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Agricultural Experiment Station
Oregon State University

Director John R. Davis

comment

One system that works

The Land Grant university is a remarkable institution, devoted to service to the people of Oregon as well as to quality programs of higher education. One of the more remarkable things about the Land Grant system is the ability of all of its public service organizations to blend their talents and work together toward common goals. The Agricultural Experiment Station, Extension Service, Forest Research Laboratory, and more recently, the Sea Grant Program, are those organizations—each an integral part of Oregon State University, separately administered and budgeted, to be sure, but working together to serve all of Oregon.

The articles in this issue of *Progress* are a result of the fine relationship between the Agricultural Experiment Station and the Sea Grant Program, and describe some of the research activities that have been developed mutually and supported jointly. Those departments that are involved in this research, especially Agricultural and Resource Economics, Agricultural Engineering, Food Science and Technology, Fisheries and Wildlife, Microbiology, all have outstanding records of research accomplishments in both agriculture and in fisheries, so the development of programs funded by Sea Grant is a natural.

The combination of Agriculture and Sea Grant has produced a new dimension in research for producing food from the sea. The capabilities and interests of faculty who have been involved in food production and natural resources have been combined with new sources of funding from Sea Grant, and the faculty members have been able to apply their knowledge to fishing gear design, fish diseases, seafood processing, waste utilization, population dynamics and other new problems.

So we now have a good thing going—by blending knowledge, the ability to solve problems, and additional resources—to assist in developing Oregon's fishing industries. However, adapting agricultural research to the fisheries industry is only one success story. We fully expect that our faculty will make major advancements in other areas as well —energy, international trade and marketing, transportation, land use and recreation, for example.

Indeed the Land Grant system, with its knowledgeable, versatile and responsive faculty, is a remarkable organization. Land Grant and Sea Grant—agriculture and aquaculture—all portend new wealth for Oregon. All Oregonians can be proud of their investment in the Land Grant university and in the Agricultural Experiment Station —it continues to pay dividends. ■

About Sea Grant

Did you know an acre of some ocean inlets (or estuaries) can be 10 times more productive than the most fertile agricultural land? Perhaps Congress did when it passed the National Sea Grant College and Program Act in 1966 to promote exploration and development of ocean resources.

Two years later, OSU received one of the first three institutional grants awarded through the new federal program, and in 1971 OSU was named one of four initial Sea Grant college centers. Today there are 12.

Administrative headquarters for the OSU Sea Grant College Program are on the Corvallis campus. But the program employs no research or advisory staff and draws on the resources of the faculties at cooperating schools in the Northwest. Projects are being funded at OSU, Washington State University, the University of Oregon, Lewis and Clark College, Clatsop Community College and the University of Idaho. ■

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COVER: Agricultural Experiment Station researchers are helping harvest the sea's bounty. For more information on their efforts, featured in this issue of Oregon's Agricultural Progress, see Director John Davis' column and the brief article on Page 2. (Illustration: Connie Morehouse, OSU Sea Grant Communications graphic artist.)

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Reef fish madness

Good taste could mean bad news for some Oregon sea creatures.

More anglers than ever want to catch a red snapper or a gruesome-looking, but equally delicious, lingcod from the state's off-shore reefs. But increased angling has made the fish harder to hook and could be draining the supply of red snapper and lingcod, according to Howard Horton, an Experiment Station researcher who is studying the creatures in a four-year-old OSU Sea Grant project.

Horton, a fisheries professor, noticed the growing number of reef anglers in 1974. He wondered how they affected not only populations of the popular red snapper and lingcod, but also less preferred reef fish such as cabezon, black rockfish, China rockfish and blue rockfish. He also wondered if the Oregon Department of Fish and Wildlife should manage reef fishes more closely to assure adequate supplies in the face of heavier angler demand.

No one knew the answers, so in 1975 Horton initiated a study of heavily fished reefs near Depoe Bay. His goals were to answer his own questions and to provide fisheries biologists with information they could use to fine tune their resource management strategies.

To date, Horton and graduate students assisting him have caught, tagged and released 4,953 reef fishes. A story has begun to unfold from tags returned by fishermen.

"We're particularly interested in the locations where fishermen catch tagged fish," Horton explained, noting that the information will help him determine if reef fish move up and down the coast, or live year-round on the reefs.

"That's important," he said. "If they do reside year-round, then it would be easy to overfish a reef. But if they move, fish from plentiful areas could replenish a heavily fished reef."

From tag returns to date, Horton speculated that most species live on the reefs all year, and that most are abundant. But the popular red snapper could be in trouble, and the lingcod could be in some danger, too.

"We've caught and tagged 33 red snapper," he said. "That's not very many. And of those 33 tags, fishermen have returned 21 percent. That's an unusually high rate of tag return."

Horton considers a one percent return rate normal. A high rate indicates that fishermen have hooked most of the fish available and suggests that the population may be overfished, he said.

An added problem with red snapper is the fish's air bladder. When a red snapper is reeled to the surface the organ expands, making the fish very buoyant and ruling out any chance of returning it to the sea (without special equipment).

A related problem is that fishermen cannot choose the type of reef fish that strikes their bait. If red snappers are being depleted on some reefs, all fishing may have to be greatly restricted, the researcher said.

Horton hopes not. Although tag returns show that red snappers do not migrate extensively during the year, they may move slowly, over several years, from unfished reefs and restock heavily fished ones. Only future tag returns will tell, he said.

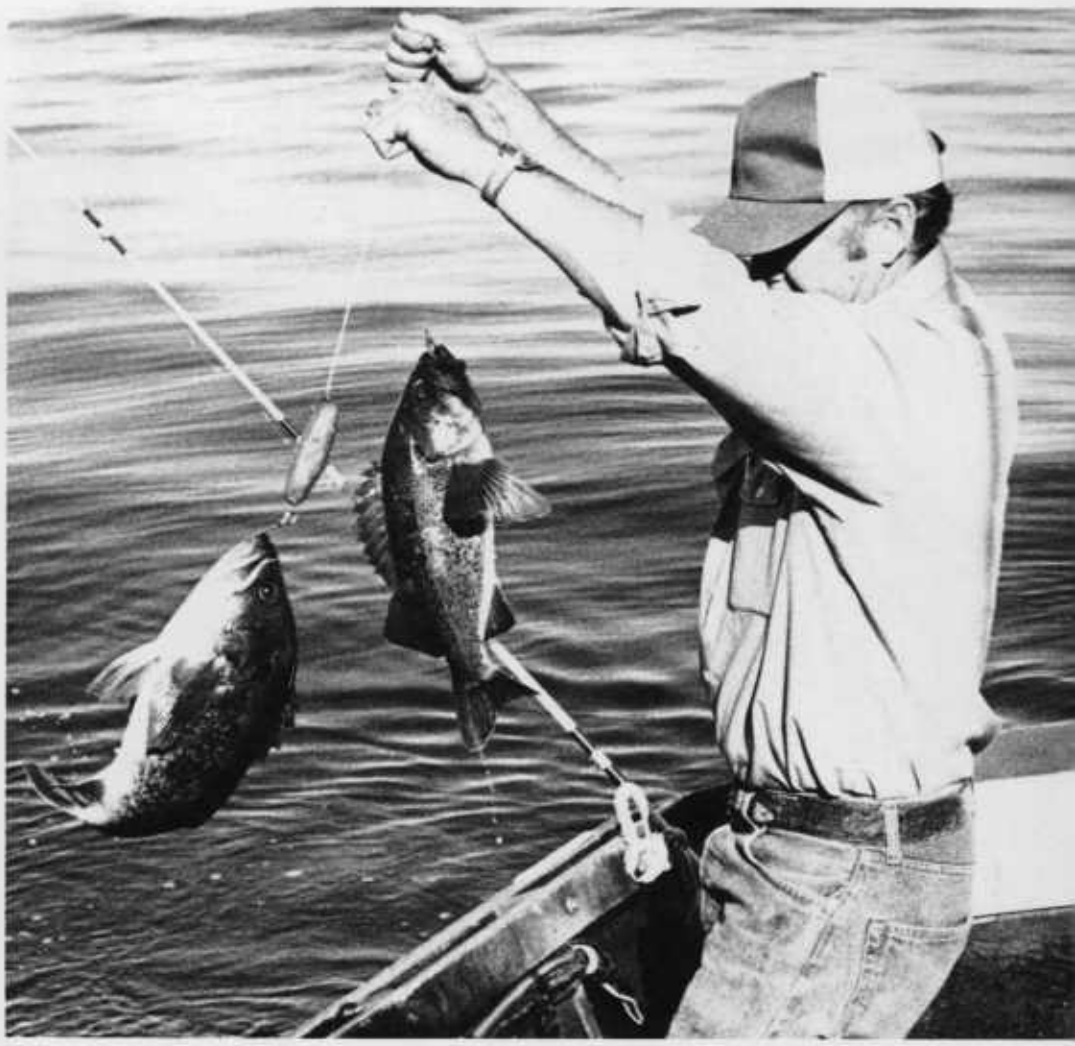
He said the lingcod situation does not appear to be as serious, even though fishermen and charterboat skippers report that demand for the fish has taxed the supply, and a high tag return rate backs up their observations.

Fortunately, lingcod do not have an air bladder and can be released unharmed in many cases. And tag returns show that they migrate extensively during the year, so lingcod from other areas could replenish heavily fished reefs.

Horton said the Oregon Department of Fish and Wildlife, recognizing the increased angling for lingcod, recently reduced the bag limit from an unlimited number to three. He thinks someday the department may impose size restrictions as well, because large females are especially good egg producers.

The scientist said his study has produced other information that will be useful to fishery managers.

For example, by analyzing stomach contents of the various reef fish species, he found that they apparently do not compete for the same food. Nor do many eat one another. Consequently, he said, fishery managers probably do not need to be seriously concerned about the possible impact of harvesting one species on the productivity of another. ■



Fisheries professor Howard Horton's study of fish living on Oregon's offshore reefs includes collecting and tagging the fish to determine if they are permanent residents, and analyzing the stomach contents of some to find out what they eat.

To tip the scales

Fish vaccines developed

Fish, too, get sick from bacteria and viruses.

One similarity between dry-land livestock production and fish farming is the susceptibility to illness of both hatchery fish and livestock raised in close confinement. A few germs can spark a disease that spreads like wildfire.

But there is an added danger with fish, at least those raised for stocking purposes. They are released into streams (often eventually reaching the ocean), lakes and ponds where the sick ones that manage to survive can infect their wild relatives.

It is an economically and environmentally damaging cycle Experiment Station researcher John Fryer set out to battle in the early 1960s, with the help of several colleagues.

His approach: vaccines for fish.

He fought his first round with bacteria that cause fish diseases, and four years ago, thanks in part to the pioneer effort of Fryer and other OSU researchers, the U.S. Department of Agriculture licensed the first fish vaccine ever to a commercial firm in Colorado. A second vaccine was licensed months later, and the vaccines were used to immunize salmonoid fish against bacterial diseases some hatcheries estimated killed up to 25 percent of their stocks.

Fryer's latest opponents are tiny viruses that invade the bodies of fish.

The OSU professor of microbiology and fisheries said much of the earlier bacterial research provided a headstart in the race to vaccinate salmon, trout and other fish against viral diseases. A major boost came from insights into how to administer vaccines efficiently.

"One of the main obstacles to combatting the bacterial diseases was finding a delivery system for the vaccines," he said. "You could inject the fish with a needle and syringe, no problem. But it obviously wasn't practical for people working with millions of fish."

Testing several methods of administering vaccines, OSU researchers learned that if a fish simply is sprayed with vaccine, enough is absorbed to cause an immune response and make the fish resistant to disease. Fish now routinely are coated for bacterial diseases and a crew of three or four persons can vaccinate more than a million in a day.

No painful shots. Simply spraying a fish is an effective way of administering vaccines, says microbiologist John Fryer (in lab coat, page 6), working with graduate researcher Warren Groberg.

A goal of OSU vaccine research is to make hatchery fish immune to diseases before the fish are released into the wilds.

But despite the headstart, virus research presented new, complex challenges, partially because of the size of the organisms.

Viruses are so tiny they invade and live inside a cell, taking over the cell's "machinery" and raw materials to manufacture more of their own kind. A virtual army of viruses amasses in a single cell before the cell bursts and the viruses move on to conquer other cells, spreading disease.

"A major research problem was just growing a mass of viruses to study," Fryer said. "Because they have no media they live in. They live in cells."

What was needed, he said, was a continuous supply of fish cells in which viruses could be grown and studied.

Tackling the problem, his research group developed from salmon tissues such a "cell line" to be used to culture viruses. Cells from the OSU stock now are used for fish virus research in several U.S. commercial laboratories and in other parts of the world, including Europe, Japan, the Soviet Union and Taiwan.

With the cell line, OSU researchers were able to address the question of what type of vaccine might be best.

Fryer said some bacterial vaccines employ small doses of the disease-causing bacteria—already dead—to trick a fish's body into manufacturing agents or "antibodies" that will attack healthy disease organisms before they get a toehold.

"We found that using live, as opposed to dead, viruses was the way to go," he said. "They spread through the body and elicit a prolonged immune response.

"What we tried to do was grow viruses under conditions that were generally unfavorable so they would grow up without the ability to cause disease, but keep their antigenic integrity and trigger an immune response."

Fryer and others now are working on such a vaccine for a virus that plagues chinook salmon, sockeye salmon and rainbow trout in fresh water.

"We've passed a virus from one culture to another 115 times," he said, "and it is growing much less virulently than it regularly does. The weak strain could be used for a vaccine."

That does not mean it will be. The OSU researchers hope their virus research eventually will benefit the men and women of Oregon who grow fish for profit or catch them for fun. However, it is up to commercial firms to produce and sell a vaccine.

"No vaccine companies have shown an interest publicly in the virus vaccine," Fryer said.

But that could change, as any fish coated for bacterial diseases knows. ■

Troubled waters

How do salmon cope?

You're moving to a home in another area. The trip is tiring, the weather changing and you think you may be harboring a flu bug. Reaching your new territory, you maneuver in the dark through an agonizingly unfamiliar set of streets, park and head for shelter. It is then the neighbor's dog decides to assert itself.

Time for a war whoop? A tension headache? Imagine trying to cope with such stress underwater.

Fish do. In fact, their battles with stress (not to overlook hooks, larger fish, diseases and several other pitfalls in the aquatic way of life) are of key interest to OSU fisheries biology graduate student Steve Jacobs and Experiment Station researcher Carl Schreck.

The purpose of a study being conducted by Jacobs, under the supervision of Schreck, is to find out if stress brought on when transporting salmon from a hatchery to a fresh-water home in a stream affects their ability to survive and migrate, as Nature intended (and as fish ranchers and sportsmen hope they will).

According to Schreck, the head of OSU's Cooperative Fishery Research Unit, scientists already know quite a bit about a salmon's physiological reaction to stress.

When experiencing stress, he explained, the level of certain hormones (called corticoid hormones) increases and the fish's ability to resist diseases, or even predators, decreases.

"It's like when a person stays up too late and catches a cold the next day," he said. "The germs were there the day before, but the added stress makes the person catch the cold."

What Jacobs and Schreck want to know is precisely what happens when recently transported fish enter the wilds.

To get at his subjects, Jacobs takes to the water himself—the cold, clear water of Mill Creek, about 25 miles west of Salem.

He dons a wetsuit and floats downstream, through the stream's pools and riffles, watching young chinook salmon—called smolts—begin their migration to the sea.

Since the project began, Jacobs and others have branded and transported to Mill Creek more than 5,000 young salmon.

Jacobs releases the fish at designated points upstream from a wire weir, or screen trap across the stream. At the weir, fish are collected in a wooden box and studied again, including comparing tissue samples taken after capture with samples taken before the fish were transported to Mill Creek.

Jacobs has encountered frustrations in his outdoor laboratory unknown to scientists whose studies are conducted in more controlled environments. One came early last spring when the first batch of fish was released. A sudden storm flooded Mill Creek and the smolts washed over the top of the weir. Later, vandals ruined the wire cages Jacobs was using to house control fish.

An ever-present frustration, he said, is not knowing what becomes of fish that don't migrate. He speculated that some are caught by persons fishing in the creek, while others are eaten by predators or die and wash up on the bank.

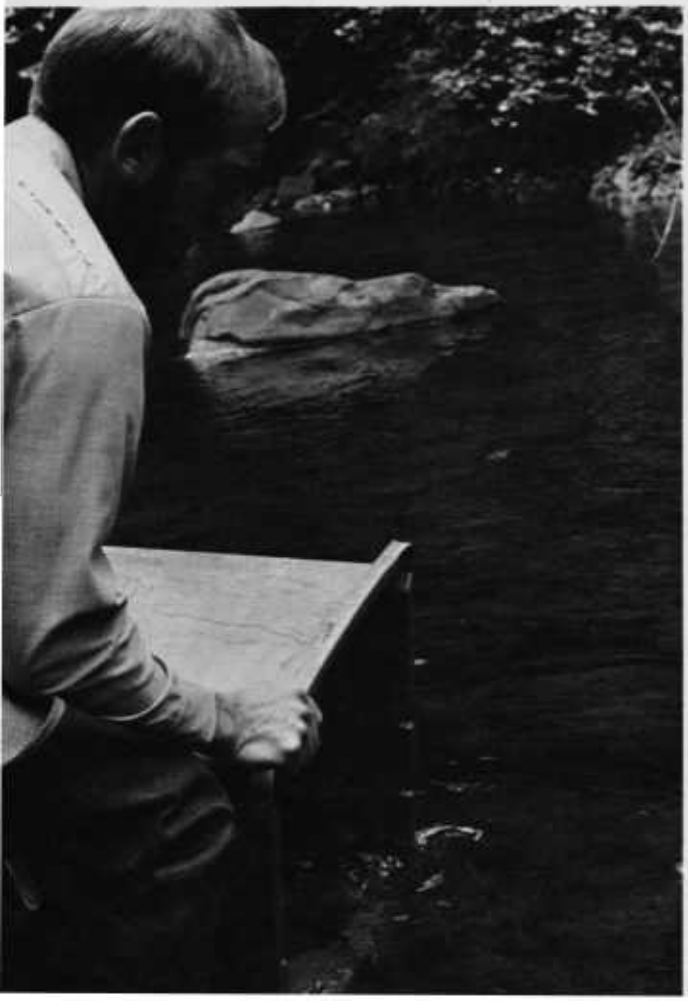
Overall, he said, Mill Creek has been a good place for the study. The water is extremely clear and he can approach within two feet of the fish before they become frightened and swim away. From that vantage point, he has observed much of the routine of fish life, including the pecking order between native cutthroat trout and the juvenile salmon as they jockey for position in the good feeding spots in the stream.

Jacobs said that, depending on the month when they were released, up to 90 percent of the chinook salmon migrated as far as the collection trap this year. Last year, in a similar experiment with coho salmon, only about 40 percent made it that far.

Schreck and Jacobs speculate that what they are learning about the 5,000 fish released in Mill Creek could relate to systems such as the Columbia River, where millions of fish are released each year. Hatchery managers have been frustrated by the low returns of hatchery-reared fish. The National Marine Fisheries Service, sponsoring the study, estimates only about one percent of the fish reared in hatcheries make it to the sea and back again.

Next year, laboratory study of the fish will continue much as it has in the past, Jacobs said. But he and Schreck plan a new wrinkle for the stream observation work. They are experimenting with tiny radio transmitters which might be implanted in the fish to monitor their activities more precisely.

They won't help the fish cope. But the transmitters could make Jacobs' life a little less stressful. ■



Researcher Steve Jacobs ((top) and Carl Schreck (left), director of OSU's Cooperative Fishery Research Unit, use a wire weir to collect young salmon from Mill Creek near Salem. Their study of the impact of stress on hatchery fish released into the wilds includes observing salmon smolts underwater.

Shrimp in the clover, crabs in the grass

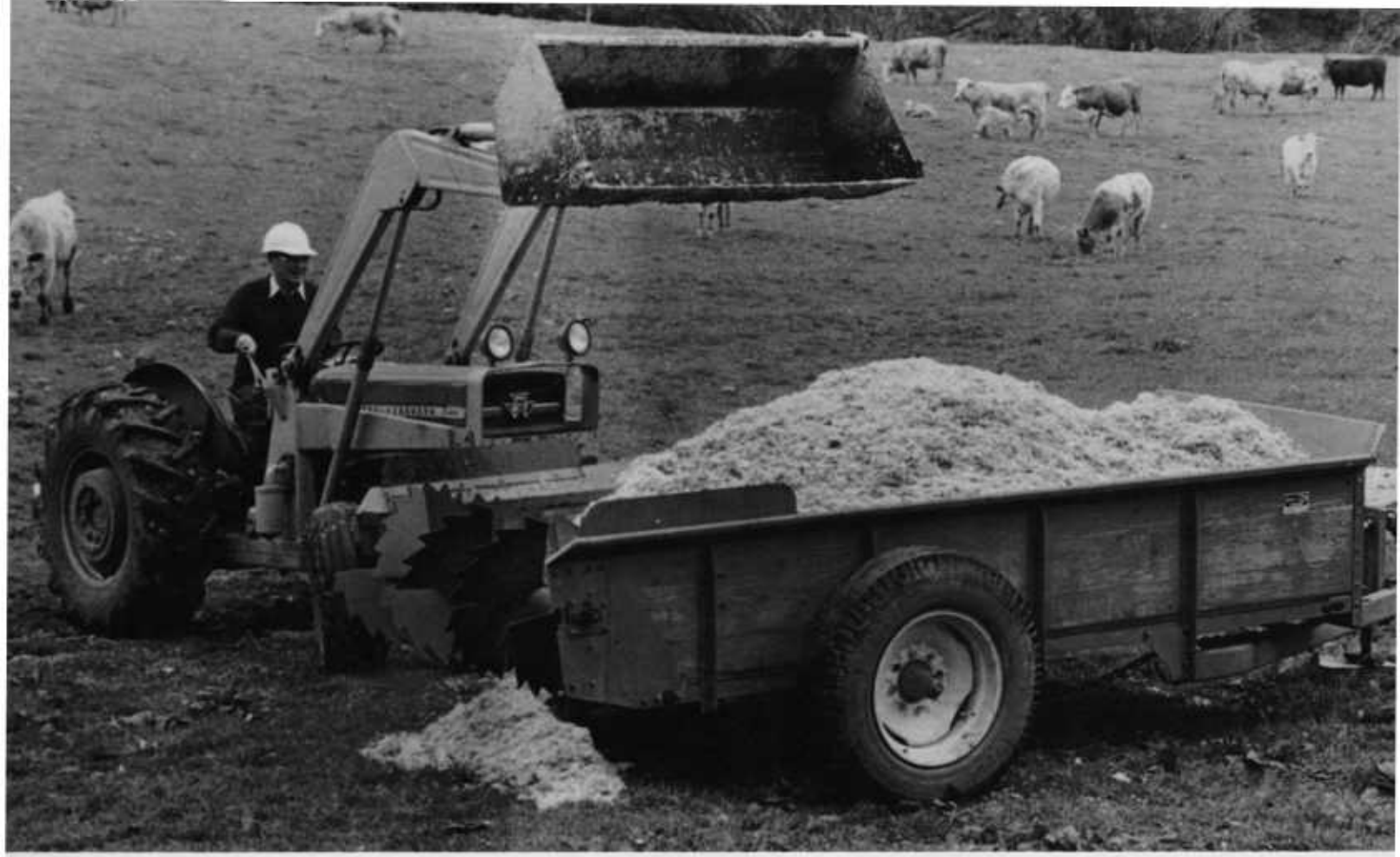
Shrimps and crabs are helping farmers grow grass and clover near the Oregon coast, thanks to a nudge from the federal government and the joint efforts of OSU ocean and agricultural researchers.

It came about like this:

In July 1977, the federal Water Pollution Control Act banned Oregon seafood processors' long-held practice of dumping crab and shrimp processing byproducts into Oregon's bays. The ban forced the seafood industry to find a new place to throw away the 15 to 30 million pounds of wastes it produces annually.

"We heard the byproducts might be valuable to farmers as a fertilizer," said Charlie Jackson, former communications specialist with the OSU Extension Marine Advisory Program. "So we decided to call Hugh Gardner."

A joint OSU research team's solution to pollution from seafood wastes is providing farmers such as Lester Hall (top, Page 11) of Yachats with cheap fertilizer. Fresh shrimp and crab are removed from boats at coastal plants and processed. Wastes, once dumped into Oregon's bays, are sold to farmers.



Gardner, an Extension Service and Experiment Station soil scientist, remembers the call.

"I told them we've been sticking dead fish under rosebushes for a long, long time," he said. "But they wanted to know some specifics —like the kinds and amounts of nutrients in the wastes and the best application rates."

Gardner confessed he didn't know. He assigned Bob Costa, a graduate student in soil science searching for a worthwhile project to complete his degree requirements, the task of helping solve the seafood industry's problem.

Costa also knew farmers through the ages fertilized their crops with fish. But he was surprised to learn that Oregon's coastal farmers had used crab and shrimp processing wastes before the advent in the 1930s of cheap, easy-to-apply inorganic fertilizers.

The young scientist's research revealed why Oregon farmers valued the byproducts in the past, and that the wastes would be valuable to modern-day farmers.

Analyses indicated that a ton of shrimp and crab wastes contained 26 to 32 pounds of nitrogen, 22 pounds of phosphate and smaller amounts of potash, sulphur, magnesium and boron. In addition, Costa found that shrimp and crab shells in the wastes would be a good source of lime. On a per-ton basis, crab wastes contained 300 pounds of lime and shrimp wastes contained 130 pounds.

Unfortunately, he found that processors produce far less crab than shrimp wastes and most of it is available during the winter when wet weather would prevent farmers from spreading it. Stockpiling crab for spreading later was not an alternative because of its unpleasant smell.

In a field trial on an orchardgrass pasture near Toledo, Oregon, Costa recorded a 6.1 ton yield of hay on an acre fertilized with three tons of shrimp wastes. It would have taken about 400 pounds of commercial fertilizer to achieve the same yield, he estimated.

Then from the results of greenhouse experiments, the researcher calculated that three to eight tons of shrimp wastes per acre would adequately meet the nitrogen needs of pasture grass, and three tons per acre would supply enough nitrogen for clover pastures.

Costa's conclusion: The processing wastes were a suitable source of nitrogen, phosphorous and lime for several crops.

Farmers apparently agreed. The demand for seafood processing wastes in several coastal counties soon exceeded the supply.

In Lincoln County a Coastal Farmers Cooperative was organized to take advantage of the resource and, according to former Lincoln County Extension Agent John Fitzpatrick, demand for the wastes remains strong. Farmers pay $6 a ton for the wastes, which Fitzpatrick estimates has the same nutrient value as $12 to $15 worth of commercial, inorganic fertilizer. He adds that lime in the wastes has helped farmers cope with extremely acid soils.

A satisfying experience for members of the joint OSU problem-solving team? Yes. But they're glad Oregon farmers and processors reaped the real rewards. ■

Two fresh looks at your seafood

At first, it might seem that Ed Kolbe, an OSU agricultural engineer, has drifted a little far of field.

In fact, one of his research projects isn't in a field at all . . . it's in the Pacific Ocean.

Kolbe, along with food scientist Jong Lee and David Crawford, director of OSU's Seafood Laboratory in Astoria, is working on a new way to keep fresh shrimp from spoiling on the boat.

"Shrimpers usually use ice to keep the catch fresh," said Kolbe. "They can leave the shrimp packed in ice for three or four days before they must return to port. But there have been some problems with using ice. So, for convenience, some shrimpers started using refrigerated sea water."

The innovative shrimpers pumped 31-degree Fahrenheit sea water, which freezes at 28 degrees F., over the shrimp through special spray heads attached to pipes running over the top of the fish hold in their boats. But on some boats, the plan didn't work and some of the shrimp spoiled. Shrimp processors also complained because, in some cases, the shrimp were too firm to peel with automatic peeling machines.

The shrimpers approached OSU for help. Kolbe began working on modifications. The design and size of the spray heads were changed, the chilling rate of the shrimp was calculated at different depths in the fish hold and a mathematical model was developed to help size refrigeration equipment and determine how much sea water was needed to keep various amounts of shrimp chilled.

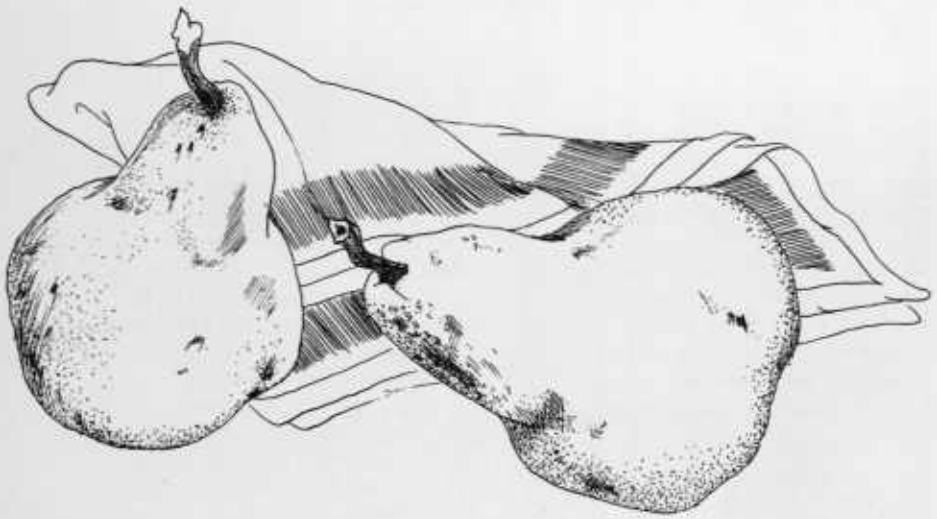
Meanwhile, Lee investigated the microbiological aspects of keeping shrimp from spoiling and Crawford began to study pre-treatments that could help keep shrimp fresh longer.

"We have published some of our results and acceptance of the findings has been good," Kolbe said. "Of course, we don't know how many shrimpers have put our findings into practice, so it's hard to know whether the systems we've developed work successfully on all the boats."

One of the major problems is cleanliness. Lee has been studying bacterial levels in the fish holds and, with Crawford, testing various substances that may help keep the level of spoilage bacteria low. The refrigerated sea water system could present a problem because as the water is drained to the bottom of the shrimp pile in the fish hold, it is put back into the refrigeration system and used again. High levels of bacteria in the water could make shrimp spoil more quickly.

"With ice, the quality depends on how well the shrimp are iced. When they aren't chilled enough. they begin to get soft and spoil. But we think that, potentially, if the refrigerated salt water system is clean, shrimp could be held for an even longer time than they are now. We don't have the data to prove that yet, but we're working on it," Kolbe said. ■

Agricultural engineer Ed Kolbe (right) hopes the shrimp industry, and consumers, will reap benefits from a refrigeration system using sea water.



Outlook is bitter for pear 'champagne'

Don't count on sipping Oregon pear "champagne" at a wedding, or dropping by the local tavern for a belt of hard apple cider.

An OSU horticulturist thinks the chances for a pear and apple alcoholic beverage industry in Oregon—or anywhere in the United States—are slim because of disease and the law.

Porter Lombard, superintendent of the Southern Oregon Agricultural Experiment Station at Medford, has studied varieties of the bitter and slightly sour pears and apples used in Europe's pear beverage and hard apple cider industry since he brought back tree cuttings from a 1973 trip to England.

"We have grown some cider apples and perry pears that look pretty good," he said.

But Lombard said the cider apples' apparent susceptibility to a disease called "fire blight," and a stiff U.S. tax on carbonated alcoholic drinks, would make an attempt to produce beverages commercially a risky proposition.

The idea is interesting, nonetheless, he said. A pear beverage called perry often is served in England in place of champagne and is referred to as "the champagne of Britain." The clear, delicate, carbonated beverage also is sold in France, Spain, Switzerland and other countries.

In addition, he said, carbonated hard apple cider is the cheapest alcoholic drink sold in English pubs and markets, and worldwide annual production tops 120 million gallons (a small fraction of total beer and wine production).

Lombard plans to continue variety studies (he has provided "budwood" to interested persons in several states) and said Robert LaBelle, a Cornell University food scientist working at OSU for a year, plans to examine the feasibility of hard cider and perry production, including a type of non-carbonated hard cider that would allow producers to circumvent the beverage tax.

According to Lombard, neither hard cider nor perry is produced commercially in the United States. Attempts to produce and sell perry in Australia and Canada in recent years failed. But hard cider production succeeded. ■

Computer tells pea-yield story

The pea and the computer are a combination farmers in northeastern Oregon may hear more about.

OSU agronomist Vance Pumphrey and soil scientists Robert E. Ramig and Ray Allmaras of the U.S. Department of Agriculture, all stationed at the Columbia Basin Agricultural Research Center near Pendleton, have analyzed more than 30 years of weather information and pea yield data to develop a computer model capable of determining how various factors affect pea yields.

Pumphrey said although the computer generally has backed up growers' hunches, it has delivered extra useful information.

"Pea growers are still at the mercy of the variability of the weather," he said. "But at least now we have a better, and more detailed, understanding of the effects of precipitation and temperature on pea yields."

Pumphrey said the researchers found that 65 percent of the year-to-year fluctuations in pea yields are related to total precipitation, rainfall patterns and temperatures. The remaining 35 percent of the fluctuations are caused by insect populations, diseases, weeds, time of planting and other factors, he said.

"The computer results may serve the grower best," said Pumphrey, "when a dry winter has occurred and the soil is not full of water at planting time."

A more precise understanding of the link between weather factors and yields might help growers decide whether they should plant or consider alternatives such as summer fallowing their land, he explained.

Pumphrey said the study revealed that during the critical period when the pea pods are filling, usually in early June, an extra inch of rain can be converted into 400 or more pounds of peas per acre. ■

Corn responds to cover-up

Sweet Jubilee variety corn before mid-August?

It is possible in Oregon if the corn gets a little extra warmth from a blanket of clear plastic, and the result could be higher profits for growers, according to a researcher at the North Willamette Agricultural Experiment Station at Aurora.

"Without question, there is definitely an increase in yield and earlier maturity," said Delbert Hemphill, who for the last three years has studied the effects on sweet corn of a clear plastic covering and various combinations of phosphoric acid and a highly concentrated phosphate fertilizer.

Hemphill said the most promising of the planting techniques he tested was to cover seeds with plastic and apply a "banded phosphate" fertilizer. This produced yield increases of up to 20 percent and harvest dates 10 to 14 days earlier than normal.

He said the protective plastic (1½ mil polyethylene), which is slit when seedlings are ready to emerge from the ground, allows earlier planting and enhances growth by increasing the average air temperature as much as nine degrees Fahrenheit at ground level and up to six degrees Fahrenheit two inches underground.

The technique could help farmers take advantage of higher early season prices, said the researcher.

"Of course people don't even think corn here until after Labor Day," Hemphill said. "But some places in the east get 20 to 25 percent higher prices for early corn."

He added that early season prices might be undercut somewhat in Oregon by corn from California and competition from the many fruits and vegetables harvested in August in the Willamette Valley.

Hemphill said when he completes final tabulations, results of the study will be available through the OSU Extension Service. ■

Families gathering away from home

The latest casualty of the fuel crunch may be the family.

As part of a major study at OSU, a graduate researcher has found that families are spending more of their "together time" away from home.

"This is a very interesting finding at a time when our resources are evaporating," said Louise Parker, who has completed a master's degree in Family Resource Management at OSU. "As less fuel is available for transportation, less time may be spent together, or families may look hard for new forms of at home or near home entertainment."

Parker's study of shared time—the time at least two family members spend engaged in the same activity—is one aspect of an OSU research project aimed at finding out how families use their time. The survey included 210 Oregon, two-parent, two-child families—half in the Portland area and half in rural Linn County. Activities of parents and children six years and older were recorded in 10-minute time blocks for two, 24-hour periods. Similar studies are underway in 10 other states.

Although three-quarters of the shared time episodes took place at home, Parker was surprised by the increased amounts of time shared away from home. In a similar study 10 years ago in New York state, shared time outside the home accounted for only 12 percent of the incidences. But in the OSU study, families reported that 22 percent of shared time occurred away from home, school and work—an increase of 10 percent in 10 years.

Weekends were the most important time for time sharing. Parker speculated that as four-day work weeks become more prevalent, the amount of shared time may increase. But that extra time will carry with it an increased burden of finding meaningful activities, she said.

"Policy changes, such as the four-day work week, may mean more time for the family, but families need to be educated so they will know how to make the most of that extra time," said Parker.

Eating is the most frequently shared activity of families now. The researcher indicated that one-third of all shared time was at mealtime. Another one-fourth was spent on recreational and social activities, and families worked together on household tasks only 13 percent of the time.

"This study did indicate an increase in shared activity in household work over studies from past decades, but such activities were still secondary to time shared in non-work areas. This may suggest a trend toward more equitable division of labor," Parker said.

Additional information from the study is being analyzed by Geraldine Olson, head of the Family Resource Management Department, and Martha Plonk, Parker's major professor. ■

Can dwarfs stand tall as commercial layers?

For some hens, laying an egg may be a little like walking in quicksand: The more they do it the harder it becomes.

At least that's what OSU scientist Fred Benoff found in his study of egg production in the "sex-linked, dwarf" Leghorn chicken variety.

The news may interest persons eyeing the dwarf chickens as potential commercial laying hens.

Benoff said he found in a study of the OSU stock of dwarf Leghorns that the output of defective eggs with only a thin membrane for a shell increased 10-fold as the chickens moved through a 40-week period following the onset of sexual maturity.

The assistant professor of poultry science said he found that "membrane eggs" are by far the most common form of defective dwarf Leghorn eggs. But they would not be detected in most hen houses because they slip through the bottom of cages and splatter on the floor.

Reduction, or elimination, of the defective eggs through selective breeding could make dwarf Leghorns more attractive as commercial laying hens, Benoff said.

Why consider them at all for commercial use?

Benoff said the U.S. poultry industry has known for several years that small-bodied or dwarf chickens can produce eggs more efficiently—that is, while eating less food—than larger chickens, and that they exhibit other desirable traits such as high tolerance to heat.

Stumbling blocks to commercial use of dwarf Leghorns include the small size of their eggs and the relatively small number of eggs they lay, he said.

"The question now," said Benoff, "is are they really not laying enough, or are they just laying defective eggs, especially as they get older?" ■

profile

A wildlife biologist in Neptune's Court

"Agents in hip boots" is the way Bill Wick likes to describe the Extension advisors who deliver his program's ocean research findings to Oregon residents and industry.

And the parallel between the Land Grant and Sea Grant programs is not surprising, especially if you consider that Wick, director of the OSU Sea Grant College Program, was educated at OSU as a wildlife biologist and spent eight years as an Extension agent in Tillamook and Clatsop counties.

He turned to the sea in 1968 when he was named director of Extension programs at the OSU Marine Science Center at Newport, became Sea Grant director in 1973, and ever since has strived to make sure his relatively young program (established just over a decade ago) taps the tremendous storehouse of experience accumulated in the 100-year history of the nation's college Land Grant program.

What can the landlubbers tell him about the sea?

Wick thinks Land Grant schools have done a particularly good job of blending day-to-day problem-solving with projects geared to the needs of tomorrow, and he works hard to keep his program, one of the country's largest, from becoming what he calls an "ocean fix-it shop."

"True, we must focus our research, education and advisory efforts on problems that need fixing now," he says. "But I feel strongly that we need to start working on tomorrow's problems today."

One of Bill Wick's favorite words is anticipate. It was out of anticipation that Sea Grant researchers began studying the legal ramifications of a 200 mile territorial fishing limit law in 1970, six years before Congress passed the legislation. The information they generated helped fishermen comment on how they thought the law should be written.

It was anticipation that sparked Sea Grant researchers' exploration of the impacts of development on Oregon's estuaries long before it became generally apparent that some were being degraded and estuary protection planning gained popularity.

The list of far-sighted projects goes on. But Wick is not preoccupied with the future. In fact, he is proud of many Sea Grant "fix-it" jobs. They include finding an answer to the question of where Oregon's seafood industry could dump crab and shrimp processing wastes (on farm fields for fertilizer), studying how such wastes might be used for livestock feed, developing new types of fishing gear and methods to protect boats from the devastating effects of corrosion, identifying new ways of processing seafoods efficiently and scrutinizing the impact of sport and commercial angling on fish that inhabit the state's off-shore reefs.

Sea Grant has no research staff of its own, so the long- and short-range projects use the expertise of researchers, technicians and others from across the OSU campus. That's precisely the way Wick wants it.

"One important thing with a program like ours is working within the framework of the university," he said. "There is so much to be gained from integrating—so we hire agents and specialists from the Extension Service, and we fund Experiment Station scientists to do a good portion of our research, and we draw from many other campus resources. It's given us a real headstart and avoided duplicating talent. That's important to the university, also."

Pondering the mission of his program, Wick adds:

"I think the integrated approach is enabling Sea Grant to do for those who turn to the sea for a livelihood or recreation what Land Grant has done for those on the land." ■

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