the LODESTAR

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Surimi with a new bite

The trawler *Dusk* eased into Kodiak harbor the morning of July 17 with a load of flatfish on board and the rising summer sun off her starboard side. In her cargo was two tons of arrowtooth flounder, iced down and ready to change the face of a fishery.

The *Dusk* delivered her load to All Alaskan Seafoods, where the arrowtooth was filleted, skinned, bagged, weighed and iced down again for transport to the surimi plant down the road at Alaska Pacific Seafoods. APS made its surimi line available all day that Tuesday for the experiment that would prove that surimi made from arrowtooth flounder could rival surimi made from any other species.

"Arrowtooth surimi isn't just wishful thinking any more, it's a reality," Dr. Diana Wasson reported a few days later. "We can say with certainty that it is possible to produce a surimi with excellent functional properties, using the methods we've developed to inhibit proteolytic degradation in the arrowtooth."

Dr. Wasson, Dr. Jerry Babbitt and their team at the Kodiak National Marine Fisheries Service lab have pioneered arrowtooth research. They have developed a way to stop the enzymatic activity that causes arrowtooth flesh to turn mushy and unpalatable—and unusable for surimi. In one production experiment, Dr. Wasson added 2% powdered beef plasma and 2% powdered egg white to the finished arrowtooth surimi, and the resulting product demonstrated gel strengths as strong as 700 g x cm to 1000 g x cm.

The arrowtooth surimi showed a moisture level of 74%—well within industry needs. It also registered comparably to pollock surimi in whiteness and brightness, according to Hunter L value tests. Experimental kamaboko production showed good initial results, though Dr. Wasson has yet to test the quality of the surimi and kamaboko gels after three months of cold storage. Whether the plasma and egg white increase the binding abilities of the fish proteins, or whether they form a gel independently of the surimi—Dr. Wasson suspects the latter—the results produce a surimi comparable to pollock surimi and apparently as viable.

The experiment produced only about 400 lbs. of surimi, not enough to make samples available to potential users. But Dr. Wasson hopes to take several lots to secondary surimi processors for analysis by their quality control labs, and to gather feedback from those processors before preparing her final report of the project. She is also experimenting with mixing arrowtooth and pollock surimi.

By Krys Holmes
Illustration by Terry Josey

Processing differences

Arrowtooth flounder (Atheresthes stomias) is a deep-water creature that lurks in the gullies and canyons of the continental shelf. According to NMFS surveys, arrowtooth increase in size the deeper you fish them. Arrowtooth grow to 33 inches long, but the average size harvested by fishermen is 18". They range between 10 and 500 fathoms, and the fish below 150 fathoms are consistently larger than 12". Arrowtooth like to move to deeper waters in winter, and some surveys indicate they may rise up off the bottom at night.

"The main problem processing arrowtooth is that most of them are too big for the Baader 175," said All Alaskan plant manager Gary Taylor. "Probably half of what comes in are too big for the machine, and quite a bit have to be hand filleted. Other than that, the only problem we have with arrowtooth is the price. It's about half the price of other flatfish."

In production, the Baader 175 flatfish filleter handles fish 19" and under, Taylor said, making surimi production from larger arrowtooth a bit of a problem. "You can't afford to run surimi off a hand fillet line," Taylor said. "Baader, or some machine manufacturer is going to have to come up with a machine that can handle big fish. It doesn't have to do as good a job for surimi as on the fillet line, but you need some mechanical means of getting the fillets off the frames of those larger fish."

Other than the hand filleting, surimi production from arrowtooth was similar to pollock surimi production. Skinned fillets were minced by the Baader 695 mincer, then washed in a 3:1 water-to-mince ratio and dewatered in rotary screens. It was refined and dehydrated as usual, and the finished product off the screw press was bagged, iced and taken to the NMFS Utilization Lab at Gibson Cove where cryoprotectants were added and the surimi was frozen.

"The washed mince dewatered and pumped easily," Dr. Wasson reported. "The major difference between arrowtooth and pollock surimi production was the greater quantity of congealed fish oil that floated to the surface of the wash tank. Since most of the oil congealed at the temperature of the wash water, it was relatively easy to remove using a basket sieve at the upper surface of the wash tank. Despite the presence of over 3% lipid in the mince, the resulting surimi contained less than 1% lipid."

The finished press cake was 80% moisture; after adding cryoprotectants, moisture was 74%. Samples were tested with different combinations of additives including beef plasma, egg white, carrageenan and two proprietary additives, and were compared to samples with no additives except the cryoprotectants. The samples were tempered overnight in the refrigerator then blended with 3% salt and/or other ingredients in a vacuum chopper, stuffed into casings and cooked at 90°C for 40 minutes.

The raw surimi showed only one tenth the level of proteolytic activity seen in unwashed mince, Dr. Wasson said. But the cooked surimi showed widespread myosin degradation, resulting in surimi too mushy for commercial use. The use of different combinations of additives at different levels showed that the most effective formula may be 2% egg white and 2% beef plasma. (There were no statistically significant differences between the top three formulas.)

"Examination of the gel electrophoresis and gel strength test data suggested that the increases in gel strength observed with both plasma and egg white were in excess of what might be expected from inhibition of the protease alone," Dr. Wasson reported. "The most probable explanation for this is that plasma and egg white both form gels independent of surimi and probably form matrices with the fish proteins that have

Continued on next page ...

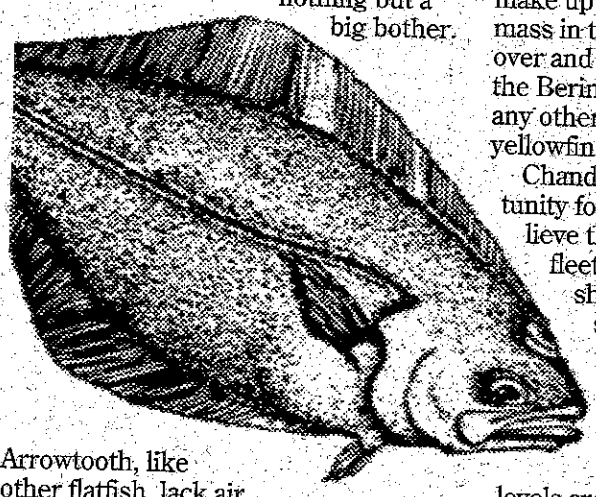
Arrowtooth surimi: Will it help open a new fishery?

greater gel strengths than those of the fish proteins alone."

Dr. Wasson's results will be published in a final report in January 1991.

New target for fishermen

Aboard the 80-ft. trawler *Topaz*, a 20-ton tow of arrowtooth flounder is nothing but a big bother.



Arrowtooth, like other flatfish, lack air sacs that can make a full trawl net buoyant, so a net full of arrowtooth hangs heavy in the water, nearly straight down. Once winched aboard, these outsized flounder with teeth like Ginsu knives are hard to handle and harder to sell.

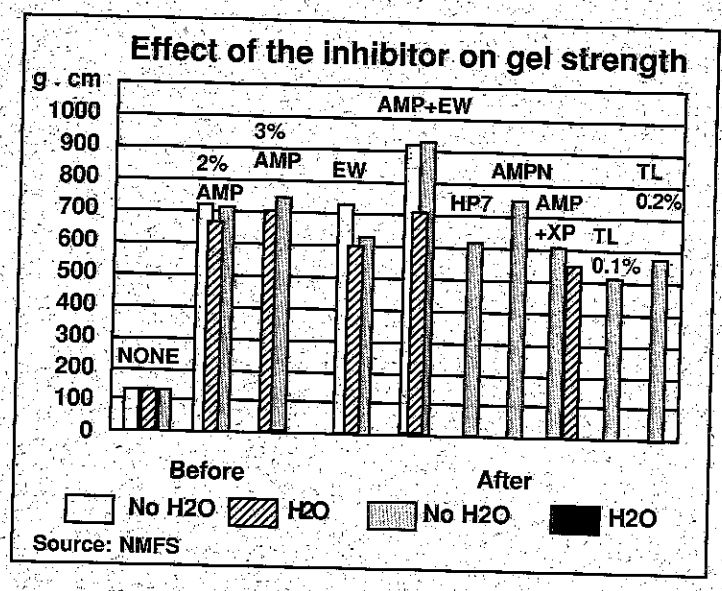
"We throw them back," said skipper Mark Chandler, who's navigated the *Topaz* through Alaska's groundfish fisheries pretty successfully for the past six years. "But most of the time we try to stay away from them. When we're scratch fishing for cod or rock sole, we can run into huge numbers of them. I've had tows of 40,000 lbs. that was nothing but arrowtooth. But usually, when we're fishing cod or sole, we get only 10, 20, 30% arrowtooth. If it's any more than that, we move."

In the waters off Alaska, it's hard to get out of the way of 2.1 million metric tons of arrowtooth flounder. They're make up the largest groundfish biomass in the Gulf of Alaska (varying over and under a million tons) and in the Bering Sea are more plentiful than any other species but pollock, cod, or yellowfin sole.

Chandler said a new fishing opportunity for local trawlers may help relieve the growing pressures on the fleet. "Trawl seasons are getting shorter, there's increased pressure from the factory trawlers—it would be great to have a new fishery to develop," he said. "Arrowtooth would give us another alternative, so if the bycatch levels are too high in one flatfish fishery, we can focus on another species."

Halibut bycatch has become the bane of bottom trawlers. A bycatch limit established by the North Pacific Fishery Management Council requires fishery managers to shut down bottom trawling once groundfish harvesters have accidentally trawled or longlined more than 8,000 m.t. of halibut. (Limits are set by area, and estimated halibut mortality is taken into consideration.) Bycatch now affects the fishery so dramatically its concerns color nearly everyone's approach to a new fishery.

"Bycatch is pretty low when you're fishing in arrowtooth," Chandler said. "You can catch 40,000 lbs. in a pretty short tow, so your net is only down for a few minutes, and that results in a low bycatch. It's not like scratch fishing, where your net would be down for a lot longer."



Would a market for arrowtooth create any real opportunities for flatfish fishermen?

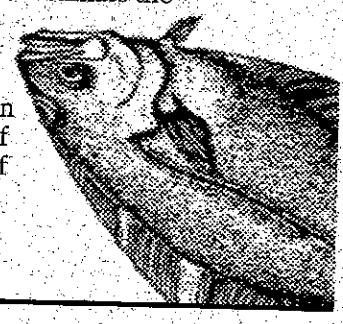
"It's exciting to try and develop a new fishery, to pioneer something," Chandler said, just before a warm grin broke like a wave over his face. "Of course, you got to watch the teeth on those guys."

World market is eager for new surimi sources

The U.S. produces about 152,000 tons of surimi per year to feed the growing world demand. Worldwide, surimi manufacturers are constantly on the lookout for new raw materials for surimi. The most popular species now used are Pacific pollock, New Zealand hoki, and northern blue whiting, but surimi makers have investigated dozens of species found around the world (lizardfish, croaker, herring,hake and greenling, to name a few) to expand their surimi processing opportunities.

Japanese companies lead the world in developing surimi from a multitude of species. Japan's 200,000 ton/yr. surimi demand keeps them on the lookout for species usable in surimi manufacture. Surimi already is being made from quite a variety of species, even oily fish like herring, for reprocessing in foods for the Oriental market. To date, however, surimi made from pollock is the primary raw material for the 200 million-lb. U.S. surimi seafoods market.

"It's too early to say how arrowtooth surimi would compete with other kinds of surimi on the market," said Mel Monsen, AFDF executive director. "But I'd estimate the potential value to Alaska's fisheries in the tens of millions of dollars."



The arrowtooth flounder surimi study is a cooperative project between NMFS and AFDF, and was funded by the Alaska Science and Technology Foundation.

Treated arrowtooth fillets may yet find a market

Firmer fillets, a nicer name and a chance at the consumer market—that's all the arrowtooth flounder needs to prove itself, according to food industry developer Rae McFarland.

McFarland's Foods and All Alaskan Seafoods just completed a series of experiments with arrowtooth flounder treated with ALAK, a proprietary formula that helps prevent softening of arrowtooth flesh during cooking.

ALAK was mechanically injected into arrowtooth fillets in a series of tests to demonstrate how the flavoring and texture-enhancing aspects of the formula might make arrowtooth more palatable. Though initial results were disappointing—a sensory panel rated the fillets only a 2 on a 1-5 scale of quality—subsequent tests have been significantly more positive.

"After this first production period, various formula changes were suggested," McFarland reported. "Then our researcher, Lachi Gangavati, returned to All Alaskan to run tests of the revised formulas. When sensory tests were done on samples from the second lot, results were significantly better. The visual appearance of the frozen fillet was very good. Average thaw drip value was indicative of a well-handled fillet. And the results of the sensory evaluations were favorable, and indicated that the fillets possessed very good odor, although the texture was fairly soft."

The sensory panel rated the fillets produced during the second experiment a 4 on a 1-5 scale of quality.

McFarland said most buyers and consumers don't like the name arrowtooth flounder. Some seafood buyers already have had bad experiences with arrowtooth and won't try it again. "It might be better to market it under one of the other FDA-accepted names, such as turbot, California sole, or arrowtooth halibut," he said.

Some informal market tests were conducted with treated arrowtooth fillets under the different names that are regionally accepted for marketing arrowtooth. Prepared samples were distributed at an international by-products conference in Anchorage, at a Salt Lake City grocery store and at a California seafood brokerage, and responses ranged from mildly positive to very positive, McFarland said.

"I would estimate there is a 3-4 million lb. per year market for arrowtooth," McFarland said. "At this point, one of the biggest stumbling blocks we've seen is the high cost of the quality enhancers that stabilize the flavor and shelf-life of the product. We think we can drop this considerably, and we've done some experimental work in this direction, but there isn't any R&D money available to do the production run to test it out."

McFarland said the quality enhancers now cost about 50¢/lb. "We think we've got the concept of stabilizing arrowtooth texture about 90% whipped," he said. "The only problem is getting those costs down. But we're still at it, in our own small way. There's almost as much arrowtooth out there as there is pollock, and there's only been about $56,000 spent on developing the arrowtooth fishery so far, compared to millions spent to develop pollock. For the little amount that has been spent, we've come a long way."

AFDF MEMBERS ONLY

Canpolar East

Canpolar East of St. John's Newfoundland, together with Mrs. Paul's Kitchens, a major buyer of Alaska's mince, are interested in working with Alaskan processors to run a trial of Canpolar's Mince Washer System.

Canpolar East Inc. is a supplier of services and technology to the fishing industry, with a focus on increasing yields and recovery from raw materials. Their Mince Washer System adds value to mince recovered from the frames, head and collar portions of cod, pollock or other white fish, material that usually is discarded or rendered into low-value meal. Collars and skeletons are minced using a bone separator. Because of the blood content, the mince is usually dark brown and its spoilage rate is fairly rapid. When blood is washed out, the shelf life is improved and the color and texture become comparable to regular minced white fish, according to Canpolar. After washing, the mince should be refined to remove any remaining bones, skin spots or non-water soluble defects. The result is a product suitable for fish sticks and other fabricated products.

Canpolar East has developed the system, and they report that Mrs. Paul's Kitchens is "very much interested in the potential for this method of mince production." The two companies will be working together to investigate the mince washing system in Alaska.

For information: David Wells, Canpolar East, Inc. P.O. Box 8414, St. John's Newfoundland, Canada A1B 3N7. Phone (709) 722-6067; fax (709) 722-1138.

American Factory Trawlers Association

The Alaska Factory Trawler Association has changed its name to American Factory Trawler Association. "The new name more accurately reflects the activities of our members, since we operate vessels in the U.S. fisheries zone of the North Pacific," said AFTA president Bob Morgan. "Home ports and corporate headquarters for our members are predominantly located in Washington state, as are many support industries and the association's offices.

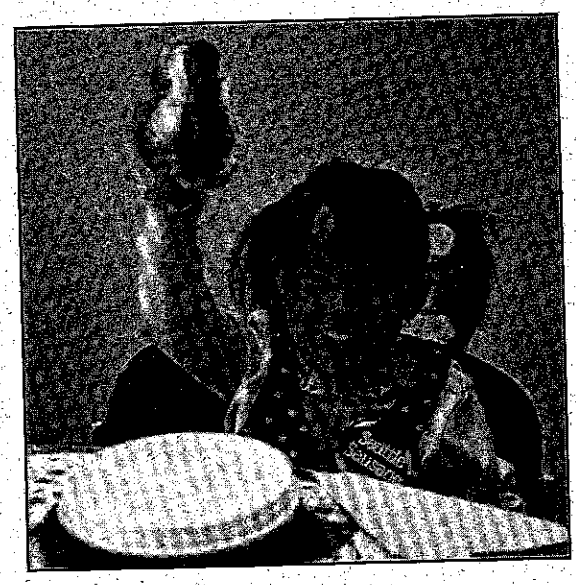
Address and phone remain the same: **4039 21st Avenue W., Suite 400, Seattle, WA 98199; (206) 285-5139.**

Sea Resources Engineering, Inc.

Dr. George Pigott and Dr. Barbee Tucker of Sea Resources Engineering have co-authored a book entitled, Seafood: Effects of Technology on Nutrition, published by Marcel Dekker. The book covers basic nutrients from seafood, the effects of processing and reprocessing on nutrients in seafood, how heat, water, irradiation and other processing methods affect seafood's nutritional value, several processing variables that maximize nutrition, the role of marine lipids in the human diet, and appendices on aquaculture and seaweeds. It's a clear, concise investigation of a topic crucial to all fish processors and QC managers, and is written clearly and simply enough for the layman. It's awkward in places (for example, a section on the history of the 200-mile limit appears in a chapter on increasing utilization of fish, with no explanation of how fishery management decisions influence the utilization practices in a fishery.)

This useful, informative book is listed at $89.75, but AFDF members are offered a 15% discount for prepaid orders. **Members may send $76.00 with their request to: Tammerly Booth, Marketing Associate, Marcel Dekker, Inc., 270 Madison Ave., New York, N.Y. 10016; phone (212) 696-9000.**

Surimi? Hot dog!



Youngsters are the ones who could best benefit from the healthy (some say tasty) formulation of Seattle Sausage.

"I want people to know that there is a healthy alternative to the traditional hot dog, one that tastes just as good. And I want them to know that kids really like it," says Richard Rhoda, entrepreneur and weekend kid-pleaser at Mutual Fish. Rhoda has spent the last dozen Fridays and Saturdays serving Seattle Sausage to waiting customers at the Seattle fish store.

"When people come in the door, the look in their eye says 'Who are you, and what is *that* doing here?'" Rhoda says. "There's a sign on the table that says, 'New and exciting fish frankfurters,' and the sign outside, which features the fresh fish of the day, says 'Seattle Sausage.' But it doesn't keep half of them from asking about it. They can't believe it's fish."

Fish it is—surimi, in fact. As president of First Alaska Surimi, Rhoda developed the Seattle Sausage line, which includes a frankfurter and a breakfast sausage, and with a small grant from AFDF, he has walked his products through market tests and focus groups. He's now ready to broaden his distribution base, increase production and see what a surimi hot dog can do to expand the markets for surimi in the U.S.

"Response has been overwhelmingly positive," he said. "The best evidence is the garbage can in front of the building. Out of maybe 200-plus servings consumed by brave souls on a Friday or Saturday, usually fewer than five are discarded. Kids generally eat two or three portions."

People like to eat Seattle Sausage franks, Rhoda said. And when they find out the nutritional value (8 gm. protein, 9.5 mg. cholesterol, only 2 gm. fat and 78 calories each) they like them even better. But educating consumers is a herculean task for a small company, and until strong demand becomes evident, the food distribution chain isn't going to be too supportive, he said.

"People think that substitute foods always bring a tradeoff," Rhoda said. "For example, soy burgers generally taste horrible. With this product, it costs about the same ($2.99/lb.), looks the same and tastes the same. But nutritionally, we're in a completely different ballgame."

Rhoda said he knew breaking into the processed meats market with a surimi product wasn't going to be easy. "But I figured the only chance for surimi to really impact the food industry in America was going to be in the processed meat category," he said. "The frankfurter industry is a 2.3 billion lb./year business, and has been at that level for over a decade. Poultry franks have gained a dramatic share of that market in the past few years, and the reason is the price—they're less expensive—and because of the perceived nutritional attributes. And frankfurters aren't even good for people—but people love them."

Rhoda said he'd like to see surimi franks take over 10% of the hot dog market. Results from his market studies say consumers might be receptive—if someone were to make the investment to educate them about surimi franks.

"Ten percent would be 230 million lbs. of surimi franks per year," he said. "That is more than imitation crab is currently doing in America," Rhoda said. "It would have a hell of an impact on the surimi industry. Altruistically, I'd like to see it happen. Personally, I'd like to make a living doing it, too."

First Alaska Surimi is distributing samples of Seattle Sausage franks and breakfast sausage. Frozen, vacuum-packed 1-lb. samples are accompanied by a two-page information sheet including nutritional comparisons, cooking instructions and answers to the most often asked questions during the focus group sessions. For samples or information call First Alaska Surimi, (206) 726-1169; fax (206) 726-1181.

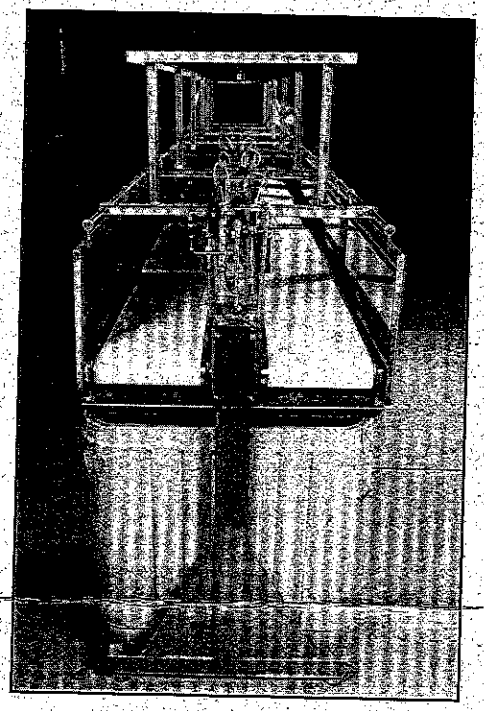
Nutritional Comparison

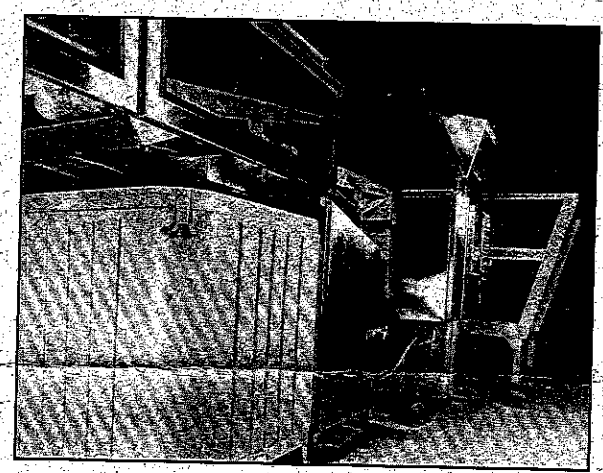
for a 2 oz. serving

	Seattle Sausage	Beef & Pork frank	Turkey frank
Protein	8 gm	6 gm	7 gm
Fat	2 gm	17 gm	11 gm
Calories	78	180	130
Cholesterol	9.5 mg	35 mg	55 mg
% of total calories as fat	25%	85%	76%

FLATFISH PROJECT *Update*

Photo by Jon Zuck





Down time spent sorting flatfish for the Baader 175 can really take a bite out of profitability. The FMS 3000 vision sorting machine may help speed processing time and reduce labor costs for flatfish processors.

Flatfish processing in the Gulf of Alaska has increased so much in the last four years that Alaska may now be the the largest flatfish producer in the country. Production in the first nine months of 1990 was 177% higher than the average yearly production since 1987. With two large-scale plants and two hand fillet operations, Kodiak processes about 700,000 round lbs. of flatfish per week, and produces more than 250,000 lbs. of fillets per month.

Gulf fishermen harvested 4.3 million lbs. (1,960 m.t.) of flatfish during the month of August. About 2,857,800 lbs. were processed on shore, and 1,454,200 lbs. at sea. East Coast markets are opening up to Alaskan flatfish, producers say, and major buyers seem receptive to new products like flatfish mince, treated arrowtooth flounder, and other experimental product forms.

Flatfish producers now are looking for ways to improve yields and increase efficiency on the line, and to improve the quality consistency of their finished products. Two new AFDF projects, designed as response to two major problems still faced by flatfish processors, will begin in November.

So many species, so little time

"One of the biggest problems discovered during the flatfish demonstration project (at Eagle Fisheries) was the bottleneck at the sorting level," said T.J. Lukshin, project manager at AFDF. "Correctly sorting a flatfish delivery by species and size requires tremendous manpower and time, and slows the production process. A processor might use as many as six workers just for sorting, icing and handling the totes."

Grove Telecommunications Ltd. of St. John's Newfoundland has developed a computer-aided vision system that can sort fish according to width and length at speeds up to 160 fish/minute. Very often, this is enough data to correctly sort by species and weight. The FMS 3000 system is used by East Coast Canadian processors but has never been applied to Alaskan flatfish, which vary markedly from the physical characteristics of Atlantic flatfish.

AFDF will demonstrate the use of the FMS 3000 at the head of an automated flatfish line, and will investigate how, and how much, the vision sorter affects processing efficiency and overall production costs. The machine will be installed in a flatfish plant in November, and will be tested for at least six months.

"One of the most significant benefits of mechanical sorting is that it helps maintain the quality of the flatfish, because the fish are handled less than with hand-sorting," Lukshin said. "Automated vision sorting should increase the overall efficiency of the Baader 175 filleting line by decreasing down time needed to mechanically adjust the 175 for different sizes and species. The down time required for this adjustment has been a problem in flatfish processing. At 160 fish per minute, the sorting machine potentially could keep up with five Baader 175s."

The FMS 3000 is about the size of a bowling lane. It weighs 7,724 lbs. and requires 700 sq. ft. of plant space. Two operators orient the fish into the infeed module; then the fish are measured and sorted by the vision system, which can handle eight different kinds of sorts at a time. As the fish pass down the sorting conveyor they are dropped into the appropriate tote for processing.

"Processors in eastern Canada report that they've used this machine to sort cod with a 99% accuracy rate," Lukshin said. "What we don't know is, can it tell the difference between rex sole and rock sole—two species that make up a large portion of the flatfish species mix."

If the machine proves successful for sorting Gulf flatfish by species and size, it will also give processors a planning boost. The computer in the vision system gives out a real-time record of all fish sorted, information that helps in predicting what sizes and species of flatfish are most plentiful at different times of year.

Information: T.J. Lukshin at AFDF, or Pat DeBourke at Grove Telecommunications Ltd., P.O. Box 9190, St. John's, Newfoundland A1A 2X9 Canada; phone (709) 753-8587, fax (709) 753-1834.

Oh, rock-a-my sole

One continual irritant during the Eagle Flatfish Demonstration Project was that rocks and shells in the bellies of flatfish damaged the blades of the Baader 175 filleter and often knocked the sensitive knives out of adjustment. When Eagle was operating they lost eight to ten minutes to down time, sometimes twice in an eight-hour shift, to replace blades and readjust the knives. Belly grit was responsible for yield losses from dull or impaired knives, and for expensive down time.

AFDF has issued a request for proposals from equipment developers to design and build a prototype flatfish gutting machine. The gutter must remove the belly cavity of the fish with minimum yield losses, must process 40 fish per minute, and must configure with the Baader 175 automated filleting machine.

"One of the reasons AFDF is funding this project is that a flatfish gutting machine is not likely to be used in other areas except Alaska," said Mel Monsen, AFDF executive director. "Fishermen in other parts of the world, including the Atlantic seaboard, bleed and gut their flatfish on-board to maintain quality on long fishing trips." But Alaskan flatfish fishermen stay out only two days, usually, and bring back deliveries of 50,000 - 100,000 lbs. These loads are far too large to effectively bleed and gut on board, nor is it necessary on such short trips.

Last year, AFDF and Eagle Fisheries launched a worldwide search for a flatfish gutting machine, but were unable to find one. Flatfish processors now operating have determined that the lack of a mechanical gutting method has decreased profitability, caused significant down time, and increased the amount of time required to candle and trim fillets of some species.

AFDF hopes to receive proposals by the end of November, and to install a prototype flatfish gutter into a plant next year.

Information: Contact T.J. Lukshin at AFDF.

A Grandeur of Groundfish

How groundfish quality changes through the year, and what you can do to improve it

October in the Gulf of Alaska. The winds are kicking up, the water angers as winter grabs hold from behind, and deep in the rocky crags of the gulf bottom the rock sole are storing up protein for the long season ahead. The meat of an October rock sole is more than 20% protein, ranging as high as 21.3%. This is among the highest protein levels of a Gulf groundfish. But by January winter will have beaten 1/2 percent of protein out of its reserves; by February it has diminished to 18.8%, and by March the fish is only 16.5% protein and its moisture content has peaked at 83.19%.

Rock sole caught in April have so much water that yields plummet due to drip loss. On the plate, rock sole with 83% moisture or more are so mushy they'll soak your peas.

The quality of a groundfish—its protein, moisture and pH levels—varies with the seasons, and can be further affected by on-board holding methods, cold storage equipment, and processing variables. New information is emerging from a year-long study of the factors affecting groundfish quality. From this data, we may begin to know more about how to handle a groundfish—and when—than ever before.

"One of the most significant things we've learned is that there's a direct correlation between protein and moisture content," said Loretta Lure, AFDF project manager. "Fish use up the body protein during the spawn season, and replace it with water. This is important because with low-fat fish like cod and pollock, you can learn a lot about quality just from determining water content, which is easy to do. You don't have to test for protein content in the samples, which is more expensive and takes longer."

Tests were conducted by Dr. Izabela Byrne at International Seafoods of Alaska (ISA). Results also show that protein and moisture levels of cod and pollock remain relatively stable between September and early April. Pollock average about 80%-81% moisture and 17.5% - 18% protein then. From mid-April to late May, protein levels begin to vary from fish to fish, and by late May, protein levels again become consistent.

Dr. Byrne took a hard look at groundfish samples that had high moisture content and mushy texture. With studies of arrowtooth texture problems going on down the road at the Kodiak NMFS lab, Dr. Byrne wondered if enzyme activity affected rock sole the way it does arrowtooth. She used the same testing methods that Dr. Diana Wasson pioneered on arrowtooth.

"The results showed clearly that, despite high levels of moisture in both species, the perceived softening of the cooked rock sole was not the results of proteolytic enzymes, but was entirely an effect of lower protein levels and higher moisture levels than normal," Dr. Byrne said. "This information is particularly useful, because it may be possible to monitor a wide variety of quality parameters solely by testing for the moisture content of incoming fish."

Further studies need to be done, she said, because the level of moisture that makes a fish seem mushy varies a lot from species to species. "We also need to investigate how much moisture the fish fillets pick up on the processing line, and whether the amount of water pick-up varies as a function of the season," Dr. Byrne wrote in a recent report.

Dr. Byrne also charted the time, depth and location that the fish were caught, and time and method of on-board handling. Through ultrastructural examination of the muscle fibers, she checked muscle shrinkage as moisture levels changed after harvest. The study also charted spawning activity and stomach content of the fish sampled.

"So far we have not been able to draw any useful conclusions on the basis of the stomach content analysis," her report says. "The stomach contents may not be good indicators since fish routinely empty their stomachs on capture. Liver condition and the color of the gall bladder may be better indicators of whether a fish is well fed or starving."

By the time the study ends in December, Dr. Byrne will have collected enough data to create a chart tracing protein, moisture, pH levels, enzymatic activity and organoleptic qualities of cod, pollock, rockfish and several species of flatfish through a whole year cycle. This information will help fishermen and processors better target high-quality fish, and learn more about how spawning activities affect quality of groundfish. Clear trends, such as the rock sole's dramatic shift in protein levels, might also be useful for fishery managers, fish buyers and secondary processors.

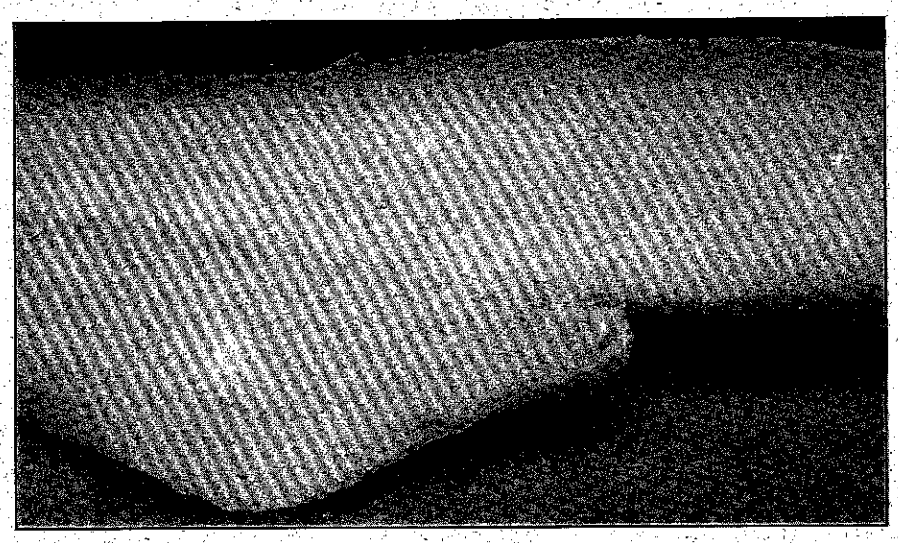
For information about this project contact Loretta Lure at AFDF or Dr. Byrne at International Seafoods of Alaska, (907) 486-4768; fax (907) 486-4885.

Quality in cold storage:
Don't put your concerns on ice

Dr. Ed Kolbe is emerging from cold storage. As part of AFDF's groundfish quality study, Dr. Kolbe, a University of Oregon professor monitored freezing speed, cold storage temperatures, and weather conditions inside the freezers at International Seafoods of Alaska. When his data thaws out, it will tell processors how the quality of their fish might be helped or hampered in cold storage.

Dr. Kolbe, with the help of Dave Cooper at ISA, set up a series of cold storage monitors and attached them to fish samples and to an agar gel dummy fish that would enable the team to do repetitive, comparative testing of freezing times. Results from this study will give processors a better idea of how fast to freeze their product, what temperatures are ideal, where in the cold storage to place the cartons, and how high to stack them.

For information about how cold storage methods affect fish quality, request "Freezing and Cold Storage Temperature Monitoring Experiment" from AFDF. Available by the end of October.



Looking fillet problems in the eye

You'd have a lot more trouble spotting the defect in the fillet shown above if it wasn't illuminated by a special ultraviolet light. It's part of a custom vision system developed by Lumetech of Denmark to aid fish processors in detecting defects in fillets. Their Fishbone Detector scans one fillet per second and a video image computer automatically calculates the number of bones and fins, their length, width and position in the fillet.

Lumetech participated in an AFDF project to demonstrate available parasite detection technology and test it on uncandled Alaskan groundfish fillets. R.A. McDonald participated as well, testing a RAM 200 Vision Machinethat can locate up to 960,000 objects per second.

The final report of this project, entitled "Demonstration of Parasite Detection Technologies on Alaskan Groundfish," is now available from AFDF. Copies are $5 each. Please send check (U.S. funds only) with your order. Foreign addresses add $5 extra for postage, please.

"I sometimes think of the ocean as the heartbeat of the world. If you stand anywhere on any shoreline, even if it's at a lake, and just listen, letting the stillness descend around you, it doesn't matter where you are– there's always a rhythm, a beat. I love being a part of that bigger self. The ocean is a living thing that occupies two-thirds of our planet; it's fragile, yet it also teaches us how vulnerable we are as a species."

– Peter Harrison

(From "Albatrosses" by Diane Ackerman)

Director's log:

Private R&D more prevalent than you'd think

By Mel Monsen
AFDF Executive Director

In this age of increasing concern about America's competitiveness, many have asked about the Alaska seafood industry's commitment to research and development. Their question: "How much private funding is invested in Alaska seafood industry research and development, and what is the return on that investment?" Of course, the question cannot be answered with any certainty. The value of private research to the industry is unquestionably far-reaching. What would surprise most people, I think, is the level of activity now going on in Alaska.

The concept of "privately funded research and development" asks for a broad definition. I suggest this: Any time a harvester tries a new fishing method, explores a new area, experiments with a gear modification or targets a new species, an investment in research and development is being made. Any time a processor modifies a plant's product flow, purchases new equipment or technology, modifies work space or changes workers' responsibilities, research is happening. Any time an equipment manufacturer provides a new machine on a test basis or at discount for experimental application, every time new or untried equipment is introduced, research and development is being done. Any time a marketer tries to move a new Alaskan product from Alaska, that's industry development.

All development efforts require an investment of time and money. Very often the results are not successful, and nothing is gained except experience. But frequently a new species is brought into production, production costs are cut in some area, or an entirely new processing method is developed and new products are made. In the past, some of these developments have been huge and far-reaching, and have boosted the industry's competitiveness worldwide.

How can you estimate the value of this kind of investment? At AFDF, we have documented that the amount of industry funds (in-kind contributions) provided to match Foundation projects has averaged about $300,000 per year for the past twelve years. The benefits of these projects have been immense. The information from the surimi project alone has had worldwide impact on the seafood industry, and has resulted in financial benefits ranging into the hundreds of millions of dollars every year. That project was enhanced by many separate private investments of the kind I mentioned earlier. Some activities were connected to AFDF's surimi project. Some were conducted in private, and their benefits were assimilated by the industry later on. We do know that the surimi industry is still attracting private research and development funds at an astounding rate.

Our flatfish project, which just completed its first major phase, has already brought tangible benefits to the industry. Deliveries at shoreside processors in the Gulf of Alaska in August 1990 were well over 1200 m.t.—that's 400 tons more than the largest deliveries previously recorded. The market's growing interest in flatfish, and producers' ability to participate in this new opportunity, are partially attributable to private investments in research and development.

All kinds of research is going on in this industry that may never see the light of day. For example, some dramatic new technology is being investigated right now on a completely private basis, and results could be tremendously beneficial to Alaska. Recently, three machines were placed and tested in Alaskan seafood plants through the use of private funds—a cod head splitter, the salmon head splitter, and salmon frame mincing equipment. In each case, an equipment manufacturer or a seafood processor, or both, provided the time, space, raw material and money needed to test out a new machine. Investments of this kind surely match the $300,000 that we document each year as S-K industry matching funds. Their benefits will never be fully accounted for because of the confidential nature of this research.

I would estimate that the Alaska seafood industry spends over $1 million per year in research and development. The benefits of past investments have more than compensated for the wrong roads and blind alleys of research and development efforts. Indeed, sometimes the most beneficial research is that which identifies a blind alley and helps us avoid subsequent losses.

The future of private research and development in the Alaskan seafood industry seems very bright. Recent major successes have removed many of the past stigmas associated with "risk takers." Also, growth of a year-round groundfish fishery has lent the industry the stability and strength required to embark on the search for new opportunities and more cost-effective techniques. As a catalyst for a large portion of the development activities in Alaska's seafood industry, AFDF has been able to enhance and to benefit from private development efforts. They may not be obvious, but they are crucial to the future of this industry.

Marine viruses show us secrets of marine life

By William Booth
The Washington Post

Marine viruses, virtually unknown until a year ago, may play a central role in the health and productivity of the world's oceans, according to new research that threatens to overturn traditional ideas about the forces that control life in the sea.

The studies indicate that viruses infect phytoplankton, the microscopic plants and algae that are the most important organisms in the ocean and the foundation of the marine food web.

"Until now, nobody has really considered disease organisms as important in marine environments," said Curtis Suttle of the University of Texas Marine Science Institute in Port Aransas, Texas, head of a team of researchers whose findings were published in a recent issue of the scientific journal, Nature. "But viruses might be in control."

As the full role of ocean viruses emerges, marine biologists say it may one day be possible for humans to seed the seas with certain strains of naturally occurring viruses to control the phytoplankton blooms, called red or brown tides, that litter beaches, kill fish and are toxic to mussels, clams and oysters.

"This may be a new biological means for controlling the primary productivity of the ocean," said Randall Alberte, a professor at the University of Chicago and a scientific officer at the Office of Naval Research, which funds some of the viral studies. Alberte called the new ideas about the importance of marine viruses "revolutionary."

Alberte said viruses could be used to encourage certain species of phytoplankton while suppressing others, thereby allowing humans to, in essence, farm the seas. This could be particularly important if nations decided to control global warming by encouraging the growth of phytoplankton, which absorb carbon dioxide from the atmosphere. Carbon dioxide is the main gas responsible for predictions of global warming.

Viruses exist in a realm somewhere between the living and the inanimate. They do not eat, breathe, move or reproduce on their own, but when they enter a cell, they commandeer the genetic machinery and start reproducing. After the invading virus has made a few hundred copies of itself, the cell dies and its membrane bursts, releasing virus particles.

Scientists have shown that naturally occurring marine

Off the Cuff

By Krys Holmes
Lodestar Editor

A friend said to me at the end of the September meeting of the North Pacific Fishery Management Council, "A sated fox is a safe fox, or so the chickens and the farmer may think."

He referred to the Council's vote to transmute some 130,000 m.t. of yellowfin sole into walleye pollock. The motion asks the Secretary of Commerce to take the yellowfin and other flatfish that were allocated to but uncaught by joint venture fisheries, (along with some unspecified reserves of fish) and give that tonnage to the pollock fishery. Yellowfin sole is a bottom-dweller, and almost all bottom trawling is closed in the Bering Sea. The pollock quota harvested by mid-water gear this fall was expected to run out in mid-October.

This yellowfin alchemy is a score for trawlers, who would be able to fish longer and make more money if Commerce approves the switch. It's not inconsistent with the Bering Sea Groundfish Management Plan, it wouldn't shove Bering Sea catches above the 2 million m.t. cap, and it doesn't even raise the pollock catch quota above the acceptable biological catch. Since catch quotas are set conservatively in the first place, the move seems like a good idea.

Curious, though, that the group of men appointed stewards of the world's last unspoiled fish resources doesn't flinch at this precedent-setting decision. Pollock stocks are slowly declining, unregulated fishing in the Donut Hole is increasing, and scientists now believe that pollock catches may be seriously underestimated. Actual catch is figured by converting product recovery rates to round weights. If actual recovery rates are lower than the rates used in the formula—and if discards are higher than we now presume them to be—actual catches could be far higher than calculated catch figures. Testimony before the Council suggests that current catch assumptions are significantly lower than real catches.

The new domestic observer program should provide some answers. But this is the program's first year, and observers are focusing primarily on bycatch. When comparisons of observers' discard reports to vessels' discards do come in, they may be disturbing.

Last December, the Council set the 1990 pollock catch quota at 1.28 million m.t., 170,000 m.t. below the allowable biological catch of 1.45 million m.t. They cited the need for conservative quotas in light of the Donut Hole fishery, the decline of Steller sea lions (who prey on pollock), and their desire to balance the 2 million-ton Bering Sea fishery across the harvested species. Since then the fleet has expanded, stocks have diminished, and it's become clear that demand will exceed supply by a long shot next year. Has ground been laid to increase the quotas again? Having overruled its own concerns of last year with no new information, has the Council set its precedent for how they will respond to these requests in the future?

Bottomfish development off Alaska was the gold rush of the 1980s. Lots of us were part of that gold rush, encouraged it, helped it along, cheered it when it came. Billions were invested, jobs were created, markets were opened, wallets were filled. Now we've found that 1.2 million metric tons isn't enough. Pollock recruitment may be low, ground-truth catch data may be sketchy, and the effect of increased trawling on the biological balance of the North Pacific remains partly mystery. Would the Council really prefer to increase pressure on the stocks than to figure out a way to live with the Pacific's finite resources?

The argument for increasing pollock catches is strong: There's a lot of money invested in pollock fishing, and every idle day costs the industry millions of dollars. As more boats enter the fishery, and competition for pollock intensifies, this argument will only get stronger. The industry's need for more pollock expands exponentially. Curious, isn't it, that this doesn't make the industry a little nervous?

These are tough years for fishermen and processors of the North Pacific. Bycatch conflicts, fishery closures, pollock prices, the exchange rate—maybe they deserve a break. Maybe the Council's request for more pollock is not a desperate act of self-interest, but is a unique response to a unique and difficult circumstance. If so, then their action does garner my understanding—but not my respect.

... and may determine the health of the seas

viruses attack specific phytoplankton hosts. The marine biologists speculate that viral infection may be the crucial factor in determining the mix of plant species and their relative abundance in the ocean.

Any change in species mix or abundance of phytoplankton has a direct effect on all ocean life, from shrimp to fish to dolphins to fishermen. The viruses probably have been a force in evolution for eons.

Suttle and his colleagues have found that viral pathogens infect the most common and most important "primary producers" in the ocean, such as diatoms, or microscopic algae, and blue-green algae. Other researchers have shown that seaweed and bacteria also are infected.

Suttle reported in the Nature article that concentrates made with marine viruses were capable of dramatically reducing phytoplankton populations in the laboratory, in some cases by as much as 78 percent. Some protein molecules also could have damaged the phytoplankton, he said, but he speculated that additional experiments would probably show that, overall, viruses and not contaminants were responsible for the killing.

Previously, most marine researchers assumed that phytoplankton were limited mostly by the absence of sunlight or essential nutrients such as phosphate, iron or nitrogen.

But a growing number of marine biologists suspect that viruses control the competition among plankton. Elizabeth Cosper of Marine Sciences Research Center at the State University of New York in Stony Brook said the sudden appearance and disappearance of brown or red tides may be regulated by viruses.

"It makes perfect sense," Cosper said. "It explains bloom dynamics and sudden rise and crash of the population."

When John Sieburth of the University of Rhode Island identified the golden-brown microalgae responsible for the brown tides in Long Island Sound and Naragansett Bay, he included in his scientific paper a photograph taken with a powerful electron microscope. "The algae was just loaded with viruses," Cosper said.

"No one looked for viruses before," said Russ Meints of Oregon State University in Corvallis. "But once you start looking, they're probably going to turn up everywhere."

Using new methods, Norwegian researchers last year reported that a billion viruses could be found in a milliliter, or about a teaspoon, of ordinary seawater, including samples taken from the Chesapeake Bay.

READ OUR FINE PRINT

These reports and publications are now available from AFDF:

The Salmon and Trout Market in Japan
We have a limited number of these bound, 24-page reports, published by JETRO, the Japan External Trade Organization. Copies are free, compliments of JETRO. Please send $2 postage for foreign addresses.

Demonstration of Parasite Detection Technologies on Alaskan Groundfish
This report summarizes AFDF's study of computer-enhanced vision systems and their applicability to the Alaskan seafood industry. Some useful information for processors interested in finding better ways to candle their fish. Copies are $5 each, or $10 for foreign addresses.

Development and Market Evaluation of a Surimi Product
This informative paper reviews the creation and market testing of Seattle Sausage (see pg. 3) and contains information learned during focus groups, from consumers and from the distribution chain. This is useful information to anyone creating a new food product. Copies are $, or $6 for foreign addresses.

HACCP Guidelines for the U.S. Surimi Industry
AFDF, Manning, Batson & Assoc., the Fishery Industrial Technology Center and Alaska Pacific Seafoods studied the application of HACCP quality control programs to surimi production. HACCP programs are being developed for the meat and poultry industries, but this is the first time its been applied to surimi processing. This is a most useful report, in light of current efforts to establish seafood inspection laws.
Copies are $5. For foreign addresses, add $12 postage, please.

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INDUSTRY News

New fish plant for Sand point?

New West Fisheries, a Bellingham, Washington-based fish processing company, told The Anchorage Times recently they plan to establish a temporary fish processing operation in Sand Point, Alaska in January. Jerry Thom of New West said the company is considering building a $10 million shore plant near the Alaska Peninsula town of 950 residents.

Thom said the New West Fisheries plant would produce value-added salmon and groundfish products for the retail market in Japan and the U.S. The company owns the 179-foot catcher/processor *New West*.

Alaska Fish Conference and Exposition

"Fishing in Alaska ... Is the Future Ours?" is the title of a conference scheduled in Anchorage November 26-28. Conference speakers will present papers on world seafood market conditions, the potential for change in the market, and the link between market developments and fishermen's wallets. An exposition and trade show will be held at the same time. For information: Alaska Fish Conference and Exposition, P.O. Box 100571, Anchorage, Alaska 99510.

Japan wants your sole

... Rock sole, that is, along with rex and flathead sole, Greenland turbot, arrowtooth flounder, blackcod, Pacific cod, Pacific ocean perch and rockfish. An 11-year-old company with sales of 160 billion yen/year is the eager buyer, according to the U.S. International Trade Administration. Contact: Mr. Yutaka Uchikawa
Marketing Manager
Aburai Kabo Co., Ltd
3-12-13, Chinhamacho
Shiogami-shi, Miyagi-ken 985 Japan
Phone 022/364-3733
Fax 022/364-3755

Junket time

Tuna '91 Bali, the second World Tuna Trade Conference, will be held in Bali, Indonesia May 13-15, 1991. The U.S. now imports 347,000 m.t. of tuna and is the largest consumer of canned tuna in the world. For information: INFOFISH,P.O. Box 10899, 50728 Kuala Lumpur, Malaysia. Phone (603) 291-4466; fax (603) 291-6804.

Cold water survival training center

The U.S. House of Representatives approved a $6 million appropriation to create a Cold Water Survival Training Center in Kenai, Alaska.The University of Alaska-based program would provide cold water training and medical research related to drowning and the effect of cold water on human survival. The $6 million covers half the cost of building the center; remaining funds would come from the State of Alaska and the City of Kenai.

Journal of Food Science looks at surimi

Three papers of interest were published in the Journal of Food Science, Vol. 55 No. 4, 1990. Dr. Chong Lee of the University of Rhode Island, long a surimi champion, co-authored "Relationships between physicochemical properties of nonfish protein and textural properties of protein-incorporated surimi gels." Two other articles of interest are "Textural degradation of cooked fish meat gel (kamaboko) by the addition of an edible mushroom, Judas' ear" and "Strength of gels prepared from washed and unwashed minces of hoki stored in ice."

Canada wants to make dogfish surimi

The Technical University of Nova Scotia is researching ways to improve the gel-forming ability of surimi made from dogfish, herring and capelin. Researchers believe they may be able to change the molecular structure of the flesh of these species, and produce a high-grade surimi from them. Their studies include some work with Atlantic hake as well. In Canada, surimi represents 12% of the seafood consumption.

Flounder explodes

A flounder being gutted in a Wellington, New Zealand plant exploded, reports *Seafood International*. According to witnesses, a buildup of methane gas in the bowels of the fish was ignited by static electricity from the knife. An explosion ensued. Nobody ever said flounders were easy.

the LODESTAR
Charting the course of fisheries development today
Alaska Fisheries Development Foundation, Inc.
Volume VIII, No. 3 Autumn 1990

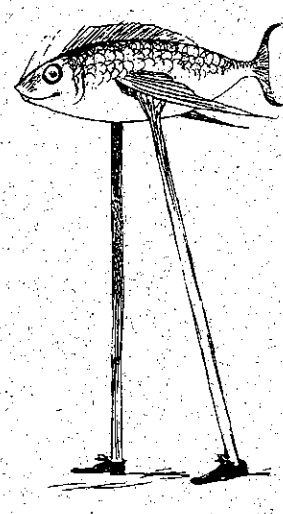
"The 'silly question' is the first intimation of some totally new development."
– Alfred North Whitehead

AFDF Annual Meeting
Walk don't run

December 10, 1990
Anchorage Hilton, King Salmon Room
Board of Directors' meeting: 9:00 a.m.
Annual membership meeting: 10:00 a.m.

Voting members will elect five board members, including three fishermen, one processor and one support industry representative. We'll also discuss project development and future direction for AFDF.

For more information, call Barbara Culver, (907) 276-7315.



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