

Fishery Resource Grant Final Report

L.D. Amory & Co. Inc

“Developing New Value Added Products from Cow Nose Ray”

April 30, 2010

Overview

We are happy to report that we have met and exceeded the objectives of our project. Improved processing techniques have resulted in significantly reduced labor costs and increased yield of both fillets and byproducts, resulting in a 50% reduction in the fillet cost and viable cartilage and skin products for the commercial market. Several value-added products are under development with a battered and breaded strip product in production and on the menu at several restaurants throughout Virginia. We continue to develop other value added products and are working to create a market for ray and promote acceptance of ray products in the marketplace.

Discussion

Below is a list of the six initial project objectives and a discussion of the work accomplished on each.

- A. Evaluate the potential of a skinning machine to reduce handling and processing time and reduce costs associated with processing cow nose rays.

We obtained and evaluated a Cretel skinning machine to process fillets from wings. We experimented with various line configurations and techniques to further maximize processing efficiency. Detailed records on raw product, finished product, hours, and costs were analyzed to evaluate yield and labor costs. As we expected, labor costs were reduced as the skinning machine and new line configuration decreased the overall processing time. We also expected the yield to increase due to machine skinning, however we were surprised at the magnitude of that increase—from 13% to 24%. The machine

skinned product is also much smoother than the hand-skinned fillets giving it a much smoother appearance than the hand cut fillets. As a result of the increased efficiency and yield we were able to reduce the price of the fillets by 50% from \$4.00/lb to \$1.95/lb while increasing the presentation and appearance.

B. Evaluate the cartilage scrubber to remove the cartilage from the ray wings.

A cartilage scrubber to clean the wing cartilage and prepare it for sale to the pharmaceutical market was designed and built. It allowed us to automate the process of cleaning the meat from the cartilage. We can include the scrubber in the processing line allowing the line to run without interruption. Without the scrubber, the cartilage was set aside until the meat was processed, then cleaned individually with a power washer. This process was time consuming and labor intensive. The scrubber allows a continuing stream of cartilage to be washed with one employee overseeing its operation. The scrubber worked as expected and can be added to the processing line once processing on the scale to produce a salable quantity of cartilage.

C. Determine the chondroitin sulphate content and quality of the cartilage, and the mineral, carbon and nitrogen/phosphorus ratio of the other processing waste material.

Chondroitin Sulfate is a well-known and scientifically proven nutraceutical used to alleviate arthritis pain. Chondroitin Sulfate assists in cartilage regeneration and does not require a prescription. We submitted cartilage samples to Ron Wiesmann at Bio-America, Inc. in Sandy, Utah, a leading supplier of bulk chondroitin sulfate from shark, avian, porcine, and bovine cartilage. His initial evaluation of the feasibility of the ray wing cartilage as a source of chondroitin sulfate found that the sample was clean enough to work with and we received an offer to purchase a 53' trailer load of cleaned and dry cartilage transported in cardboard totes. We continue to seek competitive prices for the cartilage in smaller quantities, as current processing volume will not support large quantities of cartilage. Further testing for the actual chondroitin sulfate yield will not be done until the market demand increases to a level to support full scale processing of the ray.

A method of drying the cartilage in volume to < 10% moisture must be devised in order inhibit mold and bacterial growth during storage and transport. Storage will be necessary, as a 1% yield of dry wing cartilage demands 80,000-100,00 pounds of ray to produce one 800-900 pound tote of dried cartilage.

The skin by-product is not suitable for tanning due to the use of the skinning machine. The yield of skin is 1.3%, however, testing by Bio-America, Inc. found the collagen unsuitable for commercial use.

The processing waste material was analyzed by McGill composting in Waverly, VA and determined to meet the standards and requirements established by the facility for their compost. Their compost products are used as a soil builder, a top-dressing, or a component of topsoil. They will accept as much product as we can deliver at a cost of \$0.04/lb. delivered to the facility. Transportation to the Waverly facility would cost \$0.02/lb. Currently we are disposing of processing waste at the Hampton Landfill at a cost of \$38.00/ton (\$0.01/lb) delivered by us to the facility. At our current rate of production we are able to utilize the landfill, however when production increases we may exceed capacity at the landfill, which would require us to pay to dispose of the waste at the Waverly facility.

D. Determine the best commercial use for the cartilage, livers and other parts that might be sold.

We have tested many markets in our effort to utilize as much of the ray as possible with the most promising by-product being cartilage for use in the nutraceutical chondroitin industry. The use of the skinning machine eliminates the availability of the skin for tanning, and it was not suitable for cosmetic collagen as tested by Bio-America, Inc.. Due to the low yield of the cartilage (2.1% wet; 1.0% dry), large volume processing is required to produce the required quantity for a sale. We have received an offer to purchase a 53' trailer load of cartilage, and will seek bids from other manufacturers once large-scale production begins.

We've sampled the wingless bodies, including the internal organs, and chunked whole animals for bait, but both were found to be unacceptable as crab and lobster bait. The sample pots in both New England and the

Chesapeake Bay caught little or no crab or lobster, and the consensus from the fishermen is this is due to the lack of fat and oils.

The liver was evaluated for the omega-3 oil content, but we found it was not cost efficient due to the quality and yield of the oil.

- E. Develop new lower cost value added products from cow nose ray wings such a clam strips, BBQ product, patties, etc.

Working with a co-packer, we have developed an excellent battered and breaded strip and completed a 2000 lb sample run. Two products are currently available; the Chesapeake Strip has a country style breading, and the Chesapeake Stinger has a spicier, buffalo style breading. With our eye toward the military foodservice market, we packaged our sample run 6 x 5 lb bags in a 30 lb master carton. Unfortunately the military is trending away from fried foods and looking toward healthier alternatives, so we've shifted our focus to restaurants and foodservice, which prefer 10 lb master cartons. We are repacking the product we have as we distribute it for samples and will package future production in 10lb masters.

The high protein and low fat content of the ray meat naturally lead us toward value-added products for the health conscious institutional, school lunch, and military markets. Our first R&D product was a high protein, low fat burger and cake. We have struggled to complete a pleasing product while keeping the fat and sodium at desirable levels, but we continue our efforts on this front.

Ray meat lends itself well to BBQ, however the price point of the raw product at \$2.00/lb is higher than pork or chicken. As a result, ray BBQ is not cost effective at this time. However, the pork prices seem to be rising after 10 year lows, so the price point of a BBQ product may be more competitive in the future if the pork prices continue to rise.

Mexican hangover soup, developed by Chef John Maxwell from original Sonoran recipes, is excellent and we have contacted soup co-packers with this product and a seafood chowder product. Trim from the fillets that are cut down for strip production would be ideal for soup products. No production has begun.

Another potential use of trim from strip production is jerky and smoked meat. We are working with Chef Charles Hudson at Sunburst Trout Company, to develop a product and have received initial samples of both cold and hot smoked products and a jerky product. We continue to work on these products to improve taste and quality. Again, the low fat content is an obstacle in this type of process.

We also are working on bacon wrapped tenderloins/medalions from the ray fillet. Chef Charles Hudson is helping us with this product as well and we sampled both an entree and appetizer size at the Boston Seafood Show in March. We continue development of marinades and evaluation of packaging options and marketability of the product.

We continue to focus our efforts on sampling and marketing the Chesapeake Strips and Stingers. The strips look like jumbo clams strips, but have a much more tender bite and forgiving texture that will not get chewy if overcooked. Due to improved processing techniques they have a lower price point than similar size super surfer clam strips. Our experience is that many people are attracted to the product by appearance but reluctant to try it when identified as ray. Some are enticed by the novelty of ray and others are skeptical of it. Most are pleasantly surprised once they try it, however, and would eat it again.

The Stingers were featured in the Virginia Marine Products Board booth at the International Boston Seafood Show in March. They were very well received and as a result the Stingers were picked up by Sysco Hampton Roads and were featured at their Seafair Seafood Extravaganza event in April. The event showcased select seafood items and was directed at 400 of their largest seafood customers. The remaining 26 x 10lb inventory of Stingers from the sample run has been sold to Sysco in the 6 weeks since the show and we have standing orders from both Sysco and Sam Rust Seafood as soon as we can produce more. We hope to have 4000# of fillet processed and to the co-packer by the last week in May, but this all depends on when the ray enter the Bay this season.

- F. Evaluate the frozen and refrigerated shelf-life and marketing prospects of these value added products.

Shelf-life of the strips products is 18 months per testing at the co-packing facility. Other shelf-life studies will be conducted at the Virginia Tech AREC once the products are finalized and ready for commercial production.

Summary

The efficiency and yield increases and costs decreases resulting from the addition of the Cretel skinner to our ray processing line greatly exceeded our expectations. The improved appearance of the machine skinned fillet and the reduced price of both the fillet and the strips has increased marketability. The construction of the cartilage scrubber has created a commercially viable by-product in the cartilage. Testing has proven the collagen in the skin is not suitable for commercial use. Though the oil in the liver is of high quality there is not enough per animal to make it economically viable. The cartilage by-product is saleable in volume only, requiring a large processing run of raw material and we are ready to process it when we get higher volume orders.

We have demonstrated that rays can be caught and processed efficiently, maximizing the yield and minimizing labor and processing time and costs. The two fresh cuts, the tenderloin and the fillet, have been enhanced with the use of the Cretel skinning machine and improved processing and cutting techniques. We have developed a good product in the battered and breaded strips and have several others in various stages of development. We have a sale for the cartilage by-product and a proven method of processing it. We need to continue development of the value-added products and to focus efforts on developing a market for these products. If we can establish a market and create the demand we will have succeeded in developing a viable, sustainable fishery for an underutilized and destructive species. This will help control the ray population, improve oyster restoration efforts, reduce habitat destruction, and provide a new revenue source for fishermen and processors.

Processing records and additional information available upon request.