototype fog detection units, installed at Coast Guard stations at Yaquina Bay, Coos Bay and at Cape Disappointment and Westport, Washington. Performance is being monitored and refined and it appears likely that the National Weather Service will use the system after reliability is assured.

Preventing and Stopping Deterioration of Wood in the Marine Environment (R/CP-6)

R. D. Graham and J. J. Gonor

Sea Grant investigator Robert Graham, a specialist in forest products, has developed methods to dramatically reduce decay losses to docks and pilings (a \$1 billion problem annually for the United States). He and his assistants have developed construction practices and fungus controls to deal with the problem. During the research, the gribble *Limnoria tripunctata* was discovered in Oregon waters. This major economic pest attacks creosote-treated piling in some situations. Among fumigants for control of fungi, chloropicrin was found to be the most effective.

Sediment Transport and Deposition in Oregon Estuaries (R/CP-11)

P. D. Komar and K. F. Scheldegger

This work has brought a better understanding of the contribution of sands from rivers and beaches to estuarine sedimentation and beach composition. Sediments being transported and deposited in estuaries create many complex problems. Repeated navigational dredging costs millions of dollars; it can change estuarine water circulation and impact sedimentation patterns, changing the character of the living resources. Sediment samples were taken from the Siuslaw, Alsea, Siletz and Salmon river estuaries during both the high winter run-off period and summer low flows.

Estuarine Trace Elements and Their Application in Water Pollution Tracing (R/CP-14)

W. D. Loveland

Cheaper, faster, more sensitive and environmentally acceptable methods were developed to help water resource managers trace waterborne pollutants. Trace levels of natural, rare earth elements were used to study hydraulic characteristics and water

Summary

quality at a Yaquina Bay boat marina in Newport, Oregon.

Marine Weather Information (RUCP-16)

W. H. Quinn, D. O. Zopf, and C. Creech

Climate plays a key role in determining the biological productivity of the world's oceans and coastal areas. An instrument network for sensing and routine monitoring of environmental data was developed and installed. It may eventually enable aquaculturists and others to better evaluate how climate affects fish survival. For example, coinciding the release of salmon with favorable oceanic conditions (such as upwelling) may increase the numbers of returning adults.

Coastal Engineering

Waves and Currents on a Beach in the Presence of a Jetty (RUC-4)

R. T. Hudspeth

Analytical and numerical methods were developed to help coastal engineers solve beach erosion and harbor entrance safety problems associated with jetty or breakwater construction. Coastal land owners, commercial fishermen, maritime shippers and recreationalists stand to benefit.

An Evaluation of Coastal Sand and Gravel and Marginal Rock as Construction Materials (RUC-6)

R. G. Hicks

Quantities of high quality coastal sand and gravel are, in limited supply to meet the growing demand for use in coastal construction projects. Alternative sources of marginal aggregates were identified and methods developed to make these materials usable in buildings, bridges and highways. Lower future costs of aggregates and reduced pressure on existing coastal resources will result.

Submerged Offshore Artificial Reef Study (RUC-7)

C. K. Solitt and D. Hancock

Civil engineer Chuck Solitt and oceanographer Dan Hancock have combined their talents to design a submerged offshore artificial reef in Winchester Bay on the Oregon coast. If the reef made of discarded rubber tires is installed, the researchers are confident that a new bottom fishery would develop to supplement the fluctuating sport salmon fishery. The project, co-sponsored by Sea Grant and the Port of Umpqua, is in final testing stages. Recovery of test modules confirm the engineering and biological feasibility of building offshore tire reefs.

Synthetic Fabric Application in Ocean and Coastal Engineering (RUC-8)

C. K. Solitt, J. Bell, and T. Vinson

Synthetic fabrics are used in coastal applications where natural aggregates are scarce or inappropriate. However, matching the best fabric with a particular application is currently done on a trial basis. An analytical model was developed to predict the response of a fabric material, sandwiched between two soil layers, under various wave actions. Results will eventually enable design engineers to select the optimum fabric material appropriate to specific soil, wave conditions and structural loading factors.

Analysis of Materials Handling at Marine Container Terminals (RUC-10)

E. McDowell and T. West

By computerizing the loading plan they developed, two OSU engineers have found a way to save millions of dollars annually for ports dealing in containerized shipping. Computer simulation models of various container port operations were developed for improving the use of existing facilities. The load planning model was developed to replace the current manual procedure, reducing the number of people and time required to generate the load plan. This in turn helps to reduce the time the ship spends in port, and better uses port facilities.

Public Policy Analysis

Legal and Institutional Approach to the Columbia River Basin's Anadromous Fishery Crisis: A Guide for Action (RPPA-11)

M. C. Blumm and J. Huffman

Controversies exist over how best to allocate Columbia/Snake river resources



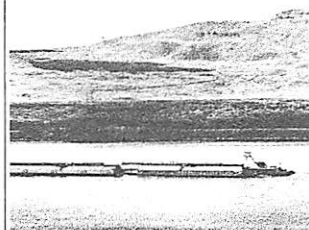
between competing uses, such as hydropower, navigation, recreation, irrigation, municipal water use, waste disposal and anadromous fisheries. Specific court decisions were analyzed along with public policies to determine the impact on the anadromous fishery resources. Results were published as a series of *Anadromous Fish Law Memos* or as law reviews. They have drawn much public interest.

Implementation of the Fisheries Conservation and Management Act in the Pacific Northwest: Legal Information and Education Services (RPPA-12)

J. L. Jacobson and R. G. Hildreth

Management of marine resources within the 200-mile limit, established by The Fisheries Conservation and Management Act of 1976, presents many complex biological, economic and legal problems. Work continues on analyzing the effects of fisheries management decisions in the Pacific Northwest. *Ocean Law Memos* and *Coastal Law Memos* were prepared covering such topics as Indian treaty fishing rights, antitrust law and coastal material hazard management.

Columbia Regional



Improving Transportation of Maritime Commerce on the Columbia-Snake System (RWSU-2)

K. L. Casavant

Project findings reinforce the tentative rejection of the possibility of enlarging the Bonneville Locks, although the potential for economic growth in the Columbia-Snake region may be constrained by the undersized locks. However, our study indicates that only under strong growth assumptions for sand, gravel and sludge movements will the benefits outweigh the costs of enlarging the locks. Furthermore, analysis of water transportation demands of wheat indicates that transit time and equipment availability have significant impact in determining type of transportation selected. The surging interest in coal shipments through the Columbia corridor may change these findings.

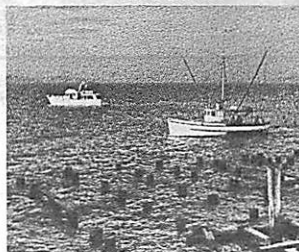
Mathematical Programming Models for Projecting Cargo Movements via Snake-Columbia River Ports (RUI-4)

K. H. Lindeborg and J. R. Jones

Export of agricultural commodities and forest products via Snake-Columbia river ports is expected to increase significantly. However, cargo movements depend partly upon rates of alternative transportation modes and terminal port charges. Projec-

tions from mathematical models indicate that fuel price increases, by themselves, will have little impact upon the shippers' choice of transportation mode or of the coastal port through which the cargo is routed. However, the quantities flowing through each port were very responsive to changes in terminal charges at a given port.

Education



Maritime Training Materials Development (TIT-5)

J. A. Flickinger and S. McMullen

Quality educational materials used in training marine technicians and other professionals are scarce. The researchers prepared a series of colored slide tapes on a wide variety of subjects, including icing and dressing trawl-caught salmon, splicing wire rope and making scarf joints. A series of video tapes on echo sounding equipment was developed for a professional fishermen's training program to demonstrate the proper operation and maintenance of electronic equipment.

Marine and Maritime Studies Program (E/M-1)

P. Copek, P. Komar, H. Spenenburgh and A. Taylor

Humanists, artists, scientists and technologists can each learn from the other about the sea and its influence on society. Courses were developed to help students and the public become better informed of the relationship between the world's oceans and the aesthetic and cultural life of humans. A set of core courses are offered annually, supplemented by subject area courses offered in alternate years. Undergraduate students can obtain a certificate in Marine and Maritime Studies.

Graduate Curriculum in Marine Extension (E/Ex-1)

G. Klein, L. Oester, and W. Andersen

Previously, marine extension agents and specialists learned their profession by word-of-mouth, and/or by trial and error. A set of core courses was developed and are now available providing a formal learning experience and a minor in Extension Education. They provide a model for academic work at other institutions. An unexpected dividend from the international and programs planning classes is their usefulness to serve other disciplines in addition to marine.

Education for Effective Management of Marine Resources (EMRM-2)

V. T. Neal

Graduate students preparing for careers in marine resource management take a broad spectrum of courses. To provide students a different perspective on maritime issues, a course in marine transportation was developed. Work has also gone into obtaining internships for students with private industry.

Marine Education Materials Identification, Preparation and Implementation for Classroom Use (E/ME-3)

R. E. Thiess and W. Hastie

This project's purpose is to develop a better awareness and appreciation among Oregonians for the part marine activities play in their lives. One way to do this is by introducing marine education to the public school system. A users' manual and a set of approximately 75, K-12 marine education activities were assembled or developed for field testing. These activities and their design are compatible with the State's "Framework for Science Program."

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The OSU Foundation has
established a special Sea Grant fund.
Donors to this fund know that their
contributions help scientists explore
new opportunities for Oregon's marine
industries, students prepare for active
careers on the ocean frontier, and
marine advisory agents bring useful in-
formation to people who can put it to
work in their jobs or recreation.
Would you like to contribute to Sea
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Send your check to Sea Grant Fund,
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sity, Corvallis, Oregon 97331.

PROGRAM STATUS REPORT

N-New, C-Continuing, F-Finished

		Fiscal Year				Investig-
		78	79	80	81	
Food From The Sea						
Aquaculture						
R/AQ-30	Interrelationships of dietary lipid and protein on the growth, quality and production of cold water cultured fish.....	C	C	C	F	R.O. Sinnhuber
R/AQ-31	Enhancement of coastal chum salmon resources.....	C	C	C	C	J.E. Lannan
R/AQ-32	Biological Feasibility of clam hatcheries for recreational harvest in the Pacific Northwest.....		N	C	F	W.P. Brees
R/AQ-33	Commercialization of recent advances in oyster technology.....		N	C	F	W.P. Brees
R/AQ-36	Relationships between institutional arrangements and aquacultural developments.....		N	C	F	R.S. Johnston
R/AQ-38	Imprinting in salmon: odorant recognition, effects of pollutants, and artificial cues in freshwater and saltwater.....		N	C	C	C.B. Schreck
Fish and shellfish diseases						
R/FSD-5	Detection, prevention, and control of diseases in fish.....		N	C	C	J.L. Fryer
R/FSD-8	Distribution of <i>Vibrio cholerae</i> and related species, pathogenic and non-pathogenic, in shellfish and estuarine waters.....			N	C	R.J. Seldier
Ocean productivity and fisheries program						
R/OPF-1	Pleuronectid production system and its fishery.....	C	C	C	F	A.G. Carey R.L. Demory W.G. Pearcy S.L. Richardson A.V. Tyler C.E. Warren E.R. Kolbe
R/OPF-7	Fisheries engineering.....		N	C	F	
R/OPF-9	Modeling studies of ecological process in the subarctic Pacific Ocean.....		N/F			C.B. Miller B.W. Frost D.R. Bernard J. Stander E.R. Kolbe R.E. Meredith
R/OPF-10	System dynamic model of the fishery for Pacific hake.....		N	C	F	
R/OPF-11	Control of corrosion and deterioration of trawling cables.....			N	F	
Marine product development						
R/PD-29	Microbial quality improvements of seafoods.....	N	C	F		J.S. Lee
R/PD-32	Seafood's role in human nutrition.....		N	F		D.T. Gordon
R/PD-33	Seafood processing and utilization.....		N	C	F	D.L. Crawford
R/PD-34	Economic implications of the international marketing of Pacific Coast seafoods.....		N	C	C	R.S. Johnston D.C. Church R.O. Kellums N.J.S. Lee
R/PD-36	Evaluation of liquefied fish protein as an animal feed.....		N	F		
R/PD-37	Microbiological impacts of seafood process modifications.....			N		
Coastal Environments						
Coastal processes						
R/CM-18	Biology and conservation of neritic reef fishes.....	C	C	C	F	H.F. Horton
R/CM-19	An assessment of sea lions in the Rogue River area.....	C	C	C	F	B.R. Mate
R/CP-1	Assessment of Oregon populations of the green sea anemone, <i>Anthopleura xanthogrammica</i> , for harvest potential.....		N	F		J.J. Gonor
R/CP-4	Population growth and feeding habits of harbor seals in an aquacultural-enhanced environment.....		N	C	F	B.R. Mate
R/CP-5	Harbor entrance visibility.....		N	F		W.H. Quinn
R/CP-6	Preventing and stopping deterioration of wood in the marine environment.....		N	C	F	R.D. Graham J.J. Gonor P.D. Komar
R/CP-11	Sediment transport and deposition in Oregon estuaries.....		N	F		
R/CP-14	Estuarine trace elements and their application to water pollution tracing.....		N	F		W.D. Loveland
R/CP-16	Marine weather information.....			N/F		W.H. Quinn
Coastal engineering						
R/CE-2	Wave reflection and attenuation at pile supported harbor facilities.....		N	F		C.K. Sollitt R.T. Hudspeth
R/CE-4	Waves and currents on a beach in the presence of a jetty.....		N	C	F	
R/CE-6	An evaluation of coastal sand and gravel and marginal rock as construction materials.....			N	F	R.G. Hicks C.K. Sollitt D. Hancock
R/CE-7	Submerged offshore artificial reef study.....			N/F		
R/CE-8	Synthetic fabric application in ocean and coastal engineering.....			N	F	C.K. Sollitt J.R. Bell T.S. Vinson J.H. Nath E. McDowell T. West
R/CE-9	Engineering roughness of marine growths on structures.....			N	C	
R/CE-10	Analysis of materials handling at marine container terminals.....		N	C	F	
Public Policy Analysis						
R/PPA-6	Current developments in ocean law: Pacific Northwest and Alaska.....		N	F		J.L. Jacobson
R/PPA-7	Refining calculations in fishery management plans: capacity and optimum yield.....		N	F		R.B. Rettig C.L. Smith
R/PPA-8	NETS - Northwest Educational Trawler Simulation.....		N	F		
R/PPA-11	Legal and institutional approach to the Columbia River basin's anadromous fishery crisis: a guide for action.....		N	C	F	M.C. Blumm
R/PPA-12	Economic analysis of the interrelationships between wild and hatchery salmon.....			N	C	R.B. Rettig
R/PPA-13	Implementation of the fisheries conservation and management act in the Pacific Northwest: legal information and education services.....			N	F	J.L. Jacobson F.J. Smith C. Vars, Jr.
R/PPA-14	Economics of the Oregon boating service industry.....			N	C	
Columbia Regional						
R/UI-4	Mathematical programming models for projecting cargo movements via Snake-Columbia River ports.....		N	F		K.H. Lindeborg
R/WSU-2	Improving transportation of maritime commerce on the Columbia-Snake system.....		N	C	F	K.L. Casavant

Education			
T/T-5	Maritime training materials development	N	C C F J.A. Flickinger
E/M-1	Marine and maritime studies program	C	C C F P. Copek
E/Aq-1	Management-oriented aquaculture training		
	(Master of Agriculture in Aquaculture)	N	C C C E.E. Bond
E/Ex-1	Graduate curriculum in marine extension	N	C C F G. Klein
E/IRM-2	Education for effective management of marine resources	N	C F V.T. Neal
E/MED-3	Marine education materials identification, preparation and implementation for classroom use		
		N	F R.E. Thiess
			W. Hastie
E/PT-1	Development program for professional fishermen	N	C D. Lodge
E/Fel-1	Sea Grant fellowships	N	C W.Q. Wick

Advisory			
A/EMAP-1	Extension Marine Advisory Program	N	F K. Hilderbrand
A/PD-10	Seafood science research result applications and information transfer	C	C C C D.L. Crawford
A/EMAP-2	Extension Marine Advisory Program		N C H.F. Horton

Program Management			
M/A-1	Program administration	C	C C C W.Q. Wick
M/A-2	Program development	C	C C C W.Q. Wick
M/A-5	Sea Grant communications	N	C C C J.R. Larison

International			
E/ICAP-1	An international cooperative assistance program for Latin America (with emphasis in Chile)	N/F	W.Q. Wick V.T. Neal
E/ICAP-2	An international cooperative assistance program for Latin America (with emphasis in Chile and Mexico)	N	F W.Q. Wick V.T. Neal

BUDGET SUMMARY 1979-81

Research	NOAA	Match
Aquaculture	262,500	295,500
Living Resources, other than Aquaculture	539,800	184,600
Mineral Resources	53,900	5,000
Marine Law & Socio-Economics	572,100	327,900
Ocean Engineering	410,800	170,800
Resources Recovery & Utilization	336,300	319,500
Transportation Systems	49,200	36,300
Research & Studies in Direct Support of Coastal Management Decisions	169,800	128,800
Pollution Studies	63,500	22,000
Environmental Studies	215,000	0
Applied Oceanography	76,500	97,700
Education		
College Level	77,000	66,900
Vocational Marine Technician Training	141,400	97,900
Retraining Program	50,800	42,200
Other Education	166,900	45,700
Advisory		
Extension Programs	843,000	495,400
Other Advisory Services	122,700	104,200
Management		
Program Administration	291,600	337,700
Program Development	125,800	33,200
TOTALS	\$4,568,600	\$2,811,300

'Dog Salmon' Better Than Most Think

Picture the rich, deep pink-red of chinook or coho salmon basted with a little lemon-butter, then grilled to a soft, succulent, flakey texture.

Now consider the paler pink flesh of Pacific chum salmon. Ungraciously called "dog salmon" by some old timers, the consumer attitude seems to be that this sometime salmon substitute for more desired species is better left unseen in colorless casseroles.

But that hasn't always been the case in Oregon, nor worldwide, where chum is often preferred over our favorites, coho and chinook.

Once the basis of a busy Oregon fishing industry, chum salmon have all but been eliminated in Oregon since post-World War II pressures of urbanization and industrialization ruined spawning grounds in many state streams, says Oregon State University Sea Grant scientist Jim Lannan.

Many Oregonians have never even heard of chum, canned or otherwise. But the species forms the basis for a very large aquaculture-supported fishery in Japan and Russia, where millions of the 12-pound average fish are harvested each year.

So why does chum take a back seat in consumer interest to other Pacific salmon? Lannan says the reasons are subtle. "There's a local bias about chum," says the associate professor of fisheries and wildlife. "For one thing, it's been a long time since there has been any fresh chum salmon on the market in Oregon. Secondly, most of the salmon caught and marketed locally are coho and chinook — consumers have come to associate the deep, red, meat color of the species with highest quality."

He thinks because people haven't been exposed to chum, they have developed a misconception about its taste and quality. He says it doesn't matter what color the flesh is, because it's the oil that makes the flavor — and "biochemically the structures of the chum oil are very similar to coho and chinook, so the flavor of chum doesn't differ noticeably," he says.

Lannan adds that of the five species of Pacific salmon in Oregon waters, chum may actually have a greater world market value. In Russia and Japan they often prefer chum's rich flavor.

In the United States, aquaculturists find this potential world market for chum attractive. The reason? In addition to any taste preference that may exist for chum, the species is easier to farm than other salmon, he says.

"This leads me to view chum and pink salmon (a similar species) as two of the finest candidates we have for producing large quantities of high quality animal protein," Lannan says.

—OSU Sea Grant, Page 15a

Seafood Technologist Predicts More Shrimp

West Coast shrimp processors can expect to see about \$28 million worth of additional processed shrimp meat for sale annually, if they adopt new handling and treatment methods developed by Oregon State University Sea Grant, according to OSU Extension Seafood Technologist Ken Hilderbrand.

Hilderbrand made his prediction following a two-day workshop for processors held at the Marine Science Center this spring, just before the opening of shrimp season.

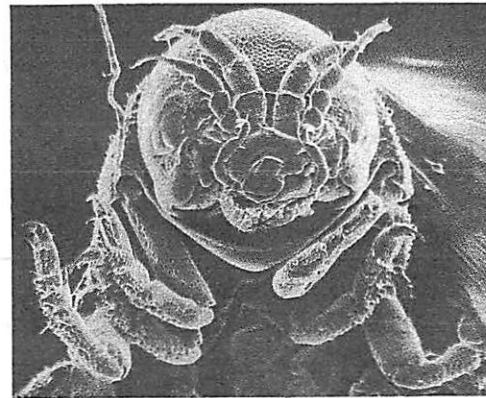
Hilderbrand based his prediction on research conducted at the OSU Seafoods Laboratory in Astoria and on findings in Oregon processing plants. He said he based the figure on the 1980 wholesale value of raw shrimp.

About 15 processors in the state have begun using a special phosphate salt bath developed by David Crawford, director of OSU's Seafood Laboratory. Raw shrimp dipped in the solution retain more of the soluble protein during the pre-cooking cycle of processing, says Hilderbrand. Additional handling methods, such as maintaining constant low temperatures before cooking, have increased yield up to six percentage points for some processors.

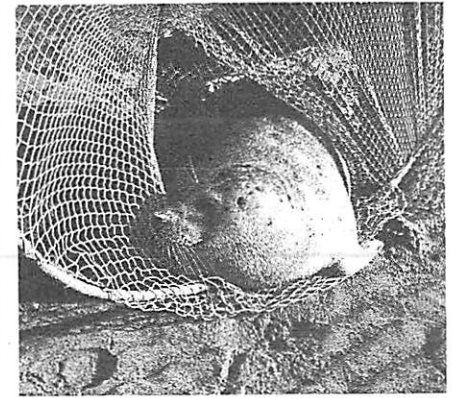
"This one seafoods project has probably brought more money into the seafood processing industry than the entire Sea Grant College Program has cost us," he claimed. "Eventually, it will benefit fishermen, processors, wholesalers, retailers and consumers — the entire marketing system."



Oregon State University student Caroline Chu from Taiwan weighs shrimp after processing.



Counteracting the
Dock-Eating Gribbles

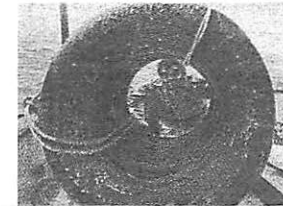


Learning the Movements
of Harbor Seals

OSU Sea Grant . . .



Bringing to Light Oregon's
Estuary Controversies



Enhancing habitat to
build a fishery

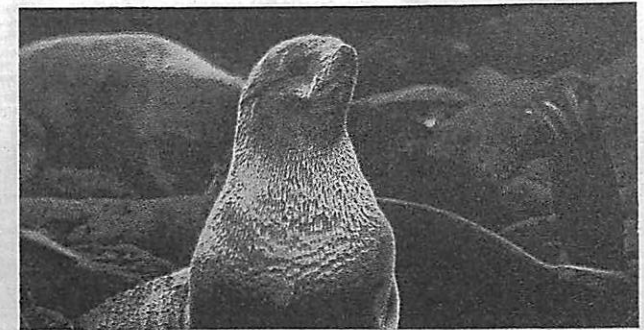
putting
Oregon's
oceans
to work



Increasing the Yield
of Pacific Shrimp



Describing the
Seal-Salmon Controversy
Page 16a, OSU Sea Grant,



Educating the Public on
Marine Mammals