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News to Use

Top of the news is a new Request for Proposals issued by AFDF in May soliciting response from Alaskan seafood processors interested in housing a pilot surimi and analogue production line. The small-scale line will be installed in the winning bidder's plant and made available to the industry (at a daily fee) for research purposes.

AFDF is acquiring the pilot line and making it available to the industry to help gain more information about surimi and anlogue processing with a small, more easily-manipulated plant. Among issues that need study are quality consistency, the functionality of surimi (particularly water-holding capacity), improving recoveries and therefore profitability, and testing new cryoprotectants and other custom formulations.

Interested companies must submit respond by June 30 with plant information, provisions for accommodating industry research, and a 30-month commitment to house and maintain the pilot line. For more information contact Peter Moore at AFDF.

Kodiak is second biggest fish port in America, according to a National Public Radio report June 1. Kodiak now is second only to New Bedford, Maine. Kodiak's record landings value was $132.9 million in 1981.

This issue focuses on improving surimi quality, and on taking a first look at some new species. Alaskan shore-made surimi was tested in a domestic analogue plant, with good results **(see page 4.)** Dr. Tyre Lanier clarifies the NFI surimi technical subcommittee's position on surimi quality determination **(see page 5.)** And AFDF takes a look at some new, hopefully profitable, endeavors including pollock liver oil **(page 2)** and flatfish **(page 8.)**

Waste utilization: teaching an old fish new tricks

By Krys Holmes

"If you can't make more fish, you've got to make more out of the fish you've got," was the simple logic presented when industry members asked AFDF to embark on a full-scale, industry-wide waste utilization project.

The bottomfish boom in Kodiak has increased seafood production there fivefold. Not only are five times more fish being processed, five times more waste is being generated than even three years ago. In the Bering Sea and Aleutians, floating and shore-based processors are beginning to look at by-products as an integral part of new plant design. In Southeast Alaska, the waste stream could help boost declining profits.

It's estimated that most processors could increase profits by 11% if they could profit from their waste materials instead of spending the millions now spent to grind waste, barge it out to sea, and dump it.

AFDF hopes to spend much of the next fiscal year exploring the potential value of the wastes generated from processing all of Alaska's major species, and demonstrating processing methods for more profitable by-products. The project is part of AFDF's FY 1987/88 S-K proposal package; however, an initial characterization of fish wastes began in early 1987.

The waste utilization project focuses on identifying profit-making opportunities now being lost in the waste stream, including in wash water generated during processing. During the project, the foundation will study:

- What is being produced, in what areas, and how seasonal changes affect the character of the waste materials from cod, pollock, crab, surimi, halibut and salmon processing;
- How to improve the quality of waste materials;

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Waste utilization

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- The potential value of Alaska's high-quality by-products in industrial, food and pharmaceutical markets; and
- Potential economic and technological plans for seafood processors interested in reaping more value from waste streams.

Taking inventory

Because statistics are compiled only for major seafood processing areas, and include only large-scale processing plants, an accurate assessment of total Alaskan seafood waste production is not to be found. However, industry standards estimate that waste totals 30% of round weight in salmon production; 60% of groundfish; and 80% of crab production. If 2 million metric tons of groundfish were harvested and processed in Alaskan waters in 1986, then 1.2 million metric tons of groundfish waste were generated by U.S. and joint venture groundfish processors alone: 97,800 metric tons in the Gulf of Alaska, and the remainder in the Bering Sea.

All of Alaska's other species totalled about 400,000 m. tons in 1986, which, on the average, would have produced about 132,000 m. tons of waste, including skin, bones, heads, tails and entrails along with process water.

In Kodiak, 12 processors generate 400 tons of waste per day at full plant capacity. Kodiak Reduction, Inc. (KRI), which operates the city-owned waste recovery facility, can process up to 150 tons of waste per day; the remainder of Kodiak's fish waste is barged out to a designated area and dumped.

Of the waste generated, an average of 13% is usually recovered in meal, and about 0.1% recovered in oils.

Fish wastes now are characterized according to their pollution potential rather than as marketable ingredients. This attitude has directed the industry to focus on safe methods of disposal rather than on designing profitable by-products. AFDF hopes to bridge the information gap that will encourage processors to develop such products successfully.

AFDF and the Fishery Industrial Technology Center (FITC) have completed proximate analyses of tanner crab, cod and pollock processing wastes, comparing waste streams between pollock surimi and fillet lines. Those comparisons show that protein recoveries from mince wash water, for example, were 15.7%; recoveries from fillet waste were 12.5%. Ash content of wash water was 7.92%, compared to 3.65% from fillet waste, and fat content from the heading and skinning steps of surimi processing was 9.1% compared to 1.9% from filleting waste.

"This kind of information will help target promising applications for Alaska's seafood by-products, to compare waste stream compositions to those of valuable products now on the market, and—we hope—create new opportunities from a valuable resource that now is being discarded," said AFDF executive director Mel Monsen. "It will also help processors estimate the profitability of including waste processing in their plant design."

Identifying the players

KRI currently produces about 6 million lbs. of meal and 800,000 lbs. of oil per year using an Alfa-Laval centrifuge system followed by a direct-flame drier. The drier, which was supplied with the plant, has hampered KRI's quality control efforts, according to manager Dan James. The drier is said to leave an off odor in the meal due to direct hydrocarbon contact with the meal. Also, because the direct-flame drier burns off some of the proteins, the percentage of ash increases making the meal less desirable in pet foods. In a brief submitted to AFDF, James said, "Another problem is that direct-flame driers break down the protein molecules and release the nitrogens. Since meal is priced by protein content, it means less dollars per ton of meal produced." KRI hopes to conquer some of its technological problems and increase production as a result of AFDF's project.

In Seward, Seward Fisheries processes 150 tons of meal and oil per day, using offal from Kenai Peninsula commercial processors. Seward Fisheries' by-products are used in sled dog feed, liquid plant food, fertilizer, dairy and livestock feeds, and food pellets for salmon hatcheries. Seward Fisheries uses an indirect-heat steam dryer which operates at lower temperatures and produces more consistent quality with lower ash content than does the direct-flame drier used at KRI.

"We hope not only to compare existing technologies for handling waste material, but also to learn about the potential value of these products, and hopefully demonstrate to Alaskan processors that it is more profitable to process the offal than to pay to throw it away," Monsen said. "It doesn't matter what kind of technology we advocate, the waste will not be used until the processors find a way to profit, or at least minimize losses, from the materials."

Many potential uses

Fish meal and oil was a $44 million business in the U.S. in 1986. Japan, the U.S.S.R. and the U.S. are the three largest world markets for meal. West Germany, the U.K. and Taiwan are the largest meal importers. Primary industrial uses for fish meal are: chicken feed, cattle and swine feed, dog and cat food, and feed pellets for fish hatcheries. Meal is high in calcium, iodine, lime and vitamin B-12, and helps promote bone and gland growth. Meal contains highly digestible minerals, which make it an effective nutrient.

White fish meal, because it is non-oily, is sometimes considered a more valuable meal because it is higher in protein and less likely to transfer any fishy taste or odor to the animals which eat it.

Edible fish oils are high in vitamins D and A, and can contribute omega-3 fatty acids to the diet to fight cholesterol buildup. Fish oils are also useful as fuel oil and lubricants, in making fatty acids for chemically-produced products or drying oils in protective coatings. Fish oil derivatives are used in margarine, inks, leather tanning, glazings, caulking and other water repellants, and corrosion inhibitors. They also face potential uses in healing topical wounds and burns, irradiation treatments and in treating inflammatory diseases.

Hydrolysate, or fish protein concentrate, is produced by solvent extraction or enzymatic hydrolysis, a process which is less expensive than traditional rendering processes. Hydrolysis methods are being investigated by the New England Fisheries Development Foundation in Boston, Mass.

Project methods

Once proximate analyses of waste materials from all of Alaska's major species can be compiled, AFDF will study different drying and rendering methods and compare results to identify optimum conditions for materials entering the plant, how process variables affect by-product quality, and how high-quality by-products may fit into existing opportunities for meal and oil in the U.S. and abroad.

AFDF also will study the effects fish age and season changes have on oil content and quality, and on the makeup of recoverable proteins. Other questions about the marketability of Alaskan seafood by-products will be addressed later in the project. For example: Is it more advantageous to sell high-quality meal to traditional markets, or to process it further into value-added items such as fish feed pellets? What are the benefits of adding clarifier to fish oils? How does the nutritional or chemical composition of fish solubles affect its marketability?

"Our primary goal with this project is to bring to an end the era of dumping valuable fish by-products in the ocean," Monsen said. "Processors now are spending significant amounts of money just to grind and discharge their waste — a million dollars a year for Kodiak's processors. We hope the information we generate will not only help increase current plants' processing capacities and market opportunities, but will also help individual processors find a way to increase their plant profits by producing high-quality by-products."

Preliminary results from some of the proximate composition studies now are available from AFDF.

Thanks to Dan James of Kodiak Reduction, Inc. for significant contributions to this article.

AFDF looks at pollock oil

Can pollock liver oil be used in high-value products like cosmetics or nutritional supplements?

AFDF hopes to find out, and has begun studying the characteristics of pollock liver oil, predictable yields, and marketability in valuable products such as fish oil pills. AFDF hopes to compare pollock liver oil with its cod counterpart, and investigate its potential as a revenue-booster for Alaskan pollock processors.

T C Swafford of Pacific Rim Fishery Projects, Inc. staged the initial test sampling for the project at Eagle Fisheries in Kodiak. Swafford and Eagle's Manny Micael hand-extracted 358 lbs. of livers, rinsed them and ground them through ¼-inch plates into a stainless tank. Fresh water was added to a level of 20% to decrease viscosity and to aid in separation.

The mince/water mixture was heated inside an aluminum spiral heating coil, avoiding direct heating of the mixture. Material temperatures were held at 180°F for 90 minutes, though Swafford said temperatures up to 205°F may provide better oil separation yields.

Cooked liver mince slurry then was pumped as feedstock to an Alfa-Laval Clarifier Centrifuge where bulk insoluble solids were separated and compressed into a cake. The clarified liquid then passed into a second heating tank where it was heated to 205°F. This mixture was then gravity-fed into an Alfa-Laval continuous separator for further purification into clear liver oil.

Swafford said the most remarkable result of the test sampling was the large variance among fish sizes, particularly among fish that were caught in the same area on the same day. Most of the fish used were larger than average to ease liver extraction, which was a laborious endeavor. Average fish weight was 4.2 lbs. for males, 4.4 lbs. for females with sizes ranging from 2.5 to 5.4 lbs. Average liver weight (as % of round weight) was 3.6% in males, 5% in females, and ranged from 1.2 oz. to 5.4 oz. About 47 lbs. of oil were produced during this first phase.

Samples were analyzed by gas chromatography at the National Marine Fisheries Service (NMFS) Utilization Research lab in Seattle. That test, which analyzed fatty acid composition of the oil, showed that in two of the three samples, EPA and DHA levels were lower than desired for nutritional supplement use —9.9% EPA and 6.8% DHA.

AFDF project manager Peter Moore said that those involved weren't surprised to get low omega-3 counts from near-spawn or post-spawn fish. "During that time, the pollock are just about living off their livers," he said. Previous pollock liver oil studies by NMFS done on non-spawning pollock showed an EPA level of 17.5%.

AFDF's next job is to investigate potential markets for pollock liver oil of varying quality. With that information, AFDF will better be able to analyze the potential of the oil in high-value products. "We have had great cooperation from NMFS, particularly from the Seattle and Kodiak utilization research divisions of the Northwest & Alaska Fisheries Center," Moore said. "When we are through with this project, we will have quite a lot of varied information about fish oils."

Rep. Young changes mind on reflagging

Rep. Don Young (R-AK), sponsor of a current bill to ban reflagging of foreign processing vessels as of Jan. 1, 1987, said in May that he now supports reflagging of some foreign vessels. Young's statement contradicts his previous statements that reflagging would make a mockery of Americanization.

In an Anchorage Daily News story, Pacific Seafood Processors Assoc. executive director, said Young's statement that between two and nine vessels should be allowed to reflag is "not acceptable. It would completely gut the legislation," he said.

Young's aides have drafted a compromise bill that would allow reflagging for five years before the ban would take effect. A majority of the U.S. processing sector opposes any window, maintaining that any reflagging would allow "paper Americanization" of a vessel while giving foreign companies a way to gain priority access to U.S. resources.

Surimi stats being collected

National Fisheries Institute (NFI) now is collecting statistics about U.S. surimi industry activity, and plans to publish a quarterly statistics sheet. Data gathering began at the April NFI convention, after much prodding from the industry. But as of press time, no questionnaires had been returned. All surimi processors are encouraged to participate. Data is published in gross figures; all company info is kept strictly confidential. Contact Joe Selsavage, NFI, (202) 296-5090 for more information.

Compromise on 100-mile exclusive zone

The North Pacific Fishery Management Council adopted a seasonal pollock joint venture (JV) apportionment as a compromise solution to shore-based processors finding it impossible to compete for the resource with JV processors. The compromise would divide JV allocations seasonally, with 260,000 m. tons allocated between Jan. 15 and April 15; the remainder would be available after April 15. The council's advisory panel agreed unanimously the move would go a long way toward encouraging U.S. fishermen to deliver to shore plants after seasonal JV allocations were satisfied.

Maine cracks down on surimi

A consortium of state agencies in Maine issued a statewide notice in May warning restaurants and retail outlets that no food item containing surimi may be sold unless clearly labeled "imitation," or "processed seafood," such as "lobster-processed seafood salad." Sale of a product containing surimi under any other name will bring a $100 fine. Proponents say the law protects consumers, though it does not require that consumers be informed that surimi is *not* imitation seafood but is white fish in a new product form.

Industry News:

New NZ hoki surimi effort

Independent Fisheries of New Zealand in May began a joint venture with a Korean company to process hoki surimi aboard a 2,200-ton Panamanian vessel. The vessel will produce about 15 tons of surimi per day under Independent's 20,000-ton hoki quota.

There are now 11 surimi factory trawlers operating in the New Zealand hoki surimi industry, all of them joint venture operations with either Japanese or Korean companies.

Compact water-maker for surimi ships

The Japanese Hokuten fleet has begun using compact water-making machines that allow small vessels to process surimi on the high seas. New 279-ton vessels under construction will include the equipment. One 499-ton vessel using the equipment last fall produced 10 tons of surimi per day, priced about $1.25/lb. (Source: BANR)

Japanese pollock quota

Japan recently announced its import quota for pollock products for April through September 1987 is 310,000 m. tons round weight, a 20,000 m. ton decrease from the same period in 1986. This quota includes 100,000 m. tons for U.S.-processed pollock products including surimi. (Source: NMFS)

16 Alaskans nominated for Promotion Council

Nominations closed in April for the newly-created National Seafood Promotional Council, created by Congress in 1986 to market U.S. seafoods. Nominated from Alaska were: Terry Baker, Arctic Alaska Seafoods; Ernest Bickley, Alaska Packers Assoc.; Bob Blake, United Fishermen of Alaska; Greg Carr, Carr's Quality Centers; Eric Eckholm, Pacific Communications & Marketing; Terry Gardiner and John Sund, Silver Lining Seafoods; Dave Harville, Kodiak and Western Trawler Group; Ron Hegge, Alaska Longline Fishermen's Assoc.; Gordon Jensen, Icicle Seafoods; Byron Mallott, Sealaska Corp.; Snooks Moore, Northern Enterprises; David Osterback from Sand Point, Robert Scott, Salamatof Seafoods; Jeff Stephan, United Fishermen's Marketing Assoc.; and Thomas Thompson, Sitka Sound Seafoods.

A total of 81 nominations were submitted from across the country; 15 council members will be selected in August by Presidential appointment. The first council meeting is expected to be soon thereafter. For more information about the council contact Phyllis Bentz at NMFS, (202) 673-5497.

Groundfish industry survey out

The Alaska Office of Commercial Fisheries Development (OCFD) will publish in June the results of an 18-month survey of Bering Sea groundfish industry support services. OCFD deputy director Paul Peyton said the survey was conducted to help the state determine the status of the infrastructure and support services for the growing American groundfish industry. The survey identified what offshore services are now available to floaters (freight, fuel, food, medical supplies, parts and maintenance services) and who provides those services, then surveyed the number and configurations of active boats and their activities, seasons, gear types and infrastructure needs. "The overall goal is to employ more Alaskans in the industry by identifying opportunities in the support sector," Peyton said. "The data ended up being more diverse than we expected. The questions were so specific that we ran into problems correlating the results. But we've now identified some solutions, such as at-sea refueling for joint venture boats." Peyton said the survey also included future service needs in the Pribilofs, what factors influence port preference, and what needs are currently not addressed in the area. "For example, the JV operators said there isn't an adequate Cat diesel mechanic in Dutch. This kind of information gives us a snapshot of where the industry is at this time, and in what direction the opportunities for growth might lie."

Copies of "U.S. Groundfish Operations in the Bering Sea: A Survey of Supply Needs and Opportunities," will be available from OCFD in June for $10. Call (907) 465-2162.

Omega-3 fatty beef?

Illinois beef researchers, wise to the wonders of omega-3 fatty acids, are injecting beef cattle with fish oils to introduce omega-3's into the beef. Cattle slaughtered after 60 days of fish oil injections produced beef containing measurable amounts of fish oil. (Source: Seafood Trend)

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Surimi: It's American Now

Get your copy now; they're going fast. This reference book is jammed with all the data AFDF collected about the U.S. surimi industry during the history of the Surimi Industry Development Project. It's profusely illustrated, simply organized, and available for $50 from AFDF.

Atka Mackerel reference

Atka Mackerel: Alaska's Invisible Fishery is a comprehensive analysis of one of Alaska's least utilized resources. This reference, written by Clint Atkinson and edited by Sharon Gwinn, covers resource, harvesting, processing and market information and might help enable some forward-thinking members to see an opportunity previously invisible to many. Available for $10 from AFDF.

Recommended reading

Journal of Food Science published in their March-April issuea paper entitled "Observations on the Functional Properties of U.S. Land-Processed Surimi" by Kermit Reppond, Jerry Babbitt and Andrew Hardy of NMFS and Scott Edson, formerly with AFDF. These research notes cover quality assessment methods and preliminary results, while noting that more research is needed.

Surimi

In the lab ar quality tests

In the plant:

A scientific study soon to be published by National Marine Fisheries Service (NMFS) shows U.S. shore-produced surimi "performs very well" in high-quality crab analogue products.

This confirmation is expected to clear some concerns in the industry over the quality of U.S.-produced surimi. Historically, U.S.-made surimi has been considered of lesser quality than Japanese top-grade surimi because it is made on shore, and because the "Americanized" surimi process is slightly different from the traditional Japanese method.

"I hope what these results will do is to help get the word out that domestic shore-produced surimi is very close to the same quality as at-sea produced surimi," said Dr. Jerry Babbitt of NMFS, who supervised the study. "In the process, we learned a lot about the functional properties of domestic surimi, and how it may differ from the functional properties of Japanese surimi. Next, we'd like to study why those differences occur."

Babbitt's study began last November at Alaska Pacific Seafoods (APS) in Kodiak, where he and his colleagues monitored the production of about 1580 lbs. of surimi, documented production conditions, and analyzed the chemical composition of the surimi immediately after production. The surimi was analyzed at two different laboratories, and Babbitt compared the results. About 80 lbs. of the surimi was frozen and held for shelf-life studies at 3- and 6-month intervals.

The remaining 1,500 lbs. of surimi was frozen and shipped to the Unisea crab stick plant in Redmond, Wash. for processing into crab analogues using the Unisea commercial formulation. Though there were some differences among quality measurements done by Unisea, APS and NMFS, results from the test production run show that APS surimi produced high-quality finished products.

Babbitt said that, because of differences in lab equipment and procedures, the results of the test production may be interpreted as more important than the results of the lab tests. "The surimi performed very well during the production run of chunk-style crab," Babbitt's report reads. "The formula used by Unisea to fabricate the crab resulted in an excellent product. The color, texture and desirability of the finished product was very good."

Unisea processed the APS surimi into crab chunks. Babbitt conducted an informal taste test among the plant workers and project participants, and those results showed that the APS surimi was comparable to other commercial products, he said.

The portion of raw surimi that was frozen for shelf life study was evaluated in March and again in May. Results showed little or no change in the quality of the surimi at either three or six months."We think that if the surimi quality hasn't deteriorated at all in six months, it's probably safe to start getting the word out," Babbitt said. "And what we are able to tell people is, if you use this size fish, held in refrigerated salt water, and it's handled in this way, and these are the chemical characteristics, then you will produce *this* quality surimi. Our information reflects the range of quality produced, not absolutes."

Other information generated by the study reflected that the in-line wash system used by APS produces results comparable to the traditional three-tank wash system. Some prefer the in-line wash equipment because it is sealed, not open to the air, and its design ensures that the first product to enter the washer is also the first to exit, thus preventing over-hydration of the mince.

"Overall, the information we generated got us a lot closer to knowing what makes good-quality surimi," Babbitt said. "We still have a lot to learn about what causes quality differences between various lots of surimi. These results were very important. And one of the reasons the study turned out so well was that Unisea uses excellent formulations with its products."

Copies of Babbitt's report will be available in July.

In the lab:

The following analysis was submitted in response to a Letter to the Editor from Dr. Chong Lee, which appeared in the last issue of The Lodestar. Dr. Lee had registered several objections to recent actions of the NFI Surimi Technical Subcommittee to establish a standard testing method for surimi quality, against which other testing methods would be calibrated. Here, acting chairman of the Technical Subcommittee, Dr. Tyre Lanier, clarifies the subcommittee's position.

By Dr. Tyre Lanier

The NFI Surimi Committee's Technical Subcommittee has recommended a set of testing procedures which would serve as standard, or benchmark, methods for evaluating the composition and functional properties of raw (frozen or dried) surimi. The objective was not to dictate testing methods or equipment which must be used routinely by processors in their plants. Rather, these *benchmark* methods will:

- Define standard units of measurement to be used in specifying a property of surimi for purposes of trade. For example, temperature is a property which can be measured in degrees Fahrenheit, and weight is a property which can be measured in ounces. Other units can be used to specify these properties, but confusion arises when different units are used for trade communications.
- Provide a standard testing regime for measuring each property of interest. An individual processor might choose to measure temperature of a batch of surimi by running his finger through it, or estimate its weight by the volume it occupies in lugs. Nonetheless, for trade purposes he must always "calibrate" these crude measurements against the readings of a thermometer and scale. Particularly in situations of dispute over a measurement, standard methods must exist for settling the issue.

It was the consensus of subcommittee members in attendance that *no grading system* for surimi should be established. This avoids confusion over whether the basis of grade determination will be color, gelling ability, or some other property. Rather, it was decided that surimi should be bought and sold based on measurements of the individual properties of lot samples (i.e., a specification sheet).

Surimi in meats: the next step

AFDF will hit the streets this summer with a series of presentations to meat processors on the functionality of surimi in red meat and poultry products. The seminars are part of the foundation's effort to gain regulatory approval for surimi in meat-based products, and will be designed to generate participation in that project by meat processors.

"We decided that the project is now at a critical point where we need to apply direct input from the meat industry to each of the segments we have addressed so far - the microbiological work, the in-plant inspections, and product development," said foundation director Mel Monsen. "Addressing all the concerns relating to USDA approval of surimi in meats has become a very complex process, and we probably could pursue any number of paths open to us and not be too far off the mark. But from the start, the surimi project has always been industry-directed, and it's time now to take our current knowledge to the meat industry and find out what direction they would like to take."

AFDF and its contractors, Manning, Batson & Associates, have been working toward USDA approval for surimi for more than a year. So far, AFDF has sponsored studies of the interaction between surimi and beef, pork and poultry meat systems, development and test production of three breaded meat/surimi nugget patty products for presentation to the USDA, and petitioned the federal agency for a preliminary ruling. USDA responded in January with approval of a sketch label for a pork/surimi nugget and a list of specific concerns that stand between surimi and USDA approval.

AFDF and a group of surimi processors has also begun developing a voluntary in-line surimi quality monitoring system called Hazard Analysis Critical and Control Point (HACCP), which, if approved by USDA, could take the place of federal plant inspections for those selling surimi to the meat industry.

The foundation recently set up a nine-member HACCP advisory committee of microbiologists, surimi producers and government representatives who will address concerns specific to surimi quality and inspection.

The newest phase of the project will allow AFDF to disseminate information about surimi to meat processors and gain their guidance in furthering the approval process. Presentations will include data on the microbiological characteristics and proximate analyses of surimi, how it interacts with muscle meats in certain formulations, and how surimi can be best applied to further experiments by meat processors.

"The objective is to share the information we have to encourage more experiments in the meat industry, and to gain some guidance as to what direction the foundation needs to turn next," Monsen said. "We want to start a dialogue that will promote product development and build meat industry support for surimi."

AFDF conducts all such industry development projects in complete confidentiality. Any company interested in scheduling a presentation or receiving more information may contact Monsen at AFDF.

nd in the plant, s make headway

All of the properties for which a standard test method has been established may not be of interest to every user. This system will thus allow much more flexibility to surimi buyers who may find only one or two properties to be important in their food formulations.

Below is a listing of the standard tests for composition and functional properties that the subcommittee deemed to be critically important in formulating either existing or future surimi-based foods.

Surimi composition

The compositional properties judged to be of most interest were protein, moisture, fat and visual contaminants (colored specks easily distinguished against the light muscle protein background).

Because pH is also a measurement of the concentration of a surimi constituent (acidity, or hydrogen ions), the method for its measurement is also included in this category.

Functional properties

Functional properties of surimi are those that affect color, texture, flavor and odor of a food in which surimi is an ingredient. Functional properties may also affect the machining properties of the food (pumpability, extrudability, resistance to tear or breakage, etc.) in commercial processing. The expression of a functional property is dependent on:

- the quantity of surimi added to the food;
- the process to which the raw food formulation is subjected during its manufacture; and
- any interactions between surimi and the other ingredients of the food.

This means that the measurement of functional properties depends on the process and (to some extent) upon any supplementary ingredients used.

Functionality measurements are thus best made by preparing and processing the surimi in a manner closely corresponding to the normal manufacturing process. If the surimi is a major constituent in a product, as it is in kamaboko or shellfish analogues, it may be unnecessary to add most of the other ingredients just to evaluate functionality.

The subcommittee recommended that all measurements of functional properties be made on a cooked model product (except for measuring raw viscosity, which is mentioned later). The preparation procedure for the product is identical regardless of the property to be measured. However, the heat process used to cook the product can greatly affect its finished properties. Therefore it was decided that, when appropriate, the model test sample may be prepared by one or more of four standardized time/temperature schedules. Collectively, the use of these four heating schedules will enable a processor to estimate the performance of the surimi when it is subjected to almost any commercial process schedule.

The surimi functional properties for which standard benchmark tests were elaborated include the following:

Color: Color will be measured by an electronic colorimeter. A single brand and model will be specified for use as a benchmark method. The units of measurement will be the CIE Lab L* (lightness), a* (redness), b* (yellowness) scale, a modern version of the Hunter L,a,b scale.

Flavor/odor: It was the consensus of the committee that a paired scale scorecard will be used to provide a semi-objective assessment of two types of flavor/odor: 1) flavor/odor characteristic to the species; and 2) "other" (generally undesirable) flavor/odor, i.e., rancid, sour, "fishy" (amine), etc.

Each type of flavor will be scored according to intensity: none, slight, medium and strong.

Gel-forming (texture) properties: This measurement will be made by determining the fundamental rheological (textural) properties of the test product when it is strained (deformed by tension, compression or shear) to failure (breakage). For surimi gels, which are generally quite cohesive, a torsional (twisting) deformation will enable the only precise calculation of these properties. This test yields the fundamental measurements of stress (at failure), strain (at failure) and rigidity (at any deformation to failure) which are related in the following manner:

Rigidity = stress/strain

If any two of these parameters are known, the third may be easily calculated. However, it is recommended that all three values be given when specifying the properties of a surimi gel. Note that stress value measures strength of the gel, strain value measures cohesiveness, and rigidity measures firmness.

The conventional Japanese punch test has some inherent flaws, and does not produce linear data useful for blending applications. However, a crude correlation table relating punch measurements to the corresponding approximate torsion scores has been prepared for within-plant quality control use, and is given here (see box at right).

Note the following warnings when using this table:

- When surimi is high in moisture content and contains very high quality protein, the punch test can yield very erroneous measurements. Standard measurements should be conducted at 80% moisture content; this table should be correct for moisture contents in the 73-80% range.
- This table should not be used with samples which cannot pass a Japanese fold test (3 mm slice folded twice without cracks). Fundamental measurements for such samples can only be obtained using a torsion or other fundamental test; the punch test will give erroneous results.

Extensive research has shown that torsion test measurements correlate much better with sensory panel results than do punch results, and are more linear (e.g., if one surimi receives a stress score twice that of another, it really is twice as strong as the other. This is not always true for punch test scores.) The importance of linear measurements is that processors can more accurately predict the effect of mixing different surimis to achieve the gelling property they need in the final mix. This will become more important as many types of surimi become available at widely varying prices.

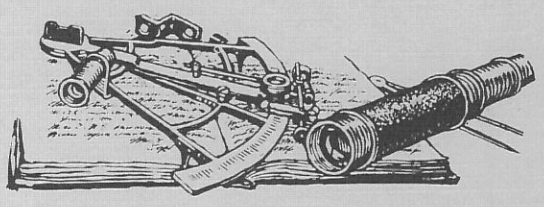
Any further questions about the NFI Surimi Technical Subcommittee should also be directed to Dr. Lanier, or to Roy E. Martin, National Fisheries Institute, (202) 296-5090.

From punch test to torsion test: Estimation of stress and strain gel measurement correlation

Stress values		Strain values	
Punch force (g)	Torsion stress (Kpa)	Punch distance (mm)	Torsion strain
20	7	10	2.25
40	9	10.2	2.27
60	11	10.4	2.29
80	14	10.6	2.31
		10.8	2.32
100	16		
120	18	11	2.34
140	20	11.2	2.35
160	23	11.4	2.37
180	25	11.6	2.39
		11.8	2.40
200	27		
220	29	12	2.42
240	32	12.2	2.44
260	34	12.4	2.45
280	36	12.6	2.47
		12.8	2.49
300	39		
320	41	13	2.50
340	43	13.2	2.52
360	45	13.4	2.54
380	48	13.6	2.55
		13.8	2.57
400	50		
420	52	14	2.58
440	54	14.2	2.60
460	57	14.4	2.62
480	59	14.6	2.63
		14.8	2.65
500	61		
520	63	15	2.67
540	66	15.2	2.68
560	68	15.4	2.69
580	70	15.6	2.72
		15.8	2.73
600	73		
620	75	16	2.75
640	77	16.2	2.76
660	79	16.4	2.78
680	82	16.6	2.80
		16.8	2.81
700	84		
720	86	17	2.83
740	88	17.2	2.85
760	91	17.4	2.86
780	93	17.6	2.88
		17.8	2.90
800	95		
820	98	18	2.91
840	100	18.2	2.93
860	102	18.4	2.95
880	104	18.6	2.96
		18.8	2.98
900	107		
920	109	19	2.99
940	111	19.2	3.01
960	113	19.4	3.03
980	116	19.6	3.04
		19.8	3.06
1000	118		
		20	3.08

Opinions

director's log



By Mel Monsen
AFDF Executive Director

One thing I have learned since coming on board is that the foundation has earned an excellent national and international reputation from the success of its surimi industry development efforts. The surimi project also provided the foundation with a wealth of contacts and information. My goal, as I begin my tenure as executive director, is to fully exploit this existing potential to the benefit of the fishing industry in Alaska.

The opportunities for fishing industry research and development in Alaska are at an all-time high. We have attained many of the goals that were set down over a decade ago when the Magnuson Fisheries Conservation and Management Act (200-mile limit) was instated. This accomplishment is very evident in Alaska's coastal communities right now, especially since many other sectors of Alaska's economy are suffering from the oil-related recession.

Capital investments in the harvesting and processing segments of Alaska's fishing industry are growing, particularly in areas with bottomfish fisheries. More and more vessels are being outfitted to harvest cod, pollock, and other previously underdeveloped species. More and more processors are making changes to their plants in order to handle cod and pollock. In Kodiak and Unalaska, processors are vying for boats so they can obtain enough product, and fishermen are weighing the economics of delivering to offshore or onshore buyers.

When coupled with the stability and, in some cases, growth of the long-established fisheries of the state, the future looks bright.

The foundation, through well-directed and enacted research and development, will be able to help industry avoid unneccessary and costly mistakes in this period of rapid development. We have already witnessed some of the problems caused by unrestricted growth in a fishery without adequate research and development. Many of the investments made in bottomfisheries immediately following the 200-mile limit were total failures. The causes were numerous, but adequate research and development work would have reduced, or at least identified, many of the risks faced by the industry.

The prime example of the benefits of research and development for the fishing industry in Alaska is the surimi effort. We now have three surimi plants in Alaska and an industry network that exists on a national and international level. The information developed by the foundation during the project has proven invaluable to the industry and may have saved millions of dollars in wrong turns and mistaken assumptions.

The foundation, with its industry-driven research and development program, has unique resources that will lead to more successful efforts. Through our extensive project identification and development process, which includes all segments of the fishing industry, we are best able to address the essential research and development needs of the industry. By involving so many participants from industry, our programs are able to avoid the biases and self-interests that less broadly structured associations cannot.

The whole point of this discussion is to emphasize the approach that the foundation has taken and to communicate the continuing good it can do for the fishing industry in Alaska. I encourage our membership, and even non-members, to become involved in determining the direction and projects of the foundation. We need to ensure quality and unbiased research and development if we expect the Alaska fishing industry to continue to benefit from Saltonstall-Kennedy funding.

In short, participate.

A special thank you

I would like to take this opportunity, in my first *Director's Log,* to thank Sharon Gwinn for her efforts on behalf of the foundation. Since last September, Sharon has sacrificed her own business interests to ensure the foundation had a smooth transition while the search for a new executive director took place. Since I came on board on April 1, she has proven to be an invaluable source of information on current projects and on historical perspective for long-term projects.

Thanks again, Sharon, and best wishes in your future endeavors.

"Most people don't eat fish for their omega-3 fatty acids. There's something fresh and clean about a creature that lives in cold salt water, feeding on crustaceans and smaller fish. As we eat, we can incorporate a little bit of the sea. So when a writer comes by for lunch, I go for the monkfish—and wait for ocean pout and Alaska pollock to appear on the menu. At the supermarket I watch for croaker and pick up the mussels from Tenants Harbor, Maine. And sometimes, sitting at my desk in the morning or going to bed at night, especially when it's windy and rainy and nasty outside, I think of the men at sea on draggers and stern trawlers, longliners and purse seiners, still putting food on the table the hard way, the last hunter-gatherers of our society."

—John P Wiley, Jr.
Smithsonian, May 1987

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AFDF Sampler

Product development is AFDF's middle name. If your company is interested in investigating product development possibilities with pink salmon, pollock or pollock surimi, you're reading the right paragraph.

AFDF offers limited amounts of product as free samples for product development purposes. Following are samples now available:

Product	Form	Sample size	Cost
Surimi	frozen block	in 10-kilo blocks (2 blocks per carton)	no charge
Pink salmon	fillets	13 lb. logs	no charge
	mince	13 lb. logs	no charge

For more information about the samples available, or to order your sample, contact Barbara Culver at AFDF.

The editor's turn

Off the Cuff

Conquering the bottomfish industry was very much like settling the Last Frontier. It was big. It took some work. Now what do we do?

Every generation has had its own Last Frontier. For my 102-year-old great aunt Nina the Last Frontier was Minnesota. For some of us, it is Alaska. For most of us, the last frontier left to explore is space, though space is becoming as littered as some parts of Alaska.

At AFDF, we're not thinking of the Last Frontier, but of the Next Frontier, which is all the unused potential in the sea. Millions of pounds of fish bones and skin and oil and protein that now are being dumped into the sea — some of it to the detriment of the sea life — make up our next frontier. We will explore new marketing ideas that will help explore various uses for these materials and make by-product processing profitable for Alaskan producers. We will set out across the geography of our imaginations, really, because imagination is the only frontier.

It doesn't take too much imagination to figure out that dumping thousands of pounds of whole dead cod and pollock over the side might do some damage somewhere. In June the National Marine Fisheries Service discovered that a large portion of one of Bristol Bay's hottest scallop beds was nearly decimated — suffocated from thousands of pounds of decaying fish, some of them whole except for a slit where roe had been extracted. NMFS reported that some of the fish were whole, possibly dumped from too-full joint venture nets.

It may take some imagination to discover the best use of those fish and to devise a fair and balanced method of making sure every gram of protein harvested from the sea is put to good use. The only way to do that is to make it more profitable to keep fish that have been harvested, and process them into something valuable, than it is to dump them dead back into the sea. That shouldn't take too much imagination.

Here's something more remarkable: Meat researchers are injecting omega-3 fatty acids into beef cattle and successfully raising their EPA and DHA levels. That's *chutzpa*. It also presents a challenge to seafood marketers in the battle for the American dinner plate, where imagination is the only firepower. (And by the way, where are they getting the omega-3 s?)

In the seafood industry in Alaska, there aren't too many grand frontiers left — krill processing notwithstanding — but what is left, and what will really engage our sense of discovery, is the challenge of using everything we've got with creativity, with respect, and with an eye toward building for the future.

Inspiration is discovering the extraordinary among the urbane. We usually think of creativity as a challenge, as extending ourselves beyond what we are. On the contrary, invention and discovery are our natural conditions. It's what drives us forward, what fuels the hundreds of letters AFDF receives every year with project suggestions, with guidance, with complaints like, "What you should have done is...." There is more energy in the single discovery of a new idea than in all the status-quo inertia from here to Washington, D.C.

Creativity is the child of imbalance; it appears when something's amiss. And imagination is what drives most of us forward, through all kinds of political, technological, and mental frontiers in pursuit of balance — between use and abuse, between profit and over-exploitation, between the pinch of the riddle and the charm of discovery.

Krys Holmes

The Lodestar

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Krys Holmes, Editor
Mel Monsen, Executive Director

Old-timer advises: Look to the future

On April 10, at the National Fisheries Institute convention, John Peterson, retired seafood processor from Seattle, was named Person of the Year. Peterson gave the following speech to the audience of several hundred seafood brokers, marketers and producers who attended the convention.

By John Peterson

You all know how interesting and exciting our business is. It is also fascinating, habit-forming, perplexing and very complicated. It is also very unusual and unique.

Ponder on this: Our industry depends upon the harvest of wild animals for its very existence. The problem is that annual production of those wild animals has just about peaked out. Increased production is simply not expected because the global production of seafood depends upon the productive capacity of the oceans of the world, and that capacity is finite. It is not possible to plow and fertilize those oceans, nor can deliberate selective breeding programs be undertaken. The best estimate of total global production is about 100 million metric tons per year. Until a few years ago, worldwide production was increasing at a steady 6% per year, but recently that rate has flattened out to about 1%—an amount so small it is difficult to measure. However, an enormous amount of seafood (a mind-boggling 220 billion pounds) is being consumed—every shred of it. There is no chronic surplus and very few short-term surpluses, although I am sure that buyers and sellers in the audience would dispute that point.

Now, we are expecting the per capita consumption of seafood in the U.S. to increase substantially during the next decade. An increase of one pound per capita requires about 500,000 metric tons of round fish, which is about ½% of the total annual global production. Probably more, because the 100 million metric ton figure includes industrial fish such as anchovies and menhaden.

So how do we cope with steadily increasing demand for seafood in the U.S., coupled with the prospect of no increase in worldwide production? I have a few suggestions:

First: Hope and pray that fishery management around the world is competent enough to prevent the destruction of existing stocks of fish through overfishing. I have little confidence in the ability of most of those regimes to do so. Fishery management is highly politicized. But it wouldn't be a bad idea to start examining the management systems of our own resources.

Second: Focus your attention on aquaculture, which currently is producing some 8 million metric tons per year and increasing annually by 10-15%. This activity does provide the opportunity to fertilize the water and tinker with the genetics of the crop. Aquaculture will certainly increase in importance for certain species.

Third: An enormous amount of waste occurs through destructive or inappropriate fishing techniques plus discards, by-catch and prohibited species catch regulations. Examine this area and work to develop remedies at both the management and harvesting levels.

Fourth: Maintain your exuberance and enthusiasm to develop innovative market forms, and continue to introduce new and little-known species. Keep high quality as top priority.

Fifth: do your best to reduce pollution of the marine environment. The hazards caused by the deliberate disposal at sea of persistent plastics and other assorted garbage, including toxic materials, is simply unacceptable if you expect the living resources to continue at maximum sustainable levels.

Sixth: Take a look at the significant fisheries developments in our North Pacific. Let me help you start thinking about that gold mine right now.

The combined annual production of the Gulf of Alaska and the Bering Sea is in excess of 2 million metric tons of pollock, cod, yellowfin sole, turbot, rockfish, blackcod, etc. plus another 400,000 metric tons of traditional species such as salmon, crab, halibut and herring. This is more than 50% of the total production in the entire U.S. FCZ.

These are the richest fishing grounds in the world, and they happen to be in our own back yard.

Presently, the bulk of groundfish is being caught by U.S. harvesters and processed by foreign-flagged vessels. However, the U.S. factory trawler fleet, — now about 20 vessels and growing by about six per year — plus substantial new and ongoing investment in shoreside facilities, will ensure that within a year or two most of that 2.4 million metric tons will be controlled by U.S. interests. At that time, supplies will be more readily available to help satisfy the growing demand in this, the greatest market in the world.

My most important advice, then, is to look to the Northwest for the supplies you need to satisfy the insatiable demand we all foresee—and don't sell cheap.

New project focus:

Flatfish: Big news for small fishermen

— and smart processors

The booming groundfish industry in Alaska has brought with it a set of new opportunities that could mean even more profits for Alaska's fishermen and processors.

With every pollock or cod delivery, about 10% of the fish is by-catch — primarily flatfish including yellowfin sole, rock sole, and arrowtooth flounder — most of which is usually thrown back into the sea. Until recently, processors had little interest in these by-catch species because they appeared in quantities too small to be profitable, and because markets have been few and far between.

The advent of the groundfish boom brought by-catches that increased proportionally with targeted harvests. At the same time U.S. markets, responding to the growing need for fresh seafood, seem to have discovered Alaska as a source for many seafood products. And processors, having gained a foothold in cod and pollock, seem willing to take new risks to broaden their opportunities.

There are some significant barriers to full exploitation of by-catch opportunities, and AFDF is designing a project to conquer those barriers. The project will focus on harvest and handling techniques for flatfish, enhancing processing technology for these species, and investingating market opportunities in the U.S. and abroad. The project emphasizes opportunities for small-boat fishermen (90 ft. or smaller) and for processors both onshore and at sea who want to expand their product mix.

AFDF project manager Peter Moore said the project has received strong interest from longline fishermen and limit seiners who are considering refitting their boats with drag or trawl gear. "We'd like to find opportunities for that part of the fleet that hasn't seen much new opportunity outside of salmon and halibut," Moore said. "We'd like to demonstrate the potential for the smaller boats in flatfish. I think they could do so much better dragging than longlining. There has been some interest for several years, but all the pieces haven't come together before now."

The three-phase project would begin with a resource evaluation and investigation into the best harvesting and handling techniques. This phase will look at the full range of on-board handling of flatfish, including processing and freezing at sea, particularly for arrowtooth flounder, which must be processed quickly after harvest to halt characteristically rapid spoilage by the parasite *Myxosporidia*.

Second, the project would investigate the economics of vessel modifications to trawl gear, and also for modification of production facilities in a shore-based plant, including test production of a variety of products.

"We're not going to pay for someone to retrofit," Moore said. "We would get plans drawn and look at the economics, and have someone prepare a prospectus that would be usable for someone going to a bank for funding."

The third phase includes a market study with emphasis on identifying possible barriers to current markets. AFDF will also help introduce finished products to commercial users via a sample distribution program.

The project will focus on arrowtooth flounder and yellowfin sole, though the emphasis of the project is not on any targeted species, but to increase profitability from the entire current catch. By-catch statistics in Kodiak last winter revealed that by-catch comprised 10% of the entire catch, and about half the by-catch was arrowtooth flounder.

Arrowtooth flounder are found from California to the Bering Sea, but concentrate in commercially important quantities only in the shallow waters of the Bering Sea/Aleutian Islands area of the Eastern Pacific. In the Gulf of Alaska, where underwater geography is steeper, arrowtooth are less concentrated and are considered by-catch, but not targeted, species.

Arrowtooth has never been a star fishery compared to Alaska's bountiful pollock resource; top harvests were 400,000 m. tons in 1973-74. After that, numbers declined radically, but the resource has begun building again. They are now harvested by joint venture fishermen (total allowable catch for 1987 was 9,795 m. tons) and sold over-the-side to foreign processors. There is no established market for arrowtooth products in the U.S. aside from the pet food market.

Yellowfin sole was harvested in extremely high numbers in the 1950s and 1960s, with Bering Sea catches reaching 1.4 million metric tons in 1960-62. Harvesting was done primarily by Japan and the USSR. By 1965, the stock had deteriorated dramatically and catches fell below 100,000 metric tons. Stocks have steadily improved since then, and the 1987 catch is expected to be 187,000 metric tons in the Bering Sea/Aleutian area.

In the Gulf of Alaska, 1987 allowable catch for all flounder is 9,000 metric tons.

The flatfish project is not a certainty for AFDF; its funding will depend on approval from the U.S. Department of Commerce to re-allocate unused funds from a previous industry development project. AFDF encourages comments from members on this industry-directed project; contact project manager Peter Moore, or executive director Mel Monsen.

the LODESTAR

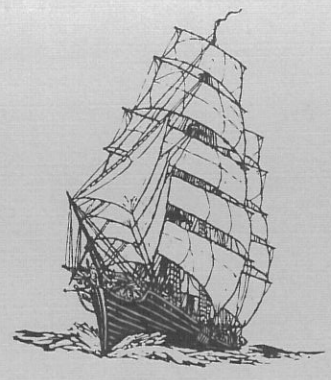
Charting the course of fisheries development today

Alaska Fisheries Development Foundation

Volume V, No. 2 Spring 1987

"Faith and doubt both are needed — not as antagonists but working side by side — to take us around the unknown curve."

— Lillian Smith



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Alaska Fisheries Development Foundation
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