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Alaska Fisheries

Development Foundation, Inc.

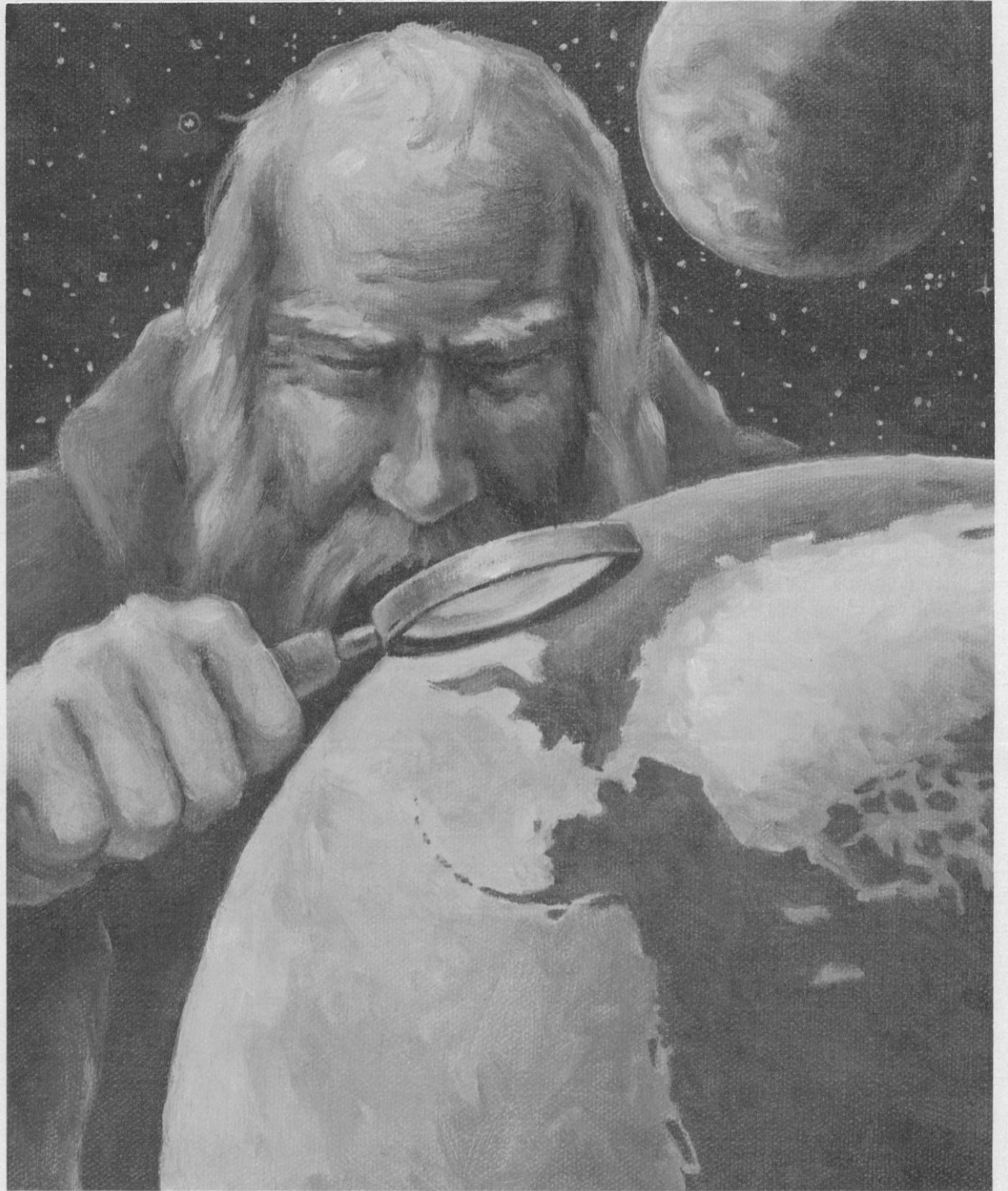
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## *Take a good look*

*Fisheries development off Alaska was first perceived to mean getting as much as possible from the sea. More recently we've begun to think of fisheries development as full utilization of what we do harvest. Now we are learning that the sea nourishes us in more ways than it feeds us.*

By Krys Holmes

Illustration by Joe Nedland



**S**almon processors are facing an opportunity that could bring in more money than fillets, cans or fish eggs ever landed in Alaska. Scientific research has revealed that DHA (docosahexaenoic acid, an important Omega-3 fatty acid) is an necessary nutrient to early brain development and to the cardiovascular system later in life. This discovery is leading to more and more research, which will require greater supplies of purified DHA. And the best source of DHA in the world is fish oil from the head of an Alaska salmon.

Purified fish oil in the form of 90% DHA currently sells for about \$300/ml. But the only source of purified DHA in the U.S. is the National Marine Fisheries Service (NMFS) lab in Charleston, S.C., where menhaden oil is super-processed to produce EPA (eicosapentaenoic acid, a different Omega-3 fatty acid, which is important to adrenal glands, the kidneys and the aorta). DHA is a by-product of EPA refinement. Menhaden is an imperfect source for DHA, however. If researchers want a sure supply of refined DHA—and signals are that they will—they will have to turn to foreign sources. Or they will come to Alaska.

“Salmon contains twice as much DHA as any other fish species,” said Roger Lindsley, a nephrologist from Oregon. “And it comes from salmon waste, which is attainable without directing a new fishery. We’re trying to match DHA with the clinical research that’s going on.”

Lindsley is a part-time salmon fisherman, and graduate of Oregon’s Univer-

sity of Health Sciences. The “we” he refers to means himself and Silver Lining Seafoods of Ketchikan, Alaska. Together they are researching the costs of producing refined DHA, the potential market among clinical researchers, and the possibility of widespread demand for DHA in specialized products in the future. Lindsley believes that in the next five to ten years the Food and Drug Administration will pronounce DHA and EPA an essential nutrient, and that the market for salmon head oil will blow wide open.

“In the event that these two fatty acids are described as essential by FDA, then they will have to be included in products that are specifically used as complete human dietary products,” he said. “For example, baby formula, or geriatric supplements, or nutritional supplements for someone being tube-fed, these may be required to include DHA,” he said.

But before that comes the clinical research stage, where researchers use human subjects on long-term, large-scale studies to chart the actual effects of EPA and DHA on humans. This clinical research is not going on now, Lindsley said, because there is not enough 90% DHA in triglyceride form to support it. Silver Lining Seafoods is studying what it would take to acquire basic salmon oil purifying equipment and perhaps contract with the NMFS lab in Seattle for supercritical extraction of the oil to a 90% DHA form. So far, Lindsley said, the figures show it’s pretty costly to produce pure DHA in this way, but a cooperative effort by the salmon processors of Alaska could create an economy of scale that would be profitable for everyone.

*Continued on next page...*



"The main thing we want to avoid is processors just selling the raw salmon oil, or low-temperature centrifuged oil to drug companies who would raise the value of the salmon oil themselves, and very cost-effectively," he said. "Drug companies understand the chemical aspects of the process, and they'd probably like to have control over the source."

But to maximize profits to Alaskan processors, they should control the oil through the refining stage, he said. "The supercritical extraction process (by which salmon head oil is refined to 90% DHA) was developed on fisheries time, at the NMFS lab in Seattle. It would be a very bad thing for a drug company to apply this technology instead of a fishing organization."

Supercritical extraction is similar to the process by which coffee is decaffeinated, Lindsley said. "Imagine if drug companies were decaffeinating coffee. There wouldn't be a decaffeinated coffee industry. But it was the coffee bean processors who used the technology for the benefit of their own industry." Lindsley and Silver Lining would like to see salmon processors benefit from DHA production by pooling their raw salmon oil and their money, contracting with a lab—the Seattle NMFS lab, most likely—to refine the oil to market specifications, and thereby getting the most value from the oil.

Supercritical fluid carbon dioxide extraction was developed at the NMFS Northwest and Alaska Fisheries Center, where fish oil purification has been going on for thirty years. Basically, CO<sub>2</sub> is used to release supercritical fluids in the oil. (For a more complete explanation, read "Fish Oil Research at the NWAFC" by Dr. Virginia Stout in *Rendering Profits*, Proceedings from the AFDF Fish Oil Seminar; it's available from

AFDF.)

There are several ways to process fish oil, and the various products command different market prices: about 5 cents per pound for raw salmon waste; around 50 cents after low-temperature processing, up to \$35/kg. after chemical processing, and up to \$500/kg. after supercritical

*"The process was developed on fisheries time. It would be a very bad thing for a drug company to apply this technology, instead of a fishing organization.."*

fractionation. According to Lindsley, salmon oil purified by a highly specialized process could bring in \$1,600-\$2,000/kg. It's the highly purified products that will be in greatest demand from clinical researchers.

"Alaska salmon processors could not provide enough oil to fill the demand among clinical research units," he said. "If DHA was declared essential by the FDA tomorrow, the source would be Japanese oil that's already being produced in bulk, or Chilean pen-reared salmon oil, and it would be refined by drug companies. They're the only people who could react to the announcement tomorrow, and drug companies tend to deal with sources they can control."

Lindsley said the next few years of clinical research will give salmon processors time to gear up as domestic suppliers of refined DHA. There are obstacles, however. First of all, the rendering equipment now used in most meal and oil plants on the West Coast destroys long-chain polyunsaturated fatty acids—the essential Omega-3's. Processors will have

to learn about a new breed of equipment, which will cost money and time. Salmon plants are spread out across the West Coast, also, making it difficult to organize a central location for collecting salmon heads for oil. The high costs of producing DHA may require that processing plants join together in a cooperative

venture, something competitors may be reluctant to do.

To tap into the clinical research market, processors will have to work with NMFS and the National Institute of Health. The Institute and the Alcohol, Drug Abuse and Mental Health Administration have been studying the effects of fish oils on the cardiovascular and immune systems for about six years. They have an agreement with NMFS in Charleston to provide EPA and DHA for clinical research. The agreement includes tax credits for commercial suppliers of the raw material. Alaskan salmon processors interested in building a DHA supply may have to get political help to become a part of the Institute's fish oil test program and receive tax credits for investment in the technology. Lindsley said he has enlisted the help of Sen. Ted Stevens of Alaska.

"I've been a fisherman and I've worked in the lab," Lindsley said. "I realize fishermen have a strong concern for today's profits. If this can't be developed on a profit-oriented basis, it won't happen. But it will take

an initial cooperative effort by Alaskan shore-based processors that's big enough to achieve economies of scale."

Lindsley seems confident that FDA will someday pronounce DHA an essential nutrient for humans, despite the perils of predicting federal pronouncements on any level. "DHA is present in mother's milk, and it's one of the main components of gray matter, of which humans have an incredibly large amount," he said. "We've known this for probably twenty years. I think the reason DHA hasn't been declared essential before this is we haven't been able to do the clinical research (on humans) to document essentiality. There hasn't been a supply of DHA to use."

Clinical research probably would focus on premature infants, pregnant women with a history of low birth rates, and cardiovascular patients. Lindsley believes research subjects will not be hard to come by because there is no known adverse side effect to fatty acid consumption. Though fish liver oil is high in vitamin A, which can create toxicity, refined salmon head oil is safe even in large quantities.

"We have evolved to a land-based food ecosystem, and moved away from the fatty acids that we require in our diet," Lindsley said. "We evolved from the ocean, but we've moved away from it, and now we're paying for it in heart disease, low birth rates, and possibly mortality."

"I believe very much this research will give us healthier babies, and it will benefit the fishermen, too," he said.

*Processors interested in learning more about DHA production from salmon head oil may call Loretta Lure at AFDF, (907) 276-7315. Roger Lindsley is in Aloha, Oregon at (503) 642-1952.*

## INTERNATIONAL BY-PRODUCTS CONFERENCE APRIL 1990

*"Some of the people who will be here base their entire businesses on by-products similar to those that processors in the North Pacific throw away."*

Fish by-products experts from Europe, Iceland, Japan and both coasts of North America will meet Alaskan fish processors in Anchorage in April 1990 to explore the potential of North Pacific fishery by-products. AFDF, NMFS, the University of Alaska Marine Advisory Program and several seafood firms are sponsoring "Alaska's Billions of Pounds of Protein," the first international by-products conference ever held in Alaska. It will be April 25-27 at the Egan Convention Center in Anchorage.

Fish processors now use only one third of the marketable material that is harvested from the North Pacific. In the 1.2 million metric-ton groundfish fishery, processors discard nearly 700,000 tons of offal, bones, cheeks, heads, skins and other protein-rich materials that could be used in valuable products. The Alaska salmon fishery alone generated about 175 million lbs. of by-products material in 1989. Salmon skins, which used to be considered worthless because they obstructed offal grinders and raised ash content of fish meal, now command \$0.70 to \$1.00 per pound from producers of salmon leather accessories. Most of the speakers at the conference will discuss how similar developments in other areas of by-product processing could benefit Alaskan processors.

"Some of the people who will speak at the conference base their entire business on by-products similar to those that processors in the North Pacific throw away," said AFDF's Peter Moore, chairman of the conference. "We are bringing these people here to introduce them to Alaskan processors. We're hoping for a two-way exchange, so that processors here can learn more about the processing and marketing possibilities, and we also want users from around the world to see Alaska's potential."

The conference will end with a one-day tour to the Seward Fisheries plant south of Anchorage, which produces 150 tons of fish meal per day. Booth space will be available throughout the conference to give seafood processors, equipment manufacturers and other technology peddlers a chance to showcase their wares.

Registration is \$70 per person, and the sponsors are hoping each processing plant will send quality control, production and marketing staff to the conference. For more information contact Moore at AFDF, or Brenda Melteff at the University of Alaska Fairbanks Marine Advisory Program, (907) 474-7086.





*Nine Star Productions filmed AFDF's new video at the Portage Glacier Information Center. The video will be available from AFDF in January.*

## NEW VIDEO FEATURES PRODUCT DEVELOPMENT

Imagine it's the year 2989 and you're a lowly miner at the Zeta 5 Water Mine. Your job is to chip glacier dirt with a pickaxe to be melted into the world's most valuable resource, fresh water. Annoying you is the historian who accompanies all glacier mining teams to search for any artifacts unearthed in the process.

You come across an ancient video machine, a relic from the days when fresh water was abundant and therefore expendable. The historian pops in the video, and it begins playing. You are amused. It is an interview with someone who lived a thousand years before you, in another time and therefore in a very different place. He is describing how, in his generation, people came to have a very different attitude about the food they gathered from the sea. He talks about how all the foods you carry in your lunchpail first came to be.

This is the story told in AFDF's newest video about product development. It features Chef Eric Benson, creator of a host of foods made from salmon mince, surimi and other seafood materials that have yet to demonstrate their full potential. The 10-minute video was produced by Nine Star Productions of Anchorage.

In the video, Chef Benson demonstrates how some of his new products are made and what their market potential is, particularly among restaurateurs. Benson has tested his products in restaurants and kitchens, and among the pickiest of eaters at the Oregon Chef de Cuisine, a banquet for 250 chefs in the Oregon region. "Believe me, these products can go somewhere," he said after the Chef de Cuisine dinner.

Copies of the video will be available from AFDF in early January for \$15 each. For information call Loretta Lure at AFDF.

## Want to make hydrolysate?

Fish processors interested in experimenting with full-scale hydrolysis of fish waste should prepare to submit proposals to AFDF by late January. Hydrolysis is a process that separates solids from oils in fish waste, and produces oil, condensed protein and wet bone meal of a higher quality than other rendering systems.

AFDF will provide a 1000 lb.-per-hour (intake) hydrolyzer developed by Advanced Hydrolyzing Systems, as well as technical assistance and training for two or three plant workers. AFDF is looking for a processor who can run at least three species of Alaskan fish, one of which should be low in oil content. The processor must supply some handling and storage materials and provide samples to interested users.

"Hydrolysis is one of the most promising waste processing technologies available," said project manager Loretta Lure. "We've been experimenting with hydroly-

sis on a pilot scale for the past two salmon seasons, at North Pacific Processors and Ketchikan Seafoods. Both plants had very positive results. Now we'd like to try it on a larger scale with several species."

One advantage of the hydrolyzer is that it can be operated on a batch schedule or continuously, depending on the waste stream of the plant. "If you're a small processor and have limited amount of waste, or only seasonal production, you can run as much as you want at a time," Lure said. "If this concept is really as good as everybody thinks it is, when the technology gets scaled up, processors with huge amounts of waste can produce a finished product of a very high quality—more refined than regular meal and oil."

AFDF has issued a request for proposals for the hydrolyzer, which contains details of the project and specific requirements for proposers. For copies, contact Loretta Lure at AFDF.

# MEMBERS ONLY

News of AFDF's member companies

## New members join AFDF

AFDF welcomes two new members this December: Bill Bossert represents Flavorite Labs, Inc., a flavoring company based in Memphis, Tenn.

(associate member) and Steven A. Russell, a halibut longliner and shrimp pot fisherman who lives in Kenai, Alaska.

## Alaskan Gourmet New building, products, seafood kitchen

"I don't even think there's a seafood shop in the Seattle area like this," said Paul Schilling of Alaskan Gourmet six months after moving into their new Anchorage building. Alaskan Gourmet expanded last summer into a second building nearly four times the size of their first building, which now is the plant's processing and distribution area.

"We've added a micro-cannery, where everything is done by hand. We use a unique can that is oval with a pull-top ring, and comes in two sizes. The small can has smoked or filleted salmon, and the large one has a 7-oz. salmon steak," Schilling said.

The shop's expansion includes a smoking operation, 1,800 square feet of retail space, a full-service take-out seafood deli and sampling area, and a test kitchen that Alaskan Gourmet will open to the public for product development, cooking demonstrations, and seafood preparation classes they hope to sponsor next summer.

"We've already had wholesale customers request use of the kitchen," Schilling said. "I think that's going to be a real positive thing for us." Not to mention that sales have shot up 50% since they opened the new building. More information: Alaskan Gourmet, Inc., P.O. Box 190733, Anchorage, Alaska 99519; (907) 563-3752.

## Survey said: Secondary processing is greatest untapped opportunity in Alaskan fisheries

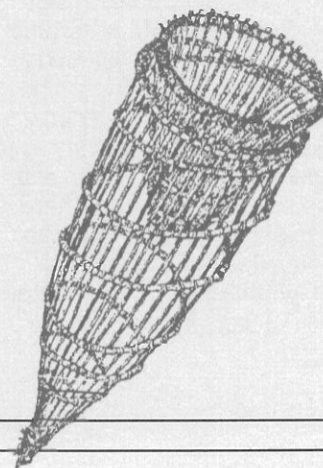
One of four respondents to AFDF's industry survey said they thought secondary processing represents the greatest opportunity for seafood development in Alaska in the next five years. Of the 145 people surveyed by phone last fall, 15% thought AFDF should focus on flatfish, 15% said the focus should be on groundfish, and 13% said by-product development is the most important challenge ahead.

When asked how efficiency of seafood harvesting could be improved, 32% chose stabilizing fishing seasons, 22% chose reducing prohibited species by-catch, and 19% chose developing new preservation methods. When asked how processing could be made more efficient, 23% said a predictable supply of material was top priority; 22% said value-added processing for existing production was the key; 20% said waste should be reduced; and 14% said automation of primary processing would be the key.

Of all the fish species not now being harvested in large numbers by the domestic industry off Alaska, respondents chose arrowtooth floun-

der as the most important, followed by Atka mackerel and squid. And in identifying opportunities for improved utilization, 39% of shore processors said salmon shows the largest opportunity; floating processors were split between pollock and flatfish (20% voted for each); 38% of groundfish harvesters identified pollock; 25% of other harvesters voted for salmon, and 29% of respondents from support industries said salmon was the strongest candidate for improved utilization, followed by pollock and flatfish.

A copy of the survey and an accompanying analysis is available free of charge from AFDF.





## WHAT'S GOING ON WITH



The U.S. surimi business has come along way since its beginning on Kodiak Island in those sunless days of January 1985. Two hundred people converged on Kodiak for the opening of the surimi plant at Alaska Pacific Seafoods in March of that year. The mood was edgy, the weather icy and the voices of the people gathered around the shiny stainless equipment were full of hope.

It's been five years since Alaska Pacific Seafoods cranked up its surimi line under AFDF's surimi industry development project, which was funded by National Marine Fisheries Service (NMFS). Here at the Foundation, we've watched the surimi business from its first uncertain steps through its early development. As this decade folds over we find a healthy industry growing in several directions, still with more potential than past success, and with about as many bruises as any other five-year old. The data base of surimi research is increasing; surimi is being used in more applications; and production has increased more than 100% over 1988. NMFS estimates 1989 surimi production at 311 million lbs., compared to 126 million in 1988 and 67 million in 1987.

### Still in foreigners' hands

Growth has brought prosperity and strength to the industry, but it's brought problems, too. The U.S. surimi industry still is primarily foreign-controlled on both production and the user end. Of the 22 plants now producing surimi in Alaska (5 on shore and 17 at sea), the vast majority are owned or partly owned by Japanese companies. This year, 75 percent of the surimi produced in the U.S. was exported, and 84% of exports went to Japan. About 45% of U.S. analog companies have foreign connections.

Foreign control exerts itself in many ways. All surimi is priced and marketed according to a grading system based on traditional Japanese criteria of color, gel strength, water content, and where the surimi was produced. Some surimiphiles in the U.S. believe the industry needs to break out of this system and determine price according to objective measurements of the functional attributes of surimi. That way surimi could be sold according to the user's specifications rather than its current market strata of grades.

Pacific pollock, the raw material for most U.S. surimi, is no longer the great untapped resource. This year for the first time the total domestic capacity to process pollock will exceed the allowable catch, according to NMFS. Not that the resource is disappearing, though biologists believe pollock is on a slight decline. But harvesting and processing capacity has increased so quickly, in and out of the 200-mile limit, that there is more demand for pollock than can be prudently taken from the sea.

Can all this surimi be marketed? Where is it going? Exports are ex-

pected to increase in 1990, as Japanese production of pollock surimi declines. (Still, 44% of Japan's pollock surimi will come from Donut Hole pollock stocks.) Surimi prices were on a long uphill hike when the U.S. came on the scene in 1985. Japanese market prices topped out at \$1.78/lb. (500Y/kg.) in 1987, and have declined some since then. Top prices paid for U.S. surimi is \$1.50/lb. this year, though prices usually range between \$1.25 and \$0.70/lb.

Domestic users purchased only about 40,000 lbs. of the U.S.-made surimi. Unless the U.S. market sees unbelievable growth in the next few years, exports will continue to be the mainstay of the surimi business.

U.S. consumption of surimi is still in the form of seafood analogs. Imitation crab took off so quickly in the U.S. market in the early 1980s, growing 100% per year between 1980 and 84, that some people predicted that we'd be consuming a billion pounds of surimi seafoods per year by 1990, 3 billion lbs. by 2000. Now, as we're about to flip our calendars on a 150-million-lb. year, we realize how optimistic that prediction was. The domestic market for surimi-based seafoods has slowed; 1989 consumption of 150 million lbs. was only 12% higher than 1988.

### Growth behind the scenes

What the surimi business has missed in numbers it's gained in interest. The most fascinating

changes in the business are playing out behind the scenes, in the areas not monitored by industry surveys and market updates. Surimi has been tested as a possible ingredient in kidney treatments, baby food, moisturizing cream, and a host of other applications. It is being used in lunchmeats, sausages, pizza toppings, pasta noodles, flaked imitation chicken meat and breaded nuggets.

Many of these applications provide a market for non-analog grade surimi that is darker, contains more water, or has a lower gelling ability than surimi used in imitation crab. Rae McFarland of McFarland Foods, who's producing Italian Medallions pizza topping, has designed his own variation of the surimi process that produces darker surimi with qualities particularly suited for meat blends. He calls his product Amerimi, for Americanized surimi.

Kona Ocean Products in Kailua-Kona, Hawaii, is experimenting with marlin sausage using surimi. "The C grade surimi is working really well in my marlin sausage," said Kona's Michael Thompson.

### First it was imitation chicken from surimi ...

In an interesting twist, some poultry producers may get back at the fish business for creating surimi-based imitation flaked chicken meat. Professor Hershell Ball of North Carolina State University is making

seafood analogs using surimi made from poultry by-products. Apparently chicken-based surimi doesn't process as well as pollock surimi, but the industry could potentially produce 3 to 6 million lbs. of poultry surimi per year from chicken by-products.

There are two things the surimi business could learn from Prof. Ball's work with poultry-based surimi. First, dark poultry waste meat has to be lightened in the surimi production process, a trick that might benefit fish surimi producers. Second, the potential appearance of darker surimi with relatively low gelling ability might create the basis for a steady market for so-called low-grade surimi as an ingredient in the food industry. Right now there is little or no market for low-grade surimi.

### Learning the details

"It's American Now," AFDF pronounced at the startup of the surimi project. Surimi indeed is on American soil and in American waters. But it is not entirely ours, because there is much yet we don't understand about it. Dr. Jong Lee and Brian Himelbloom of the Fishery Industrial Technology Center (FITC) have completed a study to help increase understanding of surimi quality.

Lee and Himelbloom have compiled the first comprehensive study of the microbiological quality of surimi and how it's affected during the surimi-making process. They studied two shore-based surimi plants, charting growth of microorganisms at each stage of processing.

They drew three conclusions: First, bacteria levels usually increased with each stage of processing, with the highest microbial counts detected in surimi. Second, they determined that bacteria grow even when operating temperatures are as low as 8°C, and freezing and thawing the product had no effect on bacterial flora. And third, they determined that a potential source of coliforms and related bacteria in the product could be attributed to the Kodiak harbor. None of these conclusions raised any health concerns relating to domestic surimi production, however.

The FITC's microbiological study of surimi provides the first real information about the microbial quality of surimi and how it is affected by processing conditions. A copy of the report is available from AFDF free of charge. (Ask for "Microbiological Study of Surimi Production: Phase II - Final Report.")

These are only a few of the recent developments in the surimi business. They only indicate, but don't fully describe, how the industry is maturing and finding its form on this side of the Pacific. What happens in the next five years will depend upon our care of the resources, our initiative on the market, and the strength of our creative impulses.



## New computer program cuts costs and waste for surimi business

It took five years to do it, but Dr. Tyre Lanier has brought computer technology to surimi processing to save seafood analog producers significant ingredient costs, and help cut waste on the surimi production line.

A food science professor at North Carolina State University, Lanier and his colleague, Dr. Jae Park, have applied least-cost linear programming (LCLP), a computer program used in the sausage and bologna business, to crab stick manufacturing. Linear programming helps producers of blended products

budgets. For the first time, blended meat producers could easily manage production costs, even though market prices for raw materials—pork bellies, or corn syrup, let's say—fluctuated wildly.

Two things have changed since then: Computers have gotten smaller, more powerful, less expensive, and are used more by every business. And the food business has begun to look at fish the same way we looked at meat 25 years ago: as a functional protein ingredient. With the introduction of LCLP into blended seafoods, surimi may be-

surimi's gel-forming ability. This means that plants can use any convenient method for testing surimi properties, but should disputes between buyers and producers arise, the torsion test will be used to settle the dispute. The Alaska Factory Trawlers Association also may endorse the torsion test as part of NFI's complete manual of surimi testing methods. They will review the manual in mid-January.

The torsion test measures the gel properties of surimi in terms of stress and strain required to break a sample of surimi apart. It gives numeric values to gel strength (stress) and cohesiveness (strain) in a repeatable, objective test. The torsion test has been shown to relate better to the mouth's perception of gel properties than other methods of measurement.

Lanier and Park gained the cooperation of SeaFest to test LCLP in a commercial plant. First they tested each lot of surimi that came to the plant, assigning each lot a gelling ability factor. Then they tested each lot, individually and in blends, after starch, water and other analog-making ingredients were added. The gelling properties of the formulated batter was tested just before extru-

formulations has been reduced," Lanier wrote.

The five-year project means more than just a computer program to Lanier. "I think it will help U.S. producers gain more control over our industry," he said. "Linear programming helps producers learn more about the materials they're using. It takes more than just a Joe Blow to operate it. It requires that you really understand how the formulations work. And if everybody started operating that way, there would be a market for a wider variety of surimi types."

An added benefit would be if the industry could begin to see surimi with darker color or lower gel strength than SA grade not as "low-grade," but as surimi with different functional properties useful in different applications. "Think of it this way," Lanier said. "The highest quality red meat is equivalent in most regards to the lowest quality surimi. Yet red meat is a valuable ingredient. We just have to change our thinking about the word 'quality' when we talk about surimi."

As complex as the initial tests were, LCLP doesn't require any brain strain to operate. It's commonly used now in the meat indus-

*I think it will help U.S. producers gain more control over our industry. It requires that you really understand how the formulations work. If everybody started operating that way, there would be a market for a variety of surimi types."*

choose the least expensive blend of ingredients to produce a consistent quality product.

Lanier always figured linear programming would be ideal for blended seafoods. LCLP has been around since the 1950s, when a food scientist at the University of Georgia named R.L. Saffle started messing with formulations for bologna and other blended meats. Saffle found himself an IBM computer and created a program that charted the ingredients in a product, the effect each ingredient had on the finished product, and the costs of each one. As the price of raw materials fluctuates, the computer program tells producers what ingredients they can substitute, and at what levels, to produce a consistent product within regulatory limits and production

come more marketable and more easily incorporated into new products. LCLP also may allow producers to use a wider variety of surimi—with varying gel strengths or water content, for example—because adjustments can easily be made in the formula to compensate for different qualities in the surimi. Such flexibility would mean analog producers could use different grades of surimi, and surimi producers could sell more of the product they make.

The key to applying LCLP in surimi seafoods was coming up with a quantitative measurement of the functionality of surimi. To this end, Lanier and his colleagues developed the torsion test, which should soon be adopted by the National Fisheries Institute (NFI) Surimi Committee as a referee method of measuring

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sion into crab sticks, and then the textural properties of the finished product were recorded.

Then Lanier and Park set about applying the computer program to the process, using several surimi lots with varying gelling abilities. They fed the torsion test results from each lot of surimi into the LCLP program, along with the prices for each lot, and determined the best blend of surimi that would produce the right gelling properties at the least cost.

The result, Lanier said, is that the plant at SeaFest has adopted the linear programming approach into their regular operating procedure for all the surimi-based products they make. According to Lanier's report, LCLP has been judged successful as a means of obtaining the desired surimi quality at least cost. "LCLP now has been extended to use in all of the product formulations used in the plant, with the net result that, since its implementation just over a year ago, the price of surimi in all

try, requires only an IBM PC (or like computer) and a few thousand dollars in software and technical assistance. There are three companies offering the software.

"If somebody is interested in looking at linear programming, they should contact us and we'll help them get a program, adapt it to their needs, and then suggest that they do some work in the plant with the people who sell them the program," Lanier said.

Lanier can be contacted at North Carolina State University (Raleigh) (919) 737-2964.

A copy of "Application of Surimi Quality Measurements to Least-Cost Linear Programming of Surimi Product Formulations" is available at no charge from AFDF.

### NFI Surimi Committee will meet in February

The National Fisheries Institute (NFI) Surimi and Surimi Seafoods Committee will meet February 8, 1990 at 8:30 a.m. during SeaFare in the Long Beach Convention Center. The agenda includes:

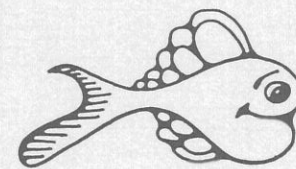
**Surimi standard of identity:** The allied ingredients subcommittee is developing a standard of identity for surimi as a raw material for analogs and other products. Their desire is to protect the name surimi for product made only from fish.

**Statistics gathering:** The committee is trying to collect production and market statistics from the industry, using Price Waterhouse as a confidential clearing house.

**Public relations:** \$11,000 has been raised to fund a public relations campaign for surimi and surimi seafoods, and members of the committee are being asked to contribute more. The campaign will be discussed at the February meeting.

**Proposed product description:** This is one step producers have to go through to sell to the military. Proposed product descriptions for crab and breaded scallop analogs have been written up and await approval.

For more information, contact Roy Martin at NFI; (202) 296-5090.





# Great opportunities for surimi in France

By Mel Monsen  
AFDF Executive Director

I just returned from the first International Surimi Symposium in France, a meeting that brought together the rapidly growing French and European surimi business with some international surimi expertise. The meeting provided a unique opportunity learn about the status of this new and exciting market, and about the approach France has taken to develop their surimi industry.

Interestingly enough, one of the first things they did was to organize a surimi association called ADISUR to help develop the industry. ADISUR has set up a library of information, organized and conducted research, and has become the networking center for their new industry. This has occurred at a very early stage of their development—a point comparable to where this country was in 1982 or 1983. This is especially enlightening when one considers our industry has yet to form this type of organization after nearly a decade. In any case, the French seem to be on the right track and are actively pursuing new technologies and opportunities.

The European industry consists of two surimi producers and two analog producers. Both surimi producers are based in France and their combined output barely tops 15 mt/day at peak capacity. There is one vessel-based operation aboard a 300-foot ship. The 350 square-foot surimi line uses blue whiting (*Micromesistius putassou*) as raw material. This species has an annual yield between 500,000 and 750,000 m.t. in the North Sea, although harvests are at much lower levels at present time. The entire biomass is estimated to be 3-4 million mt. They first produced surimi in early 1989 and results indicate the product had good whiteness and elasticity. Japanese reports say that it is better than the product from the Norwegian surimi effort of last year, which is no longer operating. The vessel also produces fish flour, and achieves an overall yield of 70%.

The shore-based surimi line uses sardine (*Sardina*

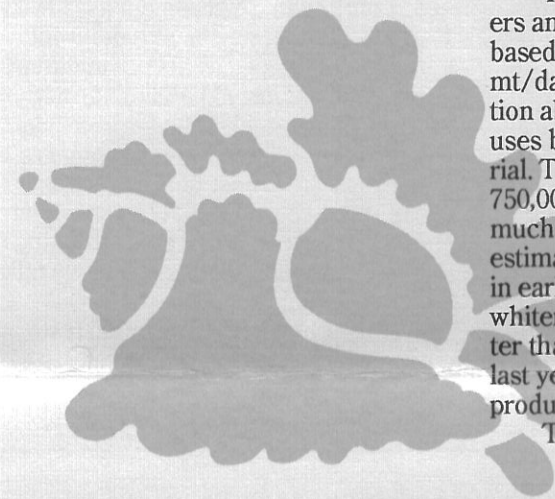
*philchardus*) and mackerel (*Scomaber scombrus*) as raw material. These species are harvested near shore and have an allowable catch of approximately 200,000 mt/year (sardine) and 400,000 mt/year (mackerel). The operation is currently at an early commercial stage and only produces 1-2 mt/day of surimi. The product has good functional quality but is somewhat darker than standard analog grade. It can be blended at about 10% in analog products. The company is interested in non-analog applications for surimi and is looking at a potential production level of 2000 mt/year from coastal stocks.

Though surimi production is in its infancy in Europe, the surimi seafood market is growing rapidly, especially in France. The market is fed by one analog plant in Scotland and one in France. Three more analog plants are planned for 1990 in France. Analog sales there are growing like ours were in the early 1980s, nearly doubling every year. Their consumption is expected to be around 7000 m.t. for 1989. This is approximately 40% of our current per capita consumption, since France's population is about 25% that of the U.S.

One other fact worth noting is that their per capita seafood consumption is twice as high as ours, and they may have a greater opportunity for surimi sales. European markets for analogs were expected to grow especially quickly in Spain, Belgium and the Netherlands, as well as in France, according to French sources.

The other major player in the formation of the French surimi industry has been their equivalent of National Marine Fisheries Service's utilization division, IFREMER. IFREMER has set up a pilot scale surimi and analog plant at their facility in Nantes, and has developed some processes that are being applied in commercial surimi production. They use only decanter centrifuges to dewater the mince and they use a refiner much like the Brown Finisher (see *The Lodestar* Winter 1988) to refine a very wet mince (around 90% moisture). Also, the traditional screw press is replaced with a decanter centrifuge.

*"Analog sales in France are growing like ours were in the early 1980s, nearly doubling every year."*



## Use knowledge to gain control of surimi industry

*In the five years since Americans have been producing surimi, many new technologies, practices and markets have developed. One thing that hasn't developed is U.S. control over the surimi industry; it's still primarily Japanese dominated, and there are a gang of opinions about why this is. We asked Dr. Tyre Lanier of North Carolina State University for his opinion. Lanier has been involved in surimi technology before it was an industry here, and has worked in the U.S. and New Zealand. — Ed.*

*"The blame for foreign control lies squarely with the American processors, for not educating themselves on the technology of surimi production, and establishing competent staff in the one area crucial to the success of any food ingredient company: technical marketing."*

It is disturbing to note that, while American fishermen have largely displaced the foreign fleets in Alaskan waters, they yet permit the foreign fishing companies to staff and manage their surimi factories. This situation persists largely because foreign buyers of surimi are nebulous and variable in their specification of the quality parameters which are required in surimi of each price grade. Thus American processors have found that the easiest way to satisfy these markets is to let the buyers direct the manufacture of the product.

The consequence of this is not only greater control of American companies by foreign interests, but tremendous waste of our fishery resource. There is little incentive for foreign "technical advisors" to maximize yield and quality, and thus a premium grade surimi is creamed from the process while millions of pounds of marketable fish protein go overboard.

For example, I am told that the average factory trawler yield of surimi in whole fish is only 12-13%, and even land-based plants do not exceed 18-19%. A yield of 23-25% was commonly quoted during the days of foreign

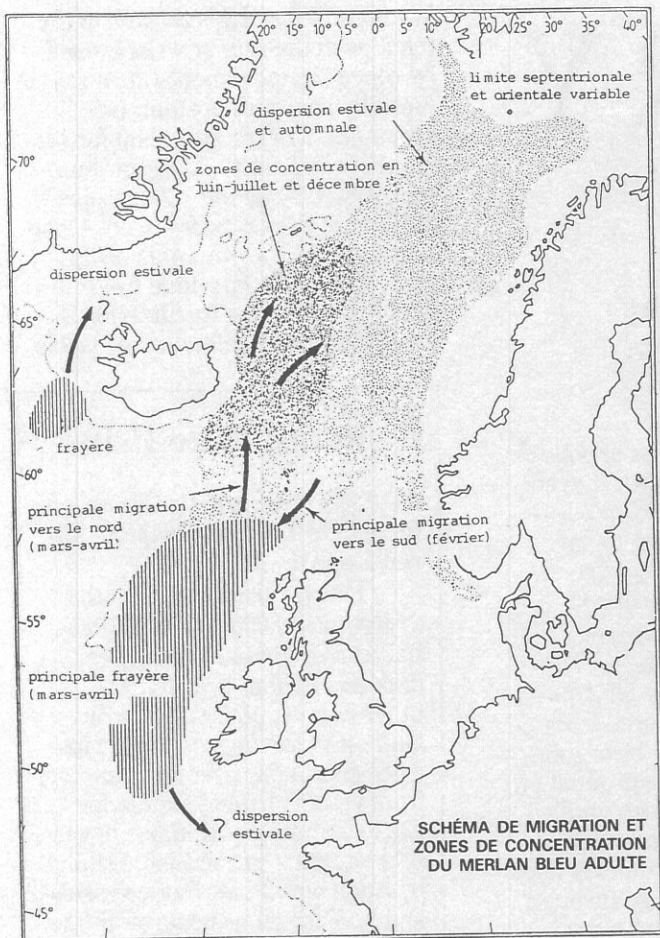
domination of the industry.

The blame for this lies squarely with the American processors, by not educating themselves on the technology of surimi production, and establishing competent staff in the one area crucial to the success of any food ingredient company: *technical marketing*. Food manufacturers worldwide depend upon the technical staff of food ingredient manufacturers for advice on how to select and manipulate the properties of ingredients in their food processes. Thus surimi manufacturers could market a range of surimis varying in properties and tailor these to the needs of various food manufacturers, just as do the producers of starch, corn syrups, spices, soy and milk proteins, etc.

A significant step toward promoting a more fair and open market for surimi as a food ingredient is the establishment of standard, objective methods for the assessment of its various properties. Presently, foreign testing methods and specifications are nebulous enough to allow buyers to frustrate the manufacturer's efforts to please them (for example, please precisely define the term "ashi.")

The Technical Subcommittee of the Surimi Committee, National Fisheries Institute, aided by earlier research sponsored by AFDF and the experiences of American surimi and surimi seafood manufacturers, have after nearly three years of deliberation developed guidelines for the standardized testing of surimi properties. These are also to be endorsed by the Alaska Factory Trawlers Association and other Alaskan processor groups. The methods are reproducible and capable of precisely defining the quality parameters important to any proces-





*Blue whiting migration patterns off western Europe show that *Micromesistius poutassou* are dispersed off the coast of France, move up into the North Sea in springtime and school up off the coast of Iceland in summer and mid-winter. They spend the fall season in the far reaches of the North Sea.*

(Source: Equinoxe)

The editor's turn

Off the  Cuff

*We harvest what we see*

By Krys Holmes

The bathyscape of the North Pacific has more to offer than undulating schools of fish and a century of stories.

As fishermen, we cast our nets into the hopefulness of the sea, and drag up the meat of our avarice from its bottom shoals. In fishing, and in living, we harvest only what we can see. Roe strippers who only see the bottom line harvest that part of the fish that profits them most. Processors who only perceive the constraints of their operating parameters stockpile fillets, cans and the perception that they are fulfilling their purpose.

It's not news to anyone that we discard more from the fishery than we use. It's no longer news that our harvesting and processing capacity is powerful enough to abuse the balance by which the ecosystem and our fellow fishermen exist. What is news is that we are about to change the way we think about using what we fish. Maybe not just yet—we still want to point fingers and threaten regulations for a while. But the zeal with which we are now laying blame on others and defending our own positions reveals that, as a community, we are about to make a major shift.

I believe we are moving away from using the profit motive as an excuse not to fish cleaner or process more responsibly, and toward the desire to make stewardship more profitable. Rather than building the industry around the obstacles to full utilization, we will begin to tear at the obstacles from both sides, shore plant and factory trawler, fisherman and user. This should happen outside of regulations, in the realm of imagination and entrepreneurship.

In this decade we have begun to learn the measure of the universe by mapping galaxy clusters and divining dark matter. We have seen light that has taken since the beginning of time to get to us. And we have begun to learn the boundaries of this world also. The North Pacific groundfish resource we described in 1979 as being near boundless we have come to know in 1989 to be limited and vulnerable. That we have come to appreciate both in the same decade is no accident. You look at a quasar 10 billion years old, and it does something to you.

If we were in space looking back on our neighborhood of Earth, we would see North America, Japan, Korea, Taiwan, China and Russia as children holding hands around the sea. All these nations are gathered around the blue Pacific like a family around the dinner table. Would this view get us thinking about how the universe should be trod? Would it elevate our arguments from onshore/offshore disputes, and from this good guy-bad guy mentality among decent people who are all in it for the money? Would it make us first unable to commit disrespect in the presence of nature?

The issues that grip the North Pacific fisheries are not new, and ours will not be the last generation to address them. The question of how we are obligated to use the fish we harvest, or how we are to save the fish, the sea mammals *and* each other, will not be answered easily or soon. The imaginative ways we think of to make fish more useful—in low-cal mayonnaise, to fuel cars, or to nourish babies who can't drink from their mothers—are just details. Important ones, surely, but they are just stepping stones on a long path toward whatever it is we can envision for the future. What's more important is that we no longer just concern ourselves with who's benefiting from the ocean. Now we are beginning to see more deeply that everything we do has consequences—to the sea and to each other.

"Use can almost change the stamp of nature," wrote Shakespeare in *Hamlet*. With luck and mercy, intelligent use of the gifts of the Pacific will change the stamp not so much of her nature, but of our own.

The final product from this process has excellent functional properties and can be used for analog production.

On the whole it was a whirlwind three days of information and contacts, and the level of interest and excitement among the French surimi pioneers was refreshing. There certainly are many opportunities for U.S. firms in France. If you have any questions about the European and

French surimi situation, contact:  
Mr. Gerard Gautier  
ADISUR  
Delegation Generale  
Chambre de Commerce et  
d'Industrie de Nantes  
Centre des Salorges  
BP 718-44027 Nantes Cedex  
France  
Phone: 40.44.60.84  
FAX: 40.44.60.90

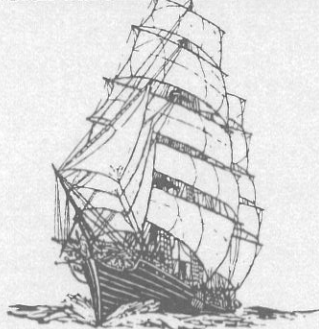
sor of any surimi-based food manufactured in the world.

However, as is true for quality measurements of any food ingredient, users must become familiar with how each measurement relates to performance of the ingredient in actual food manufacturing processes. Presently most manufacturers of surimi-based products are devising very narrow quality tests that generally involve making a sort of test version of the product they now manufacture. This results in a myriad of testing techniques and specifications which frustrate surimi manufacturers and ultimately limit the food manufacturers from exploring new ingredient blends. In contrast to this approach, Sea Feast/JAC Creative Foods has instituted testing of all incoming surimi by the standard methods mentioned above, and used the information to computer-blend literally dozens of different product formulations at least cost.

Ultimately, fundamental measurements of ingredient properties will win out over limited-application, empirical measurements as the basis

of commerce, just as the metric system is dominating other systems of measurement worldwide. The information this type of measurement provides is more universally applicable and gives more accurate understanding of the relationship in quality between competing products (not just "is A better than B" but "exactly how much better is A than B"). This tool in the hand of technical marketers who have the manufacturer's best interests in mind can revolutionize our domestic surimi industry and greatly reduce waste of the resource.

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## Fish meal makes cows give more

USDA has determined that the amino acids in fishmeal can increase milk output in dairy cows. If a cow that normally dines on high-quality alfalfa silage is also fed 1 lb. of fishmeal per day, her milk production will increase an average of 1.4 quarts, or 3 lbs. of milk per day. The fishmeal would cost about 11 cents per day more than regular soybean meal, but would produce 36 cents worth of milk more, at a 25-cent net gain per cow per day. This would mean extra profits of \$12 a day for a 48-head herd of Wisconsin dairy cows. (Erkins Seafood Letter)

## Europe to cut haddock waste?

The European Community is studying ways to reduce catches of undersized fish, particularly haddock, which must be discarded according to law. There are three possible solutions being considered: A new square-meshed net that allows juvenile fish to escape while retaining mature fish; a rule allowing vessels to work only one type of net per fishing trip is also being considered; and a multi-species total allowable catch that would allow some by-catch to be retained even after the quota had been exceeded. (Source: Eurofish Report)

# INDUSTRY

## News

### Irish fish farms need food

It takes 2 kg of feed for 1 kg of fish, reports Fish Farming International (August 1989), and a new Irish feed plant capable of producing 15,000 m.t. of feed per year still won't be able to meet the needs of Ireland's booming farmed salmon industry. They'll produce an estimated 10,000 m.t. of farmed salmon in 1990, and probably will import 30% of their feed.

### Sound familiar?

Blame is being volleyed among politicians in Nova Scotia, and toward the Fisheries Loan Board, for allowing overcapitalization of Atlantic Canada's groundfish fishery to build to crisis proportions. Nova Scotian plants increased from 193 in 1978 to 374 in 1988; the provincial government recently imposed a moratorium on all new fish processing plants, but Liberal Party leader Vince MacLean says it's too late. He claims that lack of constraint contributed to overcapacity despite declining quotas.

### Cod and pollock: Supplies are low, nobody cares

Cold storage holdings of pollock blocks are down 20% over last year—cod block holdings are down 25%—but no one appears willing to pay higher prices, says Seafood Trend. Some predict a \$0.05 rise in cod prices this winter, and say pollock prices will split into two tiers determined by breakage rates. ST tells us pollock blocks have suffered from high breakage rates that have splintered the market, leaving product on the shelves while orders go unfilled. One reason, ST suggests, is that factory trawlers process so quickly after harvest that fillet blocks go through rigor after processing, and snap apart.

### Vitamin B6 relieves work strains

A biomedical researcher who estimates that 95% of Americans are deficient in Vitamin B6 has completed a study indicating that the vitamin might cure carpal tunnel syn-

drome (CTS). CTS is a strain to the tendons of the arm or wrist caused by repetitive movements in an ergonomically incorrect position (see Ergonomics: Designing a plant for productivity and safety, Lodestar Summer 1988.) By taking 100-mg. doses of Vitamin B6 for twelve weeks, participants saw all symptoms disappear. The study was done by Dr. Karl Folkers of the Institute for Biomedical Research in Austin, Texas.

### Read our Fine Print

#### ADF&G Groundfish Observers for AFDF Flatfish Project - Final Report

This is the summary of the year-long observation of flatfish harvesting to monitor catches, crab and halibut by-catch and other harvest information from Gulf of Alaska bottom trawl trips. The report compares by-catch from vessels fishing flatfish for Eagle Fisheries with those of vessels targeting groundfish. Halibut by-catch was 3% for Eagle vessels and 3.1% for other boats targeting flatfish, compared to 5.5% for Eagle boats targeting groundfish in general and 4.7% for other boats targeting groundfish species. By-catch for Tanner crab averaged .13% and less than .05% king crab were caught. The report was prepared for AFDF by Alaska Department of Fish and Game in Kodiak, and is available free of charge from AFDF.

## Council asks for emergency ban on roe stripping

The North Pacific Fishery Management Council (NPFMC) voted December 7 to ask the U.S. Secretary of Commerce to ban roe stripping in the Gulf of Alaska by emergency measure. If approved by the Secretary, the ban will go into effect January 1, 1990 for 180 days. By that time, the Council will have to set a permanent ruling on the roe stripping issue.

Roe stripping has been one thread in a tangle of issues that beset the North Pacific fisheries this year. It is the process of extracting roe from female pollock and discarding the meat along with all the males. The practice is considered wasteful by some, and economically expedient to others; pollock roe can sell for \$18-23/kg., far more than pollock fillets or surimi. U.S. pollock roe production has declined from 11,510 m.t. in 1987 to 6,120 m.t. in 1988; estimated production was 2,900 m.t. this year. It's estimated that 111 million lbs. of pollock were roe-stripped this year. The Anchorage Daily News estimated that's enough fish to feed one fish burger to nearly half the U.S. population.

The Council and the Secretary of Commerce will be considering a how best to manage waste in the groundfish fishery in the upcoming year. Some alternatives include requiring processors to produce certain products (sillets, surimi, etc.), dividing allocations seasonally or regionally, and banning pollock harvests during roe season altogether. Information: NPFMC, (907) 271-2809.

— Anatole France

*"Men are not sufficiently perfect to exercise justice in the name of virtue. The rule of life should be indulgence and kindness of heart."*

the **LODESTAR**

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