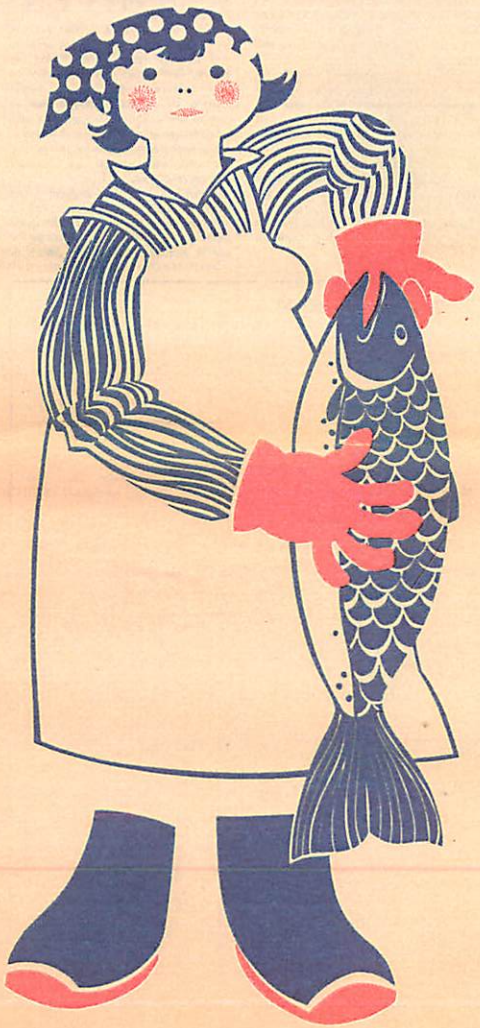
ALASKA SEA GRANT PROGRAM

ANNUAL REPORTS YEARS 06 to 08



January 1981

ALASKA SEA GRANT
REPORT 80-2

AKU-Q-81-001

From the Director

The Alaska Sea Grant College Program links the university's involvement in the development, conservation and wise use of Alaska's marine resources with the citizens of the state. This linkage is accomplished through formal and informal education programs and through research directed toward acquiring new knowledge about those resources. The principle emphasis of the program is development of the Alaska fishing industry.

From these annual reports you can see changing needs of the communities we serve. We are quite proud of the way our program has been able to adapt to meet these diverse and sometimes conflicting interests.

Years 06 and 07 were emphatically devoted to aquaculture projects. An alarming decline in Alaska's salmon harvest spurred interest in an orderly plan for developing and stabilizing this stock.

We started aquaculture training projects in conjunction with Sheldon Jackson College in Sitka and the University of Alaska's Juneau campus fisheries programs. Research efforts in many phases of aquaculture were part of our work. We published a series of aquaculture notes and a handbook on artificially spawning salmon. This effort has paid off in the best way, with a self-supporting degree program in aquaculture and a record salmon harvest in 1980.

Developing the state's potential in bottomfish harvesting is perhaps a bigger challenge than the aquaculture simply because it involves all phases of the industry on an international basis. As we reduced the aquaculture effort in year 08, the first feasibility studies were underway by Sea Grant economists determining the background information needed to develop this new fishing resource. These included a look at the lucrative foreign market: who's buying, how much they want and what kind of processing standards they have. Information for the domestic markets was also gathered: what sort of gear was needed, where to find it, and state of the art for bottomfish handling and production. Increasing Alaska's participation in this field is still a major goal.

While we use much of our support for research and information services that directly benefit the fishing industry, Sea Grant has a number of other groups to serve. Fully three-fourths of Alaska's people live in coastal areas. By providing them with information and educational services, Sea Grant hopes to insure the proper use and management of Alaska's marine resources.

Generated largely by requests from teachers, Sea Grant sponsored a number of workshops and curriculum aides which developed information for use in Alaska's classrooms. Much of the existing material had little in common with the many aspects of the marine environment specific to the arctic. We produced handbooks on various in-class marine projects and sponsored youth and teacher education programs. The most successful of these was a week long marine science camp conducted during the summer in selected coastal communities. Using existing 4-H club organizations, Sea Grant experts spent time with youngsters conducting classes using the available marine environment.

Another success story of this education goal is ALASKA Tidelines, a newsletter appearing monthly during the school year. The newsletter covers a different marine topic every month. Teachers requesting Tidelines receive a copy for each child. It is now used in nearly every school in Alaska in junior and senior high classes.

Another branch of our program is the Marine Advisory Service. This service is designed to provide immediate help to the fishing industry and helps the program keep in touch with the fishermen and processors and their communities. Through workshops, lectures, classes, conferences and acting as a mobile talent bank, our staff provides a direct link to our users. The staff includes experts in safety, financing, seafood processing, and aquaculture along with agents stationed in Petersburg, Kodiak, Cordova, Atmautluak and Kotzebue. They are the fastest way to get our research and expertise into the hands of those who will use it.

We hope this report will show Sea Grant's development, improvement and accomplishment over the past few years. We also hope it will serve as a good introduction for those of you who are not familiar with our work. A publications list appears on page 15. Please feel free to request anything that may be of use to you from our communications office. A more complete listing is available from them upon request.

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On the cover: The "Fish Grader" was graciously supplied to the Alaska Sea Grant College Program by Rie Munoz. Perhaps no Alaskan artist better evokes the common and uncommon in Alaska village life than Munoz. Her subjects are many, but constantly return to the theme of rural Alaskan life, folklore, games and activities. Painstaking observation and close attention to detail are the hallmarks of Munoz' work, giving all her creations a flavor of their original models.

Rie's work is readily visible in the Juneau International Airport, the Rasmusen Library on the University of Alaska's Fairbanks Campus and at the Alaska State Library where three of her murals hang. She has also exhibited in Anchorage, Juneau, Ketchikan, Whitehorse, Seattle and San Francisco.

Rie's art reinforces a positive vision of Alaska that we are pleased and grateful to be able to share with our readers.

Year 06

ANNUAL REPORT Nov. 1976/Oct. 1977

AQUACULTURE

Salmon aquaculture had been tried in Alaska before. But the idea of non-profit salmon ranching by private individuals or corporations was brand new. Since 1974, when the program was authorized by the Alaska legislature with the hope of rebuilding depleted salmon runs, the state had committed millions of dollars to the new industry.

But other help was needed as well — scientific knowledge on the rearing and release of salmon fry; design and hydraulic engineering advice on building and operating the facilities; trained technicians to work in the hatcheries, and management assistance in grappling with such far-out questions like, "How do you handle cash-flow problems when you're dealing with a product that spends one to five years swimming around in the open ocean?"

In the Year 06, much of Alaska Sea Grant's research, advisory and educational effort was directed toward the state's fledgling aquaculture projects.

Dave Urquhart, graduate student at UA, got plenty of experience with these nets during the Sawmill Bay estuary study. Urquhart went on to write his master's thesis based on experience gathered during this study.

One of the first of the new aquaculture facilities to go on line was a pilot program established in 1975 by the Prince William Sound Aquaculture Corporation (PWSAC) in the old Port San Juan cannery on Evans Island. The Alaska Sea Grant Program was involved from the very beginning.

An in-depth study was undertaken by University of Alaska economist Frank Orth on the feasibility of non-profit hatchery operations, including an analysis of their potential impact on the regional economy and on the common property fishery and fish processing. In addition, a business management and accounting system was designed especially for the new corporations by the accounting department's Tom Robinson.

Then in 1976, field studies began on the ability of the nearshore environment to support large numbers of hatchery released fry. Until that time, most established pink and chum hatcheries in the Pacific Northwest had used egg incubation and fry feeding with little regard to estuarine fry survival.

Sea Grant researchers Dr. Ted Cooney and D.L. Urquhart believed it was no longer reasonable to disregard the significance of the estuary in the life cycle of pink and chum salmon. They felt this may have contributed to the failure of many pink and chum salmon hatcheries in the early 1900s.

The fry pictured show the average growth from time of release at the hatchery to the size attained after about a month and a half of feeding in the estuary.

The first release of pink salmon fry from the Evans Island hatchery was made in 1976. Pinks had been chosen because they mature in two years, bringing fast returns on capital and energy invested.

Researchers gathered information on water temperature, salinity, nutrient concentration and plankton at a number of locations. The fry release was small, but study results showed fry moved into the estuary when potential food was most abundant.

In the spring of 1977, PWSAC released more than 10 million fry. Again, a field party monitored the estuary during release. Much of late spring and early summer was spent examining behavior and the early life cycle of hatchery fry nearshore. Estimates were made on what made an area safe for fry, what food was abundant and the kinds and number of fry predators.

Among significant findings of the project was the fact that both bottom dwelling copepods and open sea crusteaceans were included in the fry diet. It meant fry took advantage of energy available from two distinct marine systems.

Coves outside Sawmill Bay, where the hatchery was located, were designated as nurseries, hosting hundreds of thousands of fry for weeks. Research indicated fry would actively seek an area where survival conditions were best, passing up those with undesirable salinity or inadequate food supplies. Also, the cove areas proved to be virtually predator free.

Through careful study of salmon fry feeding, schooling behavior, and interaction with other species, hatcheries will be able to release fry when conditions are optimum for survival. The first few weeks spent

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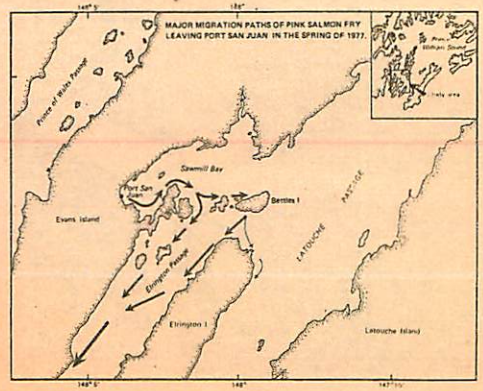
The Prince William Sound Aquaculture Corporation hatchery is located at Port San Juan on Evans Island. Salmon fry leaving the hatchery seem to migrate first to the waters near and around Bettles Island.



The salmon fry congregate for about a month in protected coves like these in Elrington Passage before moving out to sea.

Photo by Judy Wohlfrom

TRAINING TECHNICIANS

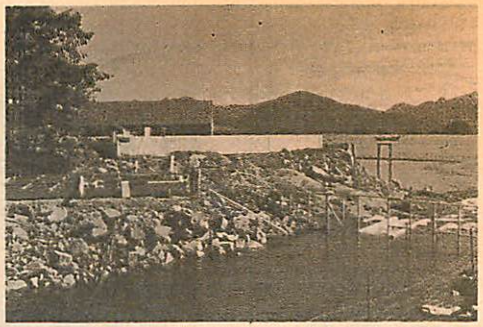
Alaska's first and only aquaculture technican training program was established in 1975 at Sheldon Jackson College in Southeast Alaska. Located on the shores of Sitka Sound, with a salmon stream running through its campus, the setting was ideal.

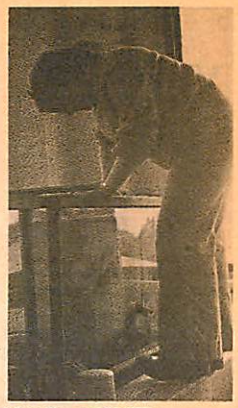
The program was designed to help meet the need for trained personnel in Alaska's expanding network of public and private hatcheries and, at the same time, enhance salmon runs for the area's commercial and sport fishermen.

With funds from private foundations, indoor and outdoor hatchery facilities were built in and around the basement of an old science building just off the beach. For two years the hatchery operated as a two million egg incubation model, and in 1977 it was expanded to a 15 million egg production-sized model.

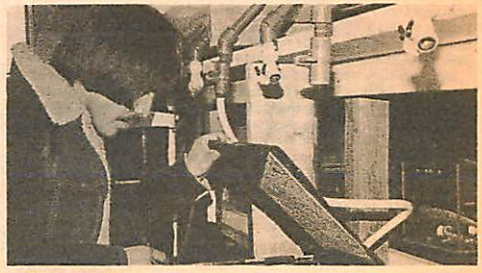
Faculty and students worked together, gathering brood stock, taking eggs, fin-clipping fingerlings, laying water pipe, and even building concrete raceways. The combination of classroom work and "hands-on" training in a functioning hatchery — with the strong possibility of a job at the other end — proved so popular that the program soon had more applicants than it could handle.

With Sea Grant support, an additional aquaculture instructor was hired and an advanced fish culture curriculum was completed.





Waters diverted from the Indian River into an open flume flow past the Sheldon Jackson College hatchery into Sitka Sound. At right, sea water aquarium tanks are tended by aquaculture student Catherine Crasky of Sitka. Below, Mike Lindoff of Hoonah checks salmon eggs in the incubator he has designed and built as part of his fish biology class. (Photos by Kathy Rowell)



"It was quite an experience for all of us," program director Mel Seifert observed. And after two years of hope and hard work, the Sheldon Jackson Aquaculture Program was solidly in business.

The long-range goal of the Sheldon Jackson aquaculture technician training program was to become self-supporting financially through the harvest of surplus salmon returning to the hatchery. And in 1977, two years after the first pink salmon were released from the hatchery, that goal suddenly became quite feasible. Because . . .

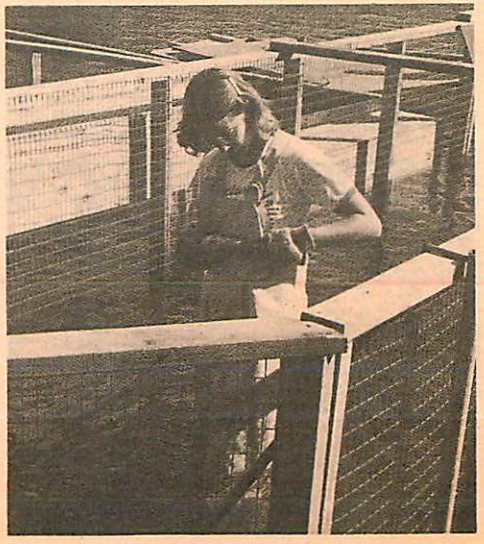
. . . That First Return Was Terrific!

Of the two million pink salmon fry that had been fin-clipped and released in 1975, some 120 thousand returned to the hatchery. Even in natural runs of pinks, a return of one to two percent is considered excellent. This was a return of more than five percent!

Eggs were taken to fill the incubators to their new enlarged capacity and provide brood stock for the next cycle. Fish were sold to commercial seafood companies to bring money for hatchery expansion and operating expenses. (A commercial seiner was hired to catch the fish on an 80-20 percent split basis, but the crew of the seiner voted to donate their 20 percent back to the college.)

Thousands of spawned out salmon (good for smoking) were given away to Sitka residents.

Students and faculty pitch in on an eggtake assembly line. More than 20,000 fish were handled in a few hectic weeks.



Second year fish husbandry student Cleo Klemzak checks a salmon for ripeness. Cleo worked in every facet of the hatchery operation, from digging ditches to supervising quality control in the egg-take operation. (Photo by Jon Nyberg)

There was quality as well as quantity in that first big salmon return. Pinks were larger than usual, averaging over five pounds.

Marine Advisory Program

The Marine Advisory Program provides a vital link between the maritime community and agencies that serve it. Through MAP, research and technological developments are more readily available to the commercial fishing and processing industries. Further, the problems and needs of coastal areas are continually monitored and passed along to researchers.

Field agents stationed in major Alaska fishing towns have specific expertise needed in the communities. MAP specialists based in Anchorage are available to travel to any area where their skills are required. With workshops, lectures, courses, an open door office policy and a genuine concern for marine users, the seven agents carry out Sea Grant long-term goals of aiding in the rational development of coastal resources.

AQUACULTURE

In the year 06, a full time aquaculture specialist was added to the MAP staff. In addition, a Talent Bank was formed of University of Alaska faculty members with expertise in the fields of corporation management, accounting, economics, engineering, water management and oceanography, to assist developing corporations. Classes were taught in Petersburg and Kodiak at which 35 people received training in basic aquaculture, salmon biology and enhancement techniques. Many of the students were hatchery permit holders, members of aquaculture corporations, or other interested participants in the hatchery program.

BOTTOMFISH

The development of a bottomfish industry was also much on the minds of Alaskans in the year 06. The commercial fishing industry was still trying to assess the effects of the 1976 law extending U.S. jurisdiction over fisheries to 200 miles offshore. Foreign fleets had long been harvesting the rich stocks of bottomfish in the North Pacific waters, but the enterprise was new to most Alaskans. Neither fishermen nor processors were familiar with harvest and handling techniques of many bottomfish species.

Sea Grant became involved helping to lay the groundwork for expansion into the new industry. Production and distribution of information pamphlets on bottomfish and existing operations were part of the plan. Studies began on the possibilities of the new industry, as well as education programs on sanitation and quality control in bottomfish processing. Introductory workshops on bottomfishing and processing techniques were held in Kodiak, where the Marine Advisory Agent was assigned to monitor progress and assist in the development of the industry.

Alexie Pavilla (right), bilingual Marine Advisory agent in Western Alaska, helps a village resident with his income tax, while a young deduction looks on.

WESTERN ALASKA

Commercial fisheries development in Western Alaska has also been a concern of the Sea Grant Program because of the special problems involved. Fishing is the only industry in most of Western Alaska, where the population is among the most economically depressed in the nation. Since most of the older residents speak only the traditional Yupik Eskimo language, Sea Grant employs an Alaska Native agent fluent in both English and Yupik. To help with the transition from subsistence to commercial fishing, workshops are held in business manangement, record keeping and tax reporting. The business management program was extended into additional villages during the year.

Also of importance in isolated areas are fishing gear construction and repair. Materials are more expensive in the bush and expert help may be hundreds of miles away, leading to costly delays and high repair bills. Workshops on repair were held in a number of communities. Additionally, workshops on fresh fish handling were conducted to increase the market quality of Western Alaska harvests.

INSURANCE

A problem always plaguing Alaska's fishermen is the high cost of insurance. Alaska fishermen work in some of the most dangerous water and weather conditions in the

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PSP Puzzler: Progress?

You're at a fashionable lawn party. Everyone is thin and tanned. There are no cavities. The conversation is about fashionable things: Woody Allen, jogging, the price of hamburger, finances. Your thin, tanned tennis partner turns to you and says, "Well, my broker is E.F. Hutton. . ." We all know that when E.F. Hutton talks everybody listens, so we eavesdrop as the informer whispers the following inside tip: "Alaska has a multi-million dollar hard-shell clam industry and nobody's using it."

It seems a golden business opportunity for you and your tennis partner. Could this be Alaska's Horatio Alger story? Small-time digger becomes clam mogul? But, let the digger beware. Within Alaska's sustainable annual harvest of 50 million shell weight pounds of hard-shell clams, a small marine organism is causing big problems. The problem is PSP: paralytic shellfish poisoning. Toxin produced by the Gonyaulax dinoflagellate is just another snack to Alaskan clams, but a milligram can kill a human being and a fraction of a microgram polishes off laboratory mice.

Dr. Paul Reichardt spent hours in his lab looking for answers to the PSP problem.

The state is not alone in its battle against PSP. Coastal people worldwide are familiar with the infamous "red tide" denoting its presence and ruining shellfish for some time. The problem is particularly prevalent in North America and forced the closing of Alaska's commercial clam industry in 1947 with only limited re-opening.

The best known PSP toxin is saxitoxin. For years, scientists believed it to be the only PSP toxin in Alaskan waters. That made things easier for researchers here than in areas where a number of PSP toxins are common.

Because PSP is widespread in Alaska, clams are taken from only certified beaches. Certification can take up to two years and requires constant monitoring. If fishermen had an easy field test to tell if their catch was contaminated, it's estimated five million pounds of clams could be harvested annually.

During the 1976-1977 year, Sea Grant researchers Paul Reichardt and Richard Nevé continued their search for a chemical test to replace the current mouse assay for PSP. Red tides are not good indicators of toxicity. Some red tides are produced by non-toxic organisms. In other situations, shellfish toxicity develops without visually red water. The Food and Drug Administration recognizes only one certification for the sale of clams: mouse assay. Unfortunately, no fishermen wants to keep a herd of mice on board to use in field assays. Reichardt and Neve decided early the chemical test would have to be simple, fast, require little equipment and produce reliable results.

The scientists have yet to develop the test needed. But Reichardt says their research in 1977 resulted in perhaps the most important PSP discovery in the past 20 years.

The scientists worked with a chromatographic test called the Buckley test. After treatment with chemicals, saxitoxin in samples became flourescent. Saxitoxin used in the test had to be purified considerably before the test would work, a stumbling block to use by laymen. Also, procedures had to be carefully followed for the desired results.

Work with colorimetry proved another possibility. The test was effective in two hours and sensitive to as little as five-tenths of a microgram of toxin. If toxin was present at certain levels, the mixture turned pink. Again, saxitoxin used in the assay had to be purified from the crude state before the test worked. It was during the work with colorimetry however, that the most important discovery was made. During tests, clams from four sites were subjected to both the colorimetric and mouse assays. Pure saxitoxin was the standard. In some cases, levels of toxin indicated by both tests were the same. In others, colorimetry, which tested for saxitoxin only, indicated low levels of toxin, but the mice died anyway. This meant the mice were reacting to something other than saxitoxin.

Although researchers couldn't name the exact dinoflagellate causing PSP or all the toxins involved, it was clear the assumption that one toxin infected all Alaska shellfish was wrong. That's how the project stood at the end of 1977.

Since that time Reichardt, Nevé and Sherwood Hall have continued the research under other funding. They became the first to isolate the dinoflagellate causing PSP. It is a member of the Gonyaulax genus and suspected to be like PSP organisms found elsewhere. Samples collected from Haines, Porpoise Island and Bartlett Cove have all contained similar organisms, producing a variety of toxins. Based on earlier Sea Grant research, the team is well on its way to using the Buckley test for identification of the toxins.

Education

Sea Grant continued its support for a fisheries academic program at the Juneau campus of the University of Alaska. Undergraduate programs there offered basic education in fisheries biology and management, while graduate programs were developing into more specialized areas. Sea Grant funding was used in this year to hire temporary instructors for additional courses. Sea Grant also supported development of curriculum and course outlines for a two year associate degree program in seafood processing at Kodiak Community College.

A lecture program was developed to add depth to university marine academic courses at four campuses in the state. The lecture program brought scientists from the lower 48 and other parts of Alaska to speak on specific areas of expertise. The program was designed for students, but the lectures were advertised and open to the interested public.

terested public.

Fisheries institutes and lecture programs have been particularly successful in answering community needs for specific information. In planning institutes, local steering committees determine topics important to them and what speakers to include. Sea Grant Marine Advisory agents supervised the overall effort. In year 06, five of these were held in four communities.

Youth and teacher education has been of increasing interest to the Sea Grant Program. Until recently, little effort was made in marine education at primary and secondary levels, due, in part, to the lack of educational materials relating to the unique Alaska marine environment. In answer to this need, Sea Grant trained leaders and sponsored sum-

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Coastal Environment Research

As offshore oil and gas exploration in the arctic increased, coastal environmental studies concentrated on movement and subsea permafrost. Determining the extent and character of subsea permafrost was the aim of one project spurred by the results of offshore research drilling sponsored in part by Sea Grant. The results indicated permafrost was widespread below the southern Beaufort Sea.

The study was particularly important because of environmental and engineering problems associated with oil and gas production. In the year 06, the specific goal of investigators was to produce a quantitative model of the subsea permafrost regimes, contained in Sea Grant report 76-5.

ICE MOTION

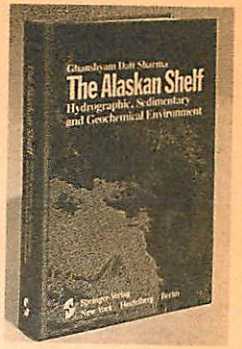
Other scientists were interested in ice motion in the arctic and the hazards sea ice might present to offshore structures. The project coincided with federal studies on offshore areas to be leased to oil and gas developers, concentrating on areas where further research was needed.

Two major areas of concern were the establishment of (1) a relationship between meteorological variables and ice motion in the Bering, Chukchi and Beaufort Seas, and (2) details on modes of ice failure around grounded objects. Ice movements were clocked and explained in terms of daily wind velocities derived from coastal stations and synoptic weather maps.

MARINE MINERALS

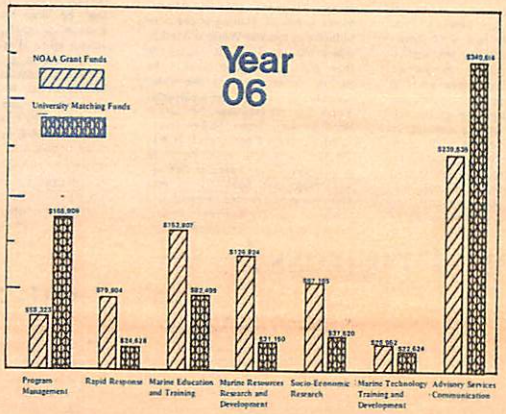
A project to develop a program in marine mineral exploration was initiated, based on study of geochemical anomalies as indicators of marine placers. Some of Alaska's marine shelves are smooth and featureless, providing a good natural laboratory for scrutiny of sediment. Except for a few beaches and nearshore areas, the large sea shelves are unexplored. Further, technology for recovery and processing of metals has been slight.

Exploration and production could increase with more knowledge about how to locate minerals and how they accumulate on the shelf. This project was looking into the possibility of using marine placers for larger deposits.



Alaska Sea Grant's lone marine geologist, Dr. G.D. Sharma published this text in 1979. It is a comprehensive study of meteorology, hydrography, sedimentology and geochemistry on the Alaska Shelf.

BUDGET REPORT



Sea Grant Management

Because of its statewide scope, the Alaska Sea Grant Program is housed in the University of Alaska's College of Environmental Sciences and receives policy guidance from the president of the university. The university reorganized at the end of 1976, and with it the Sea Grant Program.

A new internal executive review panel was created to oversee scientific and academic quality of the program. Its duties included recommending modifications in proposals and making priority ratings. Appointed by the university president, this panel included:

Dr. James Drew
Agricultural Experiment Station
Dr. William Phillips
School of Management
Dr. Peter Probasco
Cooperative Extension Service
Dr. John Goering
Institute of Marine Science
Dr. Stephen Norell
Math/Science/Engineering
Dr. Richard Gard
Division of Fisheries
Don Thomson
Kodiak Community College

The external advisory group also changed. The Alaska Sea Grant Advisory Committee was replaced by the Alaska Interagency Fisheries Committee which was to provide guidance in education, advisory and fisheries research programs. Committee membership was made up of the university president, the Alaska director of the National Marine Fisheries Service, commissioner of the Alaska Department of Fish and Game, and representatives of the governor and the Alaska Legislature. Members of the first committee were:

Dr. Robert Hiatt
University of Alaska
James Brooks
Alaska Department of Fish and Game
State Senator Kay Poland
Harry Reitze
National Marine Fisheries Service
W.I. (Bob) Palmer
Office of the Governor

Sea Grant management staff included Director Donald H. Rosenberg; his administrative assistant, Brenda R. Melteff; contract manager William N. Case, and supporting clerical help. The staff also helped with management of an inter-institutional program, the university's Outer Continental Shelf Environmental Assessment Program.

ESTUARY Continued from Page 3

in the estuary are now recognized as critical to the overall survival of each year-class. Availability of food and populations of potential predators are examples of factors considered important in a local estuary.

In an interim report on the research project, Cooney and Urquhart observed: "Some may question the need for developing a description of carrying capacity. A simpler or less costly scheme would be to flood the estuaries with large numbers of fry and let the environment regulate survival. However, this 'blackbox' approach fails to address the very real issue of ecological balance. It opens the door for numerous problems, including competition with wild fry stocks, possible stimulation of predator populations, and increased competition with other species being reared in the same estuaries.

MAP Continued from Page 9

world. Most insurance companies were hesitant to insure commercial vessels because of Alaska's high accident rate. Those that would insure, did so at very high premiums. The Marine Advisory Program employs a full-time safety specialist to help reduce the loss of life and property in Alaska's waters, and in the long run, to reduce insurance rates by cutting accidents.

Of particular emphasis in 1976 was the expansion of the emergency procedures training programs. Workshops held in a number of coastal communities included film and slide presentations, as well as equipment demonstrations.

SEAFOOD PROCESSING

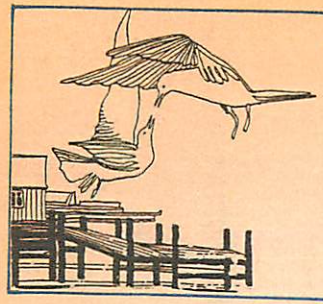
An increasingly important part of the Marine Advisory Program is to provide Alaska's seafood processing industry with technical assistance. In the year 06, processors were hit with declining harvests in several key fisheries. At the same time, new regulations on sanitation and waste disposal meant more expensive operating costs. MAP sponsored "Tell It Like It Is" workshops at which processors and regulatory officials could discuss proposed regulation changes and problems. Workshops were also part of MAP's continuing effort to improve processing plant sanitation, product quality and safety. The workshops were used to train new employees, since the industry has very high turnover.

In 1976, the seafood technology program was reorganized to include offshore oil management advice. From that perspective, MAP added some public workshops in OCS legislation. Work included public meetings to discuss OCS.

EDUCATION Continued from Page 5

mer marine education camps in coastal communities through existing 4-H programs.

In response to requests from local teachers who had little direct information on marine environments, specific curricula were developed for different localities in Alaska. The primary concern was for structuring progams to meet individual community needs. Included in this plan was a system of communication and information exchange among teachers in the various parts of the state.



Year 07

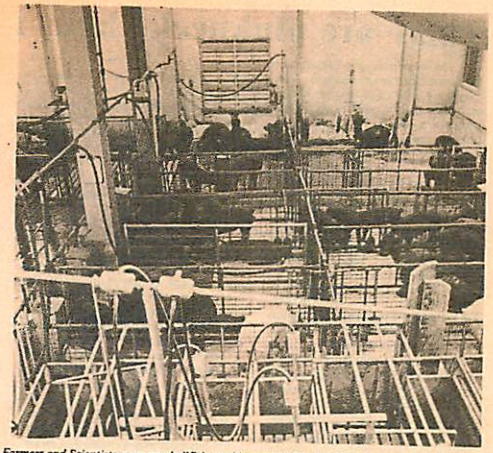
ANNUAL REPORT
Nov. 1977/Oct. 1978

Pigs & Fish

What are these pigs doing in a Sea Grant report? They're chomping on food containing king crab meal, which is a marine related activity of sorts. In the process, they're helping to solve the nagging problem of what to do with the wastes from Alaska's booming shellfish fisheries.

In cooperation with the University of Alaska Agricultural Experiment Station, Sea Grant sponsored research into the use of shellfish meal as a high protein substitute for the more expensive soybean oil meal in livestock feed. If successful, the project could have a far-reaching ripple effect by cutting waste disposal problems of seafood processors, building a fishmeal industry, providing Alaskan farmers with a low cost food supplement for their livestock and eventually, perhaps, eliminating Alaska's need to import porkchops.

Other new research in Alaska Sea Grant's Year 07 included biological groundwork for a developing pinkneck clam fishery and studies on the puzzling drop in pink shrimp catches.



Farmers and Scientists may say shellfish meal is unpalatable, but these hogs weren't listening. The animals are placed in groups, each group receiving a different percentage of crab meal in their feed. As much as 20 percent of the feed may be meal.
(Photo by Sabra MacCracken)

Pigs and Fish. It would seem the two couldn't be further apart. However, opposites attract and necessity is the mother of invention and therein may lie the reason Alaska has found pigs and fish a good team.

In all parts of the state economy, Alaska has a traditional problem with the boom-bust syndrome. From the Gold Rush to the pipeline, a series of highs and lows have plagued the economic structure with little moderation between. A general decline since pipeline construction has placed stabilization of the economy foremost among concerns for state officials. Steadying the fishing industry is a road already paved — with intensive aquaculture projects, legislative structures like limited licensing, and a host of management plans. The success of these attempts is partially measured by their ability to deal with new problems to the industry.

One of those new problems is what to do with fish processing wastes. Across the country, processors are looking at the same problem, since pending Environmental Protection Agency regulations will stop the dumping of wastes back into the ocean and mandate cleaning of effluent waters. The classic solution to this problem is fishmeal; if wastes can be made into a saleable product, they cease to be waste. Alaskan processors decided some time ago that there was a future in the fishmeal business, and three plants operate in the state at Kodiak, Petersburg and Seward.

One problem Alaska has with encouraging industry of any kind is a lack of necessary infrastructure to support it. The groundwork for fishmeal processing has been laid, however, with those plants in operation. The problem now is getting a big enough market to support them. Not only is the home market for fishmeal small, but Alaska fishmeal sold in the lower 48 has to go at a price that includes high transportation costs. Finfish meal enjoys a fairly large steady market as a high quality protein supplement, especially in livestock feed. Shellfish meal has a poorer quality protein content and finds its biggest market is much smaller than that of finfish meal and so is the price. Consequently, Alaska processors produce shellfish meal at a loss.

It's now that pigs begin to look promising. Since the 1940s, shellfish meal has been considered indigestable and unpalatable. Researchers said the protein content of shellfish meal could not be used, even by livestock. But Fred Husby of the University of Alaska Agricultural Experiment Station takes exception to that commonly held truism.

Husby says those conclusions were drawn from investigations on small numbers of East coast blue and Tanner crab. The chemical composition of Alaskan king and Tanner crab is different from east Coast crabs and should, by its nature, be more digestable. Husby's Sea Grant experiments have centered around raising pigs from 40 pounds to market weight on a diet using shellfish meal as a substitute for part of more expensive protein supplements.

In his intial experiments, Husby found that pigs had no problem eating shellfish meal. Pigs fed a corn diet had up to 25 percent of the soybean oil meal supplement replaced with shellfish meal, with no adverse effects. The change represented a savings of 3 percent or $3.30 per pig marketed. If they are fed a diet of barley, 50 percent of the soybean oil meal can be replaced at a savings of $2.90 per pig marketed (1979 figures).

There are some drawbacks to the use of shellfish meal. Since the protein is not of the highest quality, Husby does not suggest using the meal as a complete replacement for more expensive protein supplements. He says the shellfish meal is most efficiently used at lower consumption rates. (This is also because pigs tend to waste feed at a high rate.) Pigs have shown no aversion to a diet with some fish meal in it, and indeed a substantial savings in feed costs can be realized, even at lower levels of consumption.

Because of his success in feeding shellfish meal to pigs, Husby has turned his attention to other types of livestock. Preliminary experiments with dairy cattle have been successful. Alaska has one large commercial dairy and a good potential for additional growth with reduced feed costs. Husby says the cattle experiments have yielded good success in spite of one uncooperative cow who wouldn't eat. Levels of intake for most cows were high, and Husby expects successful application of shellfish meal to dairying.

Another problem with putting fishmeal of any kind into livestock feed is a market prejudice about taste. Consumers seem to feel that fish-fed livestock will taste like fish. To alleviate these fears, Husby has kept a careful sampling of his pork for testing by professional tasters. So far, Husby says no one eating the pork has complained of unusual ordors or tastes.

Alaska's Agricultural Experiment Station carries out studies concerning conservation and development of new land, improvement of production, processing and transportation of food and wood products, and development of resource management.
(Photo by Sabra MacCracken)

There are pinkneck clams a plenty . . .

If you're a discerning connoisseur of commercial clam chowder, you may have noticed a change in fare recently. If you sift through the soup for a look at the elusive clam bits you may discover the meat is a little darker than you're used to. That's because the clam chowder industry is having a hard time finding enough surf clams to fill orders and are harvesting a darker species for chowders. There's nothing wrong with the darker meat, but producers are having a hard time convincing consumers of that.

In 1977, soup companies had a clam shortage. The vast beds off the East Coast were producing about half what they did in 1975. Pollution and possible overfishing affected supplies, and clam states like New Jersey were taking steps to conserve the resource. That meant more gear restrictions and limits on harvests. In the search for more chowder clams, the companies moved into Chesapeake Bay, dredging clams off its bottom, but the gap between supply and demand continued to grow.

Calling the clam dilemma a shortage may be economically correct, but the truth is there are lots of hard shell clams. They just don't happen to be on the East Coast. It's no secret that Alaska has a lot of potential for a commercial clam fishery, although arguments continue over how large that industry could be. Before reserves could be harvested, certain problems would have to be overcome: the high cost of transportation to market, paralytic shellfish poisoning and monitoring the catch, and additional research to determine how fast the clams grow and how often they could be fished. Until now, it just cost too much for the companies to look into Alaskan possibilities. With current restricted supplies and the problem of getting market acceptance for the darker clams, it has become economically wise to investigate Alaska.

In 1976-77 a joint study between government and industry was undertaken to assess potential for harvesting the pinkneck or redneck clam *(Spistula polynyma)* in the Bering Sea. The pinkneck is a close cousin to the highly prized East Coast chowder surf clam *(Spistula solidissima)* now in short supply. Sea Grant researchers Howard Feder and A.J. Paul have been investigating the biology of Alaskan clams since 1971. Those studies were the basis for a large scale Sea Grant study into the economic possibilities of commercial clamming for Alaska, undertaken in 1975 and followed in 1978 by an economic feasibility study of harvesting and processing pinkneck clams in the Bering Sea.

Researchers located lucrative grounds along the Alaska Peninsula between Ugashik Bay and Port Moller. Clams were collected from three stations between these points.

Two subjects of immediate concern to the project were how long it took clams to reach a harvestable age and the prevalence of paralytic shellfish poisoning. Happily, PSP tests were negative for pinkneck specimens, although slight contamination was present in Tellin *(Tellina lutea)* clam samples.

Feder and Paul produced a study on the growth, mortality, recruitment and size at maturity of the Bering Sea pinkneck. The results were not as optimistic as the soup companies had hoped. Bering Sea pinknecks take much longer to reach a harvestable stage than their East Coast cousins. Feder and Paul say it could take twice as long. Eastern surf clams are harvested at 127 mm when they are 4 to 5 years old. The same clam is harvested at Prince Edward Island in Canada, but it takes 11 years for the clam to reach 127 mm in those colder waters. Even further north in the Bering Sea, clams take 16 years to reach that same length. Feder says the colder water probably plays an important part in slow growth. for much of the year, during cold winters, clams grow hardly at all. Growth increases substantially in the spring and summer as clams make up for winter losses. The East Coast surf clams, blessed with temperate climate, undergo year-round growth. Feder says the annular aging method is reliable for Alaskan clams because of their strong seasonal growing pattern. Although annular patterns in pinknecks have not been thoroughly

researched, Feder says it is reasonable to assume they have only one formation per year, like other Alaskan clams.

Because of this slow growth rate, Alaska pinknecks couldn't be taken until they are at least seven or eight. They are not sexually mature until six years and at least one spawning season should be allowed to assure future supplies. That means commercial companies couldn't fish as often as on the East Coast. If however, future research shows the clams produce two annular rings per year, like their eastern counterparts, these figures can be halved. Feder believes that to be highly unlikely.

Continued on Page 10

. . . But where have the pink shrimp gone?

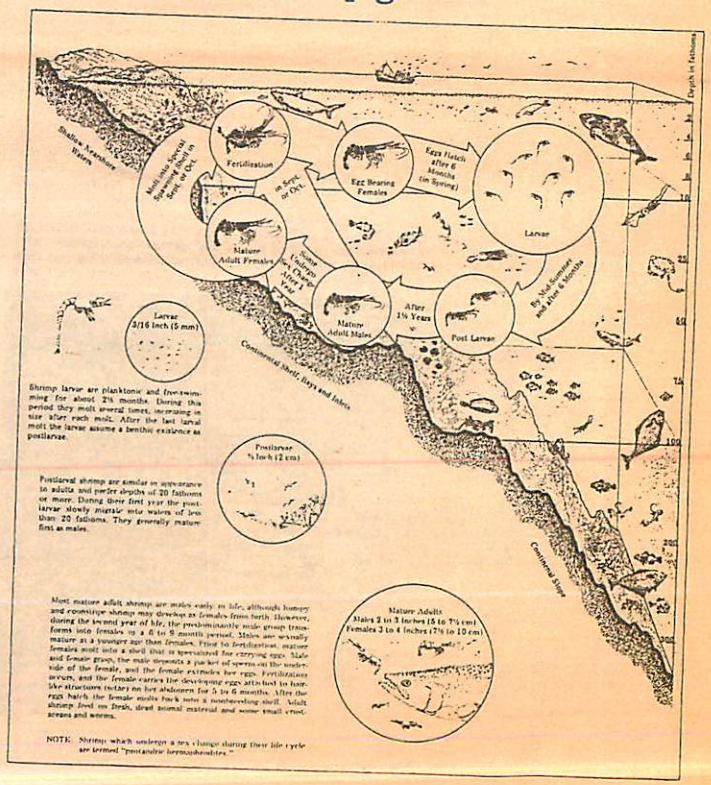
Pandalid shrimp had been a high value fishery in the Gulf of Alaska until declining stocks in the mid-1970s decimated harvests. Commercial shrimpers, largely around Kodiak had seen the industry peak in 1975 at 110 million pounds and then decline drastically.

The drop apparently was unrelated to management strategy or fishing pressure. Scientists believed strong changes in oceanographic parameters may effect the distribution and population dynamics of the shrimp. The project picked up on professional speculation that the biological productivity of the Kodiak area might be dependent on energy and current flow.

Biological research in the first year included a lab study to examine the effect of water temperature on the behavior and physiology of pink shrimp. This included design of tanks and rearing experiments. Observations were made on the effect of temperature on population statistics and egg extrusion.

Physical oceanography studies included application of large scale meteorological patterns and how they might have affected the Kodiak shrimp fishery. Warming trends were documented and correlated with meteorology. Some evidence was found indicating warmer water probably disperses shrimp. Progress was also made toward studying the Kodiak water heat budget.

The results of the project are expected to help with successful management of the fishery back to productive levels.



From "Kodiak: A Background for Living," AEIDC, University of Alaska.

Marine Advisory Program

Because of the vast area it covers and the increased demand for multilateral use of marine resources, the Marine Advisory Program divides its time among four major categories: fisheries development, marine resource issues and management, rapid response and program management. Falling under these categories are six specific missions: program leadership, commercial fisheries development for Western Alaska, commercial fishing safety, aquaculture advisory service, seafood processing technology and fisheries economics.

BOTTOMFISH

Bottomfish ventures were on the rise in 07, partially because of increased government support for the developing industry. Alaska fishermen were interested because bottomfishing could be a year-round occupation, unlike Alaska's seasonal fisheries. But refitting boats and equipment for bottomfish was expensive, and many were unfamiliar with gear, fishing techniques and handling — not to mention the fish.

To help meet these needs, an international bottomfish workshop was held in Kodiak. Fishermen were able to pick up the latest information on European trawls and other gear, and electronic methods for locating bottomfish. Small vessels in selected ports began to experiment with new bottomfish gear through this mission, particularly sunken gillnets, electronic and hydraulic jigging machines, pots and long lines.

Moving outside the fisherman's realm, ASG offered advice and expertise to Alaska's processors. Regulatory action in product quality, plant safety and effluent control had introduced a need for increased sophistication in processing. Also, bottomfish harvests would require changes in processing machinery and procedures.

This was the first year for a full-time seafood technology specialist on the staff. At the request of Icicle Seafoods, Inc., the new MAP seafood specialist toured major European bottomfish processing plants. The trip helped determine overseas market potential for Alaska pollock and herring and a source for purchase of used processing and freezer equipment not available in the United States. Contact with scientists and professionals helped solidify plans for a vocational course in bottomfish handling in Alaska and provided a review of the best in bottomfish handling and processings techniques available.

The concept of a Talent Bank, so successful in helping new aquaculture ventures, was now extended to the seafood processing industry. Particularly important was assistance in business management. Alaska's processors are geographically remote and have trouble getting professional advice on inventory, transportation, cash, and labor-management problems. Talent Bank members from the University of Alaska included:

The Marine Advisory Program's first full-time seafood technology specialist, Per O. Heggelund, joined the staff in the Year 07. Shown here touring the North Pacific Processors plant at Cordova with a group of European equipment suppliers (left to right): Ken Roemhildt, plant manager; Ben Hume, Nassau Nova Scotia Corp.; Heggelund; Svein Dagestad, marketing adviser, Export Council of Norway, and Per Korn Slinning, manager, Moreplast, Aalesund, Norway. Cordova Times Photo

Dr. David Hoffman
assistant professor of business management
Dr. William B. Workman
assistant professor of accounting
E. Thomas Robinson
assistant professor of accounting
Dr. William G. Phillips
Dean, School of Management
Howard L. Zach
assistant professor of business administration
Dr. Ron Johnson
assistant professor of environmental quality engineering.

The third "Tell It Like It Is" workshop was held in Anchorage at which representatives from industry and regulatory agencies discussed problems and mutual concerns. Six workshops were held on the Kenai Peninsula on improving fish handling. Topics included bruising, fish spoilage, onboard handling and icing of fish.

Related publications included the Marine Advisory Bulletin "Microbiology and Seafood Product Quality" and a two part article in *Alaska Seas and Coasts* on the Alaska seafood processing industry.

SAFETY

In 1970, a U.S. Coast Guard survey found Alaska's safety record to be the worst in the nation. The following year, under the sponsorship of the Coast Guard and the Marine Advisory Program, the Alaska Fishing Safety Advisory Council (AFSAC) was formed. Since that time, the council has met on an annual basis to discuss safety problems and to provide input and guidance to the Marine Advisory safety program.

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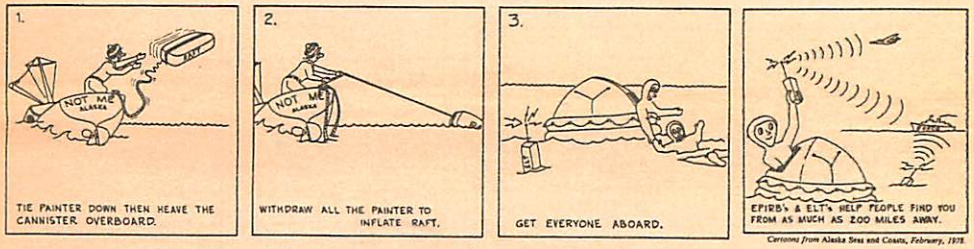


Cartoons from Alaska Seas and Coasts, February, 1978.

EDUCATION AND TRAINING

Many of Sea Grant's objectives are fulfilled when the program successfully produces new expertise in the marine sciences. This year, Sea Grant activites included continued suport for building timely aquaculture education and training programs at Sheldon Jackson College and at coastal campuses of the University of Alaska; expansion of academic degree programs; projects involving marine education in primary and secondary Alaska schools, and on-going efforts in public education through workshops and fisheries institutes.

FISHERIES PROGRAM

The marine fisheries education program at the university was expanded and revised during 07. The Southeastern Senior College of the University of Alaska, Juneau, offers B.S. and M.S. degrees in fisheries. Both programs have enjoyed lively growth since beginning in 1975. This year, a new teaching and research facility was completed and opened. Several lecturers were added to the staff to increase course offerings. This effort also included teaching basic aquaculture courses in several coastal communities.

LECTURE SERIES

Sea Grant supplements existing curricula with the marine science lecture series, bringing experts from around the world to University of Alaska campuses throughout the state. Separated by large distances, faculty and students in the fisheries program need exposure to outside ideas and developments. Sometimes experts from one campus travel to another to speak on a particular topic.

OCEAN ENGINEERING

Development of an ocean engineering academic program was undertaken this year. Because of its expansive shoreline and continental shelf, Alaska has ocean engineering problems more varied than those of any other state. The natural forces of work in our water — wind, waves, current, tides and ice — all present special problems of a magnitude rarely matched in other parts of the world. For example, disposal of waste water in Alaska fjords requires an understanding of estuarine systems which do not occur elsewhere.

This project initiated a program for blending existing oceanography curricula with engineering. Alaska's need for ocean engineering expertise has become obvious in aquaculture work, shoreline erosion protection, oil pollution and spill containment, harbor design, and wave related problems.

Designed for use with advanced undergraduates and beginning graduate students in engineering and applied science, the first part of the program was to stimulate interest in marine specialties for degrees. Graduates could then offer technical assistance suited to Alaska problems for the state's marine users.

FISHERIES INSTITUTES

Fisheries Institutes have proven to be a successful way of fulfilling Alaska Sea Grant's public education commitment. Institutes provide non-credit general education on marine technology and issues of importance to coastal residents. First conducted in Kodiak in 1971, institutes were expanded in response to requests from other Alaska communities.

In 1977-78, an institute on salmon enhancement was held in Petersburg. Kodiak residents attended an institute on harvesting and marketing bottomfish and underdeveloped species.

Two major workshops were held in Anchorage for Sea Grant's parent agency, the National Oceanic and Atmospheric Administration. The first, dealing with the marine resources of Prince William Sound, was conducted for Marine Ecosystems Analysis (MESA), a division of NOAA. The proceedings were used by MESA to produce a plan to study the marine ecosystem of Prince William Sound.

The second, a two day workshop on ocean pollution, was attended by 65 scientists from federal, state, university and conservation agencies who expressed their views to NOAA on research and study priorities in connection with ocean pollution in the Alaska region.

In cooperation with the American Association for the Advancement of Science, Alaska Division, Sea Grant also sponsored the 29th Alaska Science Conference on the University of Alaska's Fairbanks campus. The theme of the conference was, "Alaska Fisheries: 200 Years and 200 Miles of Change."

Continued on Page 10

The Economic Research

Economic research on renewable marine resources centered on a far-reaching analysis of Alaska's seafood processing industry. Although Alaska is among the leading producers of food fish in the the United States, policy makers and planners had very little economic information on the industry. Some progress had been made toward accumulating information on harvesting economics, and little had been done about collecting marketing and processing data. This project was designed to produce in-depth studies on the shellfish processing industry (crab and shrimp) and on finfish processing (salmon, halibut and herring). Investigators concentrated first on shellfish, where the need for information was greater. Production data was received and compiled from the Alaska Department of Fish and Game and put on a computer. From the information, measures of concentrations were determined for king, Tanner and dungeness crab, and shrimp.

Surveys also were sent out to processors to determine individual company structures.

The completed shellfish study (AK-SG-78-10) included buyer and seller concentrations and fluctuations, ownership interties, foreign investment, vertical market channels, sources and barriers of entry into markets, and market structure influence on processing, fishing, consumers and system efficiency.

Another project, this one on demand and market channels for Tanner crab, began with a request from the North Pacific Fishery Management Council to provide data on the current market and projected markets and what effect expanding the allowable harvest would have. The project was continued after the short-term to provide the NPFMC with more complete information on the subject. The study produced a statistical demand model and a description of market channels for king and Tanner crab, both foreign and domestic. The final report was published as AK-SG 78-12.

Program Management

Direct state support for the Alaska Sea Grant Program increased in the year 07. The university continued to provide the Marine Advisory Program with direct appropriations, and supported Sea Grant with overhead service on all of the projects.

Specifically in this year, administration worked to create closer ties between Marine Advisory staff and the research faculty. Development of a formal review procedure for the Sea Grant Program continued with consideration given to including industry spokesmen on the panel. The communications staff also was expanded.

Rapid Response funding was used in three projects. The largest share was invested in planning and development of *Alaska Tidelines*, a monthly marine environment education periodical for Alaska secondary schools. Funding also supported Sea Grant's part in conducting the 29th Alaska Science Conference and in development of plans for the bottomfish industry.

EDUCATION Continued from Page 9

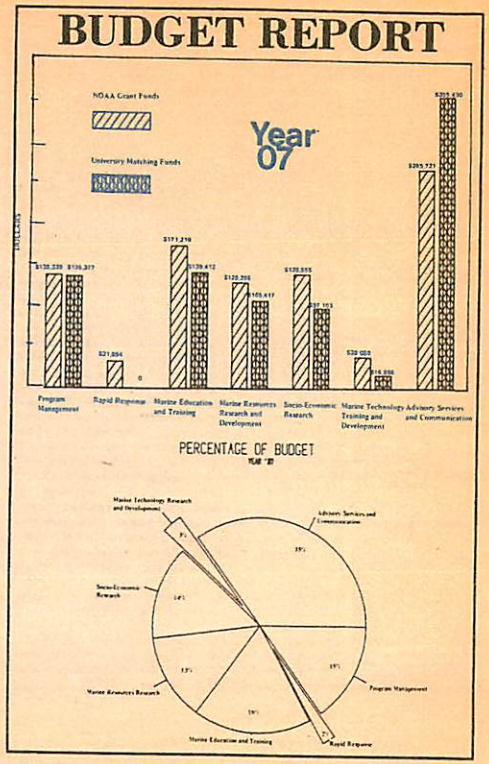
SECONDARY EDUCATION

In answer to requests from teachers and various agencies for marine related curricula relevant to Alaska, Sea Grant devoted a project to youth and teacher education in marine affairs. Some regional curricula already had been developed, but making them work in a classroom was another problem. Alaska Sea Grant's answer was a continuing effort to serve as a source of direct information and instruction for bush teachers.

Designed to instruct teachers, the project concentrated on developing skills for curriculum development, lesson plan development, relating curriculam to the local marine environment, and training participants to act as sources for others in their district. Work included development of supplementary teaching materials and marine sciences curriculum aids. A two session workshop on marine science education was held for rural Alaska teachers, providing a forum for communication among state science teachers.

Alaska Sea Grant also expanded its marine education through 4-H programs, holding three day workshops for local 4-H leaders. Working with Marine Advisory agents, participants designed a summer marine education camp for young Alaskans. Sea Grant hopes to establish through this program self-supporting marine affairs oriented 4-H groups in Kodiak, Cordova and Petersburg.

On-the-spot marine education for young Alaskans is provided at summer 4-H camps with guidance and support from the Alaska Sea Grant Program. At Glacier Spit in Kachemak Bay, clams are gathered, identified, inspected and dissected before landing in the pot. *Photo by Richard S. Lee*



MAP continued from Page 5

This program includes training in ocean survival and abandon ship procedures, first aid, dissemination of safety information, equipment demonstrations, upgrading of safety standards, and assistance to local review boards and individual fishermen for supplementing voluntary standards.

A series of two day Commercial Fishing Fairs were held in six Alaska ports, attended by 350 to 400 people. Information was provided on fire control, Coast Guard emergency procedures, engine oil analysis, life rafts and survival suits, and emergency radio beacons. Each fair included a demonstration of life raft inflation and survival suit use.

MAP also took part in a Seattle seminar on the safe use of rigid polyurethane foam for vessel insulation. The audience included marine surveyors, insurance representatives, boat builders and naval architects.

Joint Sea Grant-AFSAC activities included publication of interim fishing vessel safety standards, which was widely distributed among Alaska fishermen. The standards form the baseline for defining critical areas of concerns on board vessels. Alaska fishermen also formed an incentive program to encourage operators to voluntarily adopt the AFSAC safety standards, which resulted in reduced insurance rates of about 10 percent.

Two meetings were held in Homer to discuss traffic problems in Kachemak Bay where fishermen and commercial shippers were at odds over gear losses. The meetings provided a neutral forum for discussion.

Articles prepared for *Alaska Seas & Coasts* covered such safety topics as engine oil analysis, fire control developments, life rafts and survival packs, and thermal barriers for exposed rigid polyurethane foam insulation.

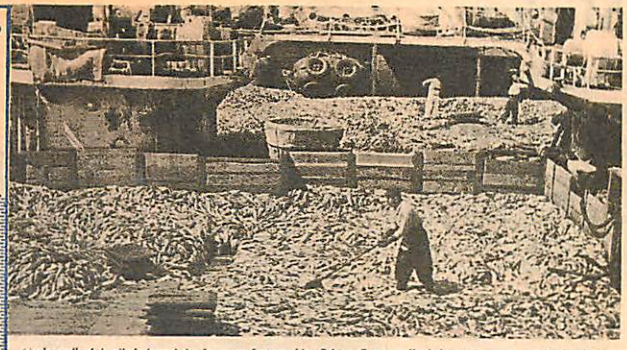
CLAMS Continued from Page 8

Feder and Paul also urged further recruitment studies on the Bering Sea pinkneck since they had observed total year-class failures for recruitment in some Alaskan clams during other research. Because the method of collection used snared only older clams, not much was concluded about recruitment of younger specimens. From the available mortality figures on clams over 12, age classes 13 through 16 were considered stable. The dredging procedure is controversial in this area since little is known about how it affects the bottom environment. The dredge is designed to collect only those clams large enough to be harvested. Smaller ones fall back to the bottom, but how many survive after that is unknown. However, joint study results indicate that dredging is the preferred method of collection among large companies.

With data in hand, the joint participants indicated a strong interest in Alaska's clams. Whether or not harvesting will be an economic possibility is up to chowder producers and their advisers. It does seem reasonable however, that Sea Grant studies have built a strong case for setting up commercial clam operations within the state. Feder and Paul have contributed basic biological information on clams from Southeast Alaska to the Bering Sea, and economists have provided projections for sales and costs. With that in hand, it is likely that Alaska can have a clam industry even if soup producers look elsewhere for chowder clams.

ANNUAL REPORT Nov. 1978/Oct. 1979

Year 08



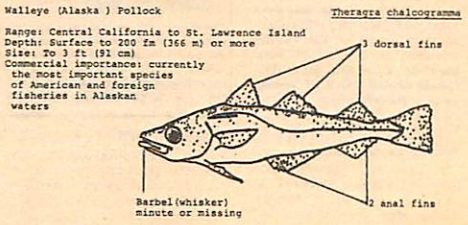
Alaska pollock is piled abroad the Japanese factory ship Soyo Maru. Now harvested almost exclusively by foreign fishing fleets, pollock is a primary target in the development of a bottomfish (white fish) industry in Alaska.

Photo by R.C. Naab, National Marine Fisheries Services.

Underutilized Species

Pollock. Sole. Flounder. Pacific Ocean perch. Red snapper. Pacific cod. Sablefish. Atka mackerel. Smelt. Herring. Capelin. Squid. Octopus. Sea urchin. Sea cucumber. Neptunae sea snails. There is a ready market for all these underutilized species. And billions of pounds are there for the taking in Alaska's nearshore waters and across its continental shelf.

Historically, the finfish species had been sought only by foreign fleets. But in 1977 U.S. fishermen gained a prior right to this rich harvest with the extension of U.S. fisheries management jurisdiction to 200 miles offshore. To take advantage of this vast marine resource, however, they needed information on a whole new set of fishing, handling, processing and marketing techniques. In the year 08, a major thrust of the Alaska Sea Grant Program was helping to provide this knowlege.



From *"White Fish Identification Guide"* Marine Advisory Bulletin No. 9 Alaska Sea Grant Program

ECONOMICS

The economics involved in development of the new fisheries was the subject of a major Sea Grant research project, which had started the year before at the request of the North Pacific Fishery Management Council. The original investigation into joint ventures now was broadened to include studies on comparative cost efficiencies of alternative harvesting and processing methods.

In order to make wise management and investment decisions, more information was required on floating processors and catcher-processors, inshore processing, harvesting costs for bottomfish (white fish — see box lower left), and vessel sizes within the fleet. Acquiring information on large-scale operations meant turning to foreign fleets which have larger enterprises. The result of this research was a series of informational sheets covering various operation modes of bottomfishing, similar to Marine Economic Data Sheets.

PROCESSING

A pilot course of what promised to be a valuable series of fisheries courses was taught in Kodiak. Funded jointly by the Office of the Governor, the Department of Commerce and Economic Development, and the Alaska Sea Grant Program, the course was designed to teach senior fish plant personnel the basics of white fish processing and the means of managing white fish lines.

Among top priorities in connection with the courses was the development of a white fish processing manual covering international product specifications, markets, demand, regulation, species identification, pre- and post-harvest quality changes, and in-plant handling and processing.

The Scandanavian firms of Denconsult Ltd., Faroe Seafoods, and Atlas A.S. were instrumental in the preparation of the manual and aided in the teaching. Personnel from the National Marine Fisheries Service laboratory in Kodiak and the Marine Advisory Program also prepared portions of the manual and taught parts of the course.

Meeting four hours per day for four weeks, the 80 hour course included fish identification; special handling; quality control and sanitation; hand filleting and trimming of cod, pollock, rockfish and flounder, and management oriented sections.

As a result of the course, two bottomfish processing plants in Kodiak have substantially improved their product quality, and a third plant established a white fish line.

Participating seafood processing personnel provided course evaluation to guide further modification and improvement. The program was then reviewed and prepared for future presentation in other fishing ports as the Alaskan white fish industry develops and the need for training increases.

MARKETING

Domestic markets for many of the underutilized species are small, but foreign demand is quite high, notably for sea urchins, sea cucumbers, octopus and squid. Information on these markets, together with preferred handling and processing techniques, is required. This Sea Grant research project was designed to produce a series of publications highlighting world use, international trade and processing techniques.

COMMERCIAL FISHING

The commercial fisheries assistance mission in the Marine Advisory Program was devoted mainly to bottomfish efforts. Modification of gear to bottomfishing needs, harvesting, handling, and processing techniques and marketing were among the areas studied. Other underutilized species were included, such as squid, sea urchin, snails and capelin. All these have stable world markets, but are not traded in volume as are bottomfish.

Through training programs under this effort, Kodiak vessels are developing octopus fishing gear and techniques for full entry into the fishery. Participating vessels in the Kodiak area worked on longline fishing techniques for Pacific cod. The possibility of modifying currently used gear and machinery for the new fishery was examined as an alternative to high investment costs of new machinery.

HERRING

Herring gear and herring fishing workshops were held in villages along the Bering Sea Coast, where fishermen were participating in the herring sac roe fishery for the first time. Local fishermen had become interested in gillnetting for herring as a result of increased quotas and herring prices. The Marine Advisory Program provided training in net construction and herring fishing techniques. These workshops were substituted for planned small engine repair workshops.

Herring roe on kelp fishing was the subject of a workshop held in Cordova. Twenty scientists, fisheries managers and fishermen fr[illegible] Canada and the United States attended. Proceedings were published as Alaska Sea Grant report 79-3.

What's in a name?

They're White Fish, Not Bottomfish

The terms "groundfish" and "bottomfish" are commonly being used in Alaska to designate those species of finfish that are presently underutilized in the state. The fisheries that fall into this grouping are the cods, pollock, flat fishes and rockfish. They are generally referred to as demersal in the scientific literature.

In England and northern Europe, these fishes are called "white fish." White fish are low in oil content, high in protein, and have a predominance of white flesh. Dark or red flesh is a minor part of the total muscle.

"White fish" is a better term than either "groundfish" or "bottomfish" in that the latter two terms imply to the consumer a fish of lower quality and desirability. (No one would refer to a halibut as a bottomfish even though it spends most of its life lying on or moving along the bottom.)

With the exception of sole and flounder, the white fishes spend much of their time off-bottom. This comes as no surprise to the salmon troller who all too often finds a pollock or rockfish on every hook from top to bottom. Also it is common for many of the flounder species to migrate to the surface to feed at night.

The term "white fish" as applied to marine fish should not be confused with the freshwater whitefish, members of the family Coregonidae.

By John F. Doyle
Leader, Marine Advisory Program
From *Alaska Seas & Coasts*, June, 1979

Marine Advisory Program

The Sea Grant Marine Advisory Program and its seven missions continued to grow and change in the year 08, reflecting the expanding needs of Alaskans. This year a new mission on Fisheries Economics was added to the program.

FISHERIES ECONOMICS

The fisheries economics mission was geared toward stabilizing Alaska fishermen's financial records. Discussions with fishermen often showed that a good or bad year was determined by gross revenue. Little attention was given to net profit, operating efficiency or return on investment. This was due primarily to a lack of basic knowledge about financial analysis techniques and a lack of baseline statistics for comparison.

WESTERN ALASKA

A knowledge of fisheries economics was also becoming increasingly important in Western Alaska where the Native people were switching from the traditional subsistence fishing to commercial fishing. There the Marine Advisory Program, through its bilingual agent, conducted business management programs with an emphasis on record keeping, income tax preparation and fishermen's loans.

Workshops were held in 11 villages with over 200 people attending. Participants in St. Mary's and Mountain Village have been on the program for several years and were handling tax problems on their own.

Two workshops on fresh fish handling also were held in an attempt to improve the processing quality of Western Alaska catches. Meetings sponsored by MAP between fishermen and local buyers helped to outline problems and suggest improvements.

AQUACULTURE

With salmon runs improving and more hatcheries coming on line, a uniform reporting system for production and financial tracking of hatcheries was devloped and distributed.

An introductory aquaculture course was taught by the MAP aquaculture specialist in Kenai and Valdez. Several students in the course applied for non-profit salmon hatchery permits and a Valdez group made plans for three salmon resources development projects, two of these production facilities and one educational. In Kodiak, aquaculture courses resulted in four people being hired to monitor local streams for water quality and fish escapement, and spurred construction of a demonstration educational hatchery.

In research, feed comparison ttials were run, stimulating interest in development of a fishfeed processing industry. Papers were presented on this project, including one on the near term potential for aquaculture in Alaska presented at the World Mariculture Society meeting.

The Marine Advisory Program is made up of a team of specialists and field agents dedicated to helping Alaskans in the wise development, utilization and enjoyment of the marine resources of the state. Pictured here (left to right) are Curt Kerns, Anchorage, aquaculture specialist and marine biology; Brian Paust (standing), Petersburg, fisheries and coastal management; John P. Doyle, Anchorage, program leader, fisheries, fish processing, fishing gear; John Ball, Anchorage, safety specialist, economics and management, Craig Wiese, Cordova, fisheries and coastal management, and Hank Pennington, Kodiak, fisheries and coastal management. Absent, Alexie Pavilla, Atmautluak, fishing gear, business administration, small engines.

WORKSHOPS

Sea Grant often conducts conferences and workshops at the request of other agencies, as well as in connection with its own projects. A Kodiak workshop on pandalid shrimp was held in February. International participation by 140 scientists, management personnel and fishermen sought to explain low harvests and improve management strategies. The fourth "Tell It Like It Is" workshop was held in Anchorage just before the King Crab Marketing and Quality Control Board meeting. The meeting allows industry and regulatory officials to talk over current and proposed regulations in a neutral forum. The fifth Better Process Control School was held in Kodiak this year at the request of industry.

The program also put together several meetings on the Prince William Sound clam industry. Although processors and fishermen were ready to exploit this neglected fishery, government sampling wasn't frequent enough to meet safety standards. These meetings resulted in increased sampling and the opening of three new beaches in Prince William Sound to commercial clamming.

SAFETY

In the area of fishing vessel safety, workshops, newsletters, demonstrations and training programs were accomplished throughout the year by the safety specialist. Development of safety standards and education continued to be the most effective conduits for safety work.

Survival technique was the topic for many workshops and safety fairs held during the year. Vessel icing safety standards and new equipment demonstrations were also part of this effort. A series of meetings held in conjunction with the University of Washington involved insurance company representatives, boat builders and marine surveyors. A detailed safety check list for fishing vessels was developed, along with an emergency procedures chart.

Safety publications have included articles in *Alaska Seas and Coasts* on vessel icing, the fishermen's fund, personal survival kits, survival procedures, lazarettes and galley stoves and heaters.

COMMUNICATIONS

The communications project of the ASG Program is responsible for production and dissemination of research results, education materials and advisory information. The ever-growing number of requests for such information makes this project indispensable to effective use of SG efforts by the people its serves.

In addition to publications originating in other parts of the program, the communications project also puts out *Alaska Seas and Coasts*, a 5 issue per year newsletter for the commercial fishing industry, reaching 10,000 subscribers. This year, requests for permission to reprint articles came from varied sources, including *Fisherman's News*. *Alaska* magazine, *Western Fisherman* and *National Fisherman*.

Education and Training

Alaska Seas Grant's growing commitment to marine education and salmon enhancement programs was reflected in new and continuing projects in the year 08.

FELLOWSHIPS

A new Sea Grant Fellowship program was established to give financial assistance to university students enrolled in degree programs emphasizing fisheries. Its goal was to encourage and train Alaskans to assist in the development and conservation of the state's marine resources.

In the first year of the fellowship offering, 18 students applied and five fellowships were awarded.

FISH CULTURE

Another new project provided funds for the establishment of a two semester laboratory course on experimental fish culture at the University of Alaska's Juneau campus. In the labs, students studied relationships between the environment and fish growth by building and operating their own incubation equipment.

CONTINUING PROGRAMS

With marine fisheries education programs successfully established at the University of Alaska campus in Juneau and at Sheldon Jackson College in Sitka, Sea Grant funding ended at the close of year 08.

Throughout the year, however, continued Sea Grant support provided for expanded course offerings, additional teachers, work-study programs, and needed equipment. The introductory aquaculture course also was offered in Petersburg, Kodiak and Kenai.

SECONDARY EDUCATION

Sea Grant sponsored two projects in the area of secondary education. One involved youth and teacher marine education and the other produced a marine educational monthly periodical for use in the classroom.

The first two years of the marine education program were spent developing curricula specifically suited for use in Alaska classrooms. These teaching materials were based on regional environments and marine life with emphasis on aquaculture and fisheries.

Schools in Kodiak, Kake, Sand Point and Ketchikan had developed fisheries and aquaculture programs and 10 other schools had expressed interest in the program. The Marine Advisory education specialist answered requests and questions from teachers throughout the state, and held a number of workshops to help teachers develop their own aquaculture and fisheries programs. The Alaska Sea Grant Program also published a series of classroom teaching aides, including life cycle posters of various fish and shellfish, and books on classroom aquaria and close-up marine photography.

TIDELINES

To help meet a need for timely relevant teaching materials about Alaska's unique marine resources and environment, the monthly publication *ALASKA Tidelines* was developed by the Sea Grant Program.

Statewide circultion grew from 9,000 following distribution of the pilot issue, to 22,000 by the end of the academic year, reaching 340 schools in Alaska. Each month, a different subject is discussed, from salmon to bowhead whales to migrating waterfowl.

Research on Renewable Resources

While the need to diversify catches drew much of Sea Grant's attention in the year 08, research continued toward improvement of Alaska's traditional shellfish and salmon fisheries.

The salmon harvest of 1978 was higher than any since 1971, showing the apparent success of hatchery programs. The state continued its commitment with increased funding for state hatcheries and the four nonprofit private hatcheries.

HATCHERY VS. WILD

Research began this year on genetic interaction between hatchery reared salmon and natural stocks. The project was to determine how much interaction occurred, and if that interaction made any difference in offspring.

Samples and equipment were secured and tagging experiments begun. Four enzymes were noted which displayed variability, suggesting that there were differences between Auke Creek fish and those of other systems.

Tagging took up most of the year. The project was expected to move on to data collection and screening in the next year. Information collected was to be used to determine variation within stocks, similarities between stocks, and divergence between odd-and even-year cycles.

A separate project was concerned with inheritance of egg and fry characteristics by chum salmon. It was designed to determine the effect of hatchery fish transplants, particularly whether they would transmit any weaknesses of survival and reproductive abilities to natural stocks.

Breeding experiments were used to determine genetic control over salmon characteristics. Results will help in developing policies governing the location of hatcheries and transplanting of stocks.

FISHFEED

Fishfeed development projects were started to relieve the feed problem with pink and chum salmon. No feed regimen existed for these species, despite the burgeoning salmon hatchery ventures. Development of a practical locally produced feed would not only solve the problems of releasing hungry fry, but also cut operating costs for Alaska aquaculturists. Diet is a particular problem with these species since their requirements are different from those of king and coho salmon.

The additional objective was development of a feed that would keep without freezing for four weeks at 22 °C and eight weeks at 11 °C, the average hatchery temperature.

OIL AND FISH

Because of the multiple use of Alaska's coastal waters, including oil terminal and tanker traffic, studies began into the effects of oil on the growth of fish. Assuming salmon were consuming in some form oil leaked into the coastal food web by oil tankers and other traffic, fish were examined to note any changes in growth or nutritional value. Pink salmon were chosen for the test because they are common around the oil terminal at Port Valdez.

In the first funding year, brine shrimp raised on oil treated food were cultured. Juvenile salmon were captured and raised in tanks on a diet supplement and the oiled brine shrimp. In the next year, salmon would be examined to determine how much oil came through the chain, if growth was affected, and whether oil changed the nutritional composition of the fish.

CLAMS AND CRABS

Another project related to the food chain dealt with the benthic environment and the growth of clams and crabs. Clams are a major part of the crab diet. Because the crab's food chain is short, it is possible that toxic heavy metals present in the sediments could be transferred from clams to crabs.

Cadmium was selected for study because it appears in sediments and in Cook Inlet clams. It serves no known biological function. It is also found in significant amounts in the vital organs of marine mammals far removed from any pollutants. Again, for these mammals the food chain is short.

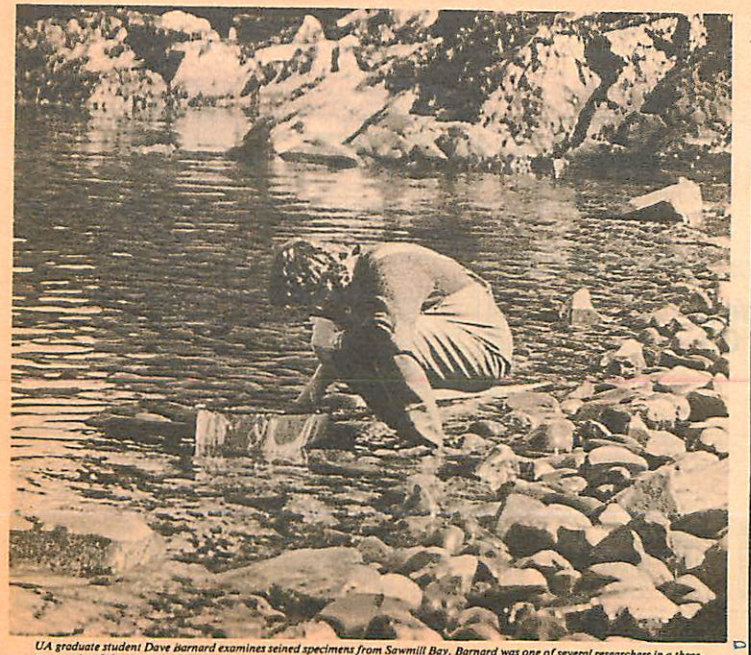
The project was also tied to controversy surrounding the importance of detritus to the energetics of benthic biota. These bacteria are important in the transfer of materials throughout the food chain.

HYDROCYCLONES

As work continued into the use of shellfish wastes as protein supplements for livestock, new research began on efficient ways of separating solids and liquids at processing plants. This was especially needed because of localized water shortages in Alaska, the increasing value of recovered by products, and the need to reduce processing waste.

Major emphasis was placed on hydrocyclone technology. Tests involving simulated wastes were conducted with an average separation efficiency of 94 percent. Slightly lower efficiency resulted when a more typical flow rate was used, averaging to 92 percent.

Energy costs for operation were found to be lower than those of techniques already in use. The hydrocyclones were scheduled for testing in the processing plants during the next funding year.



UA graduate student Dave Barnard examines seined specimens from Sawmill Bay. Barnard was one of several researchers in a three-year study of the estuary and its importance in the survival of hatchery released fry.

A satellite view of the pack ice moving through the Bering Strait.

Courtesy of UA Geophysical Institute

Coastal Research

SEA ICE

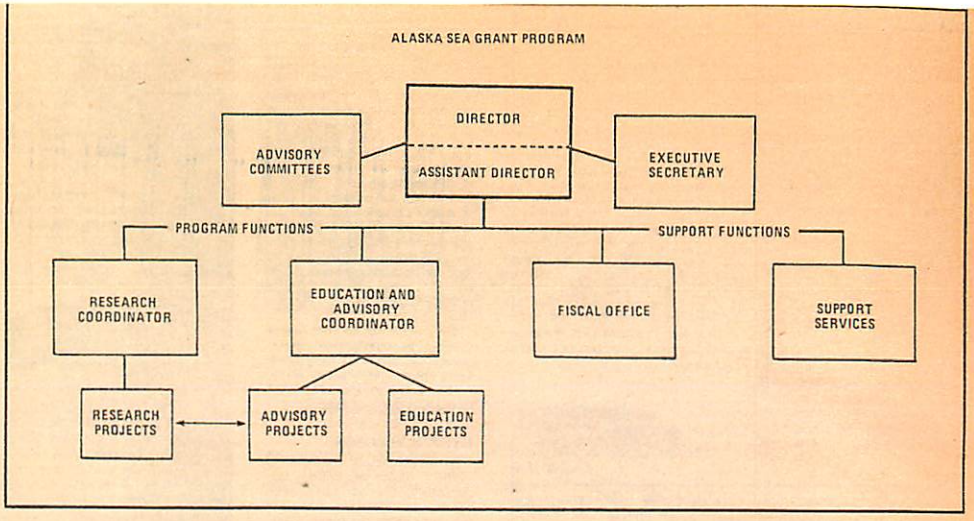
Since 1973 the University of Alaska has maintained a radar system at Barrow to monitor the nearshore movement of sea ice. The system has been operating continuously and although sections of the material had been used in various combinations, no analysis had been done on the complete record.

Recorded instances of pack and fast ice build up and movement could prove invaluable to those working in offshore waters. Images were studied during the first funding year with the ultimate goal of mapping seasonal boundaries of the landfast ice.

WAVE ACTIVITY

Another study dealt with predicting wave activity. Alaska has some severe erosion problems, as well as the need to know about wave effects on structures in the offshore areas.

The project work was aimed at development of computer models to evaluate and predict wave activity. A similar model created by the Virginia Institute of Marine Science was adopted for use in the University of Alaska computer.



Program Management

Program work is divided into four areas: administration, education and training, information and advisory services, and research. Research programs are further divided into the categories of renewable marine resources, and coastal and human resources.

In the year 08, these efforts were concentrated on shellfish development, salmon ranching, seafood processing and marketing, bottomfish development, under used species, ice motion and distribution, and other projects.

In addition, Rapid Response money allows the program to meet short-term needs for information and research which develops after the proposal is written and accepted.

This year Rapid Response funds went to six projects including: compilation of catch data of foreign fleets; preparation of a guide to common seaweeds of Alaska; development of a forecasting model for Alaska's commercial fisheries; continuation of graduate studies on estuarine survival; studies on fecundity in Bristol Bay salmon, and fluctuations in meteorological and oceanographic parameters in Alaskan waters.

External guidance had been provided by the Alaska Interagency Fisheries Committee. This panel was modified in 1978-1979 to include representatives of industry and government agencies. It was renamed the Sea Grant Advisory Panel and divided into two groups, whose main duties are to review Sea Grant's annual proposal.

External review panel members for research projects were:

Clinton Atkinson, fisheries consultant, Seattle.

Dr. William Smoker, Director, Auke Bay Laboratory National Marine Fisheries Service, Auke Bay.

Steven Pennoyer, Director, Division of Commercial Fisheries, Alaska Department of Fish and Game, Juneau.

Mark Hutton, Assistant Executive Director, North Pacific Fishery Management Council, Anchorage.

Dr. George Rogers, professor, University of Alaska, Juneau.

External review panel members for education and advisory projects were:

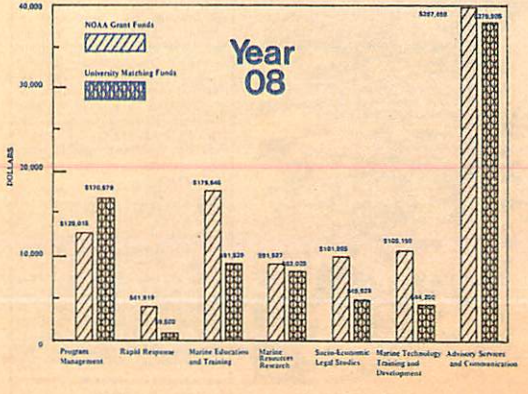
Clinton Atkinson, fisheries consultant, Seattle.

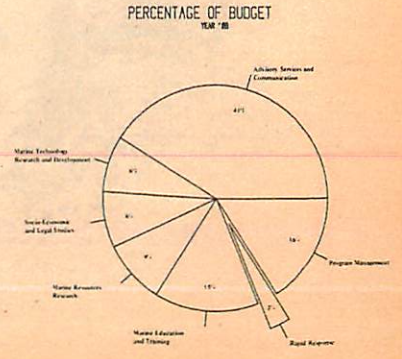
Ron Bedard, Office of Education Program Support, Alaska Department of Education, Juneau.

Gail Nichols, biology teacher, North Star Borough School District, Fairbanks.

Dr. Joan Clutts, Director of Instructional Services, School of Education, University of Alaska, Fairbanks.

BUDGET REPORT





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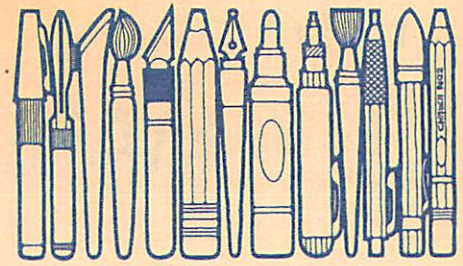

AK-SG-76-10 History of the Marine Hatcheries of Alaska
William R. Hunt, 45 pp.

AK-SG-76-11 A Preliminary Study on Rearing Chum Salmon
A.J. Paul, D.W. Hood, R.A. Neve, 6 pp.

AK-SG-76-12 Bibliography of Marine Teaching Materials
R.S. Lee, 17 pp.

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R.S. Lee, 10 pp.

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R.S. Lee, 10 pp.

AK-SG-76-15 A Coupled Heat and Salt Transport Model for Subsea Permafrost
W.D. Harrison, T.E. Osterkaup, 21 pp.

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J.S. Zenan and P.H. Brommelseik, 20 pp.

AK-SG-76-17 Alaska Statutes: Commercial Fishing Loan Act, Salmon Hatcheries and Fisheries Enhancement Loan Program
E.T. Robinson, 17 pp.

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R.D. Nelson, M.Tauriainen, J.Borghorst, 60 pp.

AK-SG-77-2 Japanese and Soviet Attitudes Toward Aquaculture
T.Nishiyama, 19 pp.

AK-SG-77-3 Life Cycle Posters Curriculum Aid No. 4 (set of 5 posters showing life cycles of pink shrimp, Pacific halibut, king crab, ocean perch and weathervane scallop, each 24" x 36")

AK-SG-77-4 The Economic Feasilibity of Private Non-Profit Salmon Hatcheries
F.L. Orth, 15 pp.

AK-SG-77-5 The Bering Sea Tanner Crab Resource: U.S. Production Capacity and Marketing
E.Anderson, C.Atkinson, A.Gorham, H.Ness, F.L. Orth, L.Queirolo, J.Richardson, 157 pp.

AK-SG-77-6 Alaska Statutes: Commercial Fishing Loan Act, Salmon Hatcheries and Fisheries Enhancement Program, As Amended
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AK-SG-77-7 Proceedings of the Second Aquaculture Conference
B.R. Melteff, ed., 78 pp.

AK-SG-77-8 Proceedings of the Cordova Fisheries Institute
B.R. Melteff, ed., 259 pp.

AK-SG-77-9 Hydrography, Nutrient Chemistry and Primary Productivity of Resurrection Bay, Alaska
D.T. Heggie, D.W. Boisseau, D.C. Burrell, 111 pp.

AK-SG-77-10 Data Report Benthic Survey for Port Valdez, Alaska
H.M. Feder, G.J. Mueller, 59 pp.

AK-SG-77-11 Southeast Alaska Troll Logbook Program, 1976 Scientific Report
Alaska Trollers Association, 61 pp.

AK-SG-77-12 Age and Growth of the Pinkneck Clam, *Spisula Polynyma* in the Bering Sea
H.M. Feder, A.J. Paul, J.M. Paul, 58 pp.

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F.L. Orth, 13 pp.

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H.M. Feder, A.J. Paul and J.M. Paul, 26 pp.

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P.B. Reichardt, R.A. Nevé, R.M. Gershey, S.Hall, D.L. Musgrave, P.J. Seaton and G.A. Swisher, 49 pp.

AK-SG-78-4 Some Aspects of the Carrying Capacity of Prince William Sound, Alaska for Hatchery Released Pink and Chum Salmon Fry
R.T. Cooney, D.L. Urquhart, R.A. Nevé, J.Hilsinger, R.Clasby and D.Barnard, 98 pp.

AK-SG-78-5 Alaska Sea Grant Annual Report, 1976
D.R. Rosenberg, 20 pp.

AK-SG-78-6 An Investigation of Certain Aspects of Marine Disposal of Crab Processing Wastes, Dutch Harbor, Alaska
J.M. Colonell and W.S. Reeburgh, 31 pp.

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A.H. Gorham, 63 pp.

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J.Ball, C.Kerns, C.Weise and F.L. Orth, 36 pp.

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F.L. Orth, J.R. Wilson, J.Richardson and S.M. Pidde (in press)

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J.B. Martin, 123 pp.

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J.M. Terry, A.H. Gorham, D.Larson, B.C. Paust, R. Scoles, R.S. Johnston, F.J. Smith, F.L. Orth and P.W. Rogers, 515 pp.

AK-SG-79-3 Proceedings of the Herring Roe on Kelp Workshop
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A.J. Ippolito, H.J. Niebauer, T. Nishiyama and T. Weingartner, 31 pp.

AK-SG-79-12 Recent Fluctuations in Meteorological and Oceanic Parameters in Alaskan Waters
H.J. Niebauer, 34 pp.

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