Alaska Fisheries Development Foundation, Inc.

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KODIAK RESEARCHERS MAKE SURIMI FROM ARROWTOOTH FLOUNDER -- A BREAKTHROUGH FOR ALASKA'S FISHERIES

ANCHORAGE, ALASKA -- For years, food scientists and fish processors have tried to come up with a profitable use for one of Alaska's most plentiful fish, arrowtooth flounder. Now, thanks to the surimi technology that created worldwide demand for pollock, arrowtooth flounder has a new purpose in life.

Researchers at the National Marine Fisheries Service (NMFS) lab in Kodiak this summer made surimi out of arrowtooth flounder, a success that not only creates a potentially huge market for the flatfish, but also is a breakthrough for Alaska fish researchers.

Dr. Diana Wasson and Dr. Jerry Babbitt, director of the NMFS lab, have led the arrowtooth surimi research. Babbitt was one of the pioneers of surimi production in the early 1980s, and Wasson developed a new method of controlling the texture breakdown of arrowtooth flesh after processing. It was Wasson's method of texture enhancement that made arrowtooth surimi possible.

"Arrowtooth surimi isn't just wishful thinking any more," Wasson said. "It's reality. We have yet to conduct the product evaluation experiments after three months of frozen storage--those tests will provide answers to our remaining questions. But we are extremely encouraged with the results so far."

Arrowtooth flounder (*Atheresthes stomias*) are deep-water white-fleshed fish that make up the largest group of flatfishes off Alaska. There are about 2.1 million metric tons in the Gulf of Alaska, plus another half million metric tons in the Bering Sea. But fishermen don't target on arrowtooth, and usually

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throw back the ones they catch because, up till Wasson's texture study, arrowtooth was unmarketable. An enzyme in the flesh makes it soften to an oatmeal-like texture when cooked. The bountiful but unusable species has been a puzzle to fishermen and fish scientists alike.

The surimi production process

Arrowtooth surimi was first made in July, from a delivery of 4,000 lbs. of iced flounder off the F/V Dusk, a trawler owned by the Burch Brothers of Kodiak. The fish were processed at two Kodiak plants, which donated space, labor, equipment, totes, trucks and ice to the experiment. First the fish was mechanically filleted at All Alaskan using a Baader 175 flatfish filleter (yield 38% to 42%). The fillets were skinned and then bagged and iced for cold storage through the night. The fillets were then taken to the surimi plant at Alaska Pacific Seafoods, where they were minced through a Baader 695, processed through three wash cycles using a 3:1 water/mince ratio, and dewatered between washings on rotary screens. The washed mince was refined and dehydrated using Fukoku equipment, and the final product was immediately transferred to the NMFS lab where cryoprotectants were added and the finished product was frozen.

"The major difference between arrowtooth and pollock surimi is that with arrowtooth, a greater amount of congealed fish oil floated to the surface of the wash tank," Wasson said. "Since most of the oil congealed at the temperature of the wash water, it was relatively easy to remove using a basket sieve along the top of the water."

Wasson said that, despite the 3% lipid content of the mince, the finished surimi contained less than 1% lipid. The final press cake from the screw press was 80% moisture, and was within the range of Hunter L values, or brightness value, considered acceptable to surimi buyers. After adding cryoprotectants, the surimi was 74% moisture--a level generally considered ideal.

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Improving the texture of arrowtooth surimi

In her earlier research, Dr. Wasson identified the proteolytic activity that causes texture degradation of arrowtooth flounder flesh after cooking. Her theory, and several methods of halting proteolytic activity, were tested on the arrowtooth surimi and proved successful in short-term storage.

"We found that the raw surimi showed only one-tenth the level of proteolytic activity in the unwashed mince when it was incubated," Wasson said. "However, the cooked surimi showed wide-spread myosin degradation. This produced an extremely weak gel--approximately 130 g x cm. gel strength--which rendered the surimi unsuitable for commercial use."

Wasson added a formula of 2% powdered beef plasma plus 2% egg white powder and increased the gel strength of the arrowtooth surimi to over 1000 g x cm.

"Gel strength tests showed this to be the best mixture of additives, partially because the plasma and egg white each form gels independent of surimi, and probably form matrices with the fish proteins that have greater gel strengths than those of the fish proteins alone," Wasson said.

"We can say with certainty that it is possible to inhibit proteolytic degradation and produce a surimi with excellent functional properties. And the inhibitory additives are effective regardless of whether they are added during surimi production or during secondary processing," she said.

Because no one has successfully made high-quality arrowtooth flounder surimi before, it's unknown how the product would compete with other surimis on the world market. The potential value to Alaska's fisheries could be tens of millions of dollars per year.

Babbitt and Wasson's work is part of a cooperative effort by Alaska Fisheries Development Foundation and NMFS to develop Alaska's commercial flat-fish fisheries. This project was funded by the Alaska Science & Technology Foundation.

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