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Fish Tales Newsletter

West Virginia's Aquaculture Newsletter is produced to help inform, educate, and update those interested in producing quality aquatic products, in a sustainable manner, for the recreational and food fish markets.

Aquaculture Is Agriculture

By Rodney Kiser

Fonda Holehouse, attorney and visiting professor at the WVU Davis College, presented an "Update on the Regulatory Structure of Aquaculture in West Virginia" as part of the Aquaculture Forum in Charleston. he offered a perspective on state aquaculture law, perceived problems with the statutory and regulatory structure, a background on policies of states with successful aquaculture industries, and suggestions on what should be done by government to encourage development of aquaculture in West Virginia.

The presentation was well-received by those in attendance. At the business meeting of the West Virginia Aquaculture Association following the forum, it was decided that the information should be presented to leaders of the West Virginia Department of Agriculture. April 18 was set as the date after consultation with Commissioner Douglass's staff.

Fonda Holehouse presenting to NASAC

The meeting was attended by leaders from the W.Va. Department of Agriculture (Commissioner Douglass, Steve Hannah, Dr. Joe Starcher, Dr. Gary Kinder, Brenda Keavey, and Rob Nichols), representatives from (continued on page 2, column 1)

Improving Feed Conversion at the National Center for Cool and Cold Water Aquaculture

By Beth Cleveland

In aquaculture production, feed costs can represent at least 60% of an operation's expenses. As a result, the ability of the fish to efficiently convert feed into body mass (feed conversion) has tremendous impact on the profitability of a farm. With large-scale production, even a small improvement in feed conversion can translate into appreciable monetary gain. At the USDA/ARS National Center for Cool and Cold Water Aquaculture (NCCCWA) in Leetown, we aim to improve feed conversion in rainbow trout by selective breeding of animals with a genetic predisposition to high feed efficiency. To achieve this, research at the NCCCWA emphasizes (1) understanding what biological and genetic mechanisms contribute to variations in feed conversion and (2) evaluating trends in feed conversion throughout the trout life cycle.

Rainbow trout demonstrate the highest feed efficiency during early stages of growth and become less efficient during adulthood. Therefore, accurately detecting trends rather than simply measuring lifetime feed conversion may enhance the effectiveness of the selective breeding process. Differences in rates of protein synthesis or protein degradation, the efficiency of energy production, nutrient utilization and mobility, and energy partitioning are all mechanisms

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the West Virginia Aquaculture Association (Jonathan Browning, Fred Hayes, and Mike Nardella), and representatives from WVU Extension and the Davis College of Agriculture, Forestry, and Consumer Sciences (Fonda Holehouse, Sara Brown, Dave Miller, Tom Brand, Dr. Ken Semmens, and Rodney Kiser). The presentation described the need for aquaculture to be recognized as agriculture in the legal code, the need for coordination among state agencies, the need for simplifying permitting, and the importance of the Department of Agriculture becoming the lead agency regarding aquaculture development and regulation.

The meeting was successful in engaging the WVDA and receiving the verbal support of Commissioner Douglas. It is expected that subsequent meetings will be held with representatives from WVU Extension and the W.Va. Department of Agriculture.

At yet another meeting, Ms. Holehouse and Dr. Semmens worked together to present their assessment of a workable regulatory structure of W.Va. aquaculture at a meeting of the National Association of State Aquaculture Coordinators (NASAC) held in Springfield, Mo., April 29 through May 2. The presentation was well-received by aquaculture coordinators from across the country.

Efforts will continue to deliver this information to the W.Va. Farm Bureau and other groups that may support aquaculture development. The task ahead is not easy and will take some time. The goal is clear – make West Virginia an "Aquaculture Friendly" state where **aquaculture is agriculture** and the WVDA is the lead agency.

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that may be responsible for variations in feed conversion. At the NCCCWA, we have determined that there are differences in the expression of genes involved in pathways of protein degradation between rainbow trout families. This supports the concept that variations in rates of body protein turnover can affect feed conversion. Recent research also focuses on quantifying trout activity levels with the objective of determining if the energy spent for greater levels of activity results in lower feed conversion. Understanding how these mechanisms contribute to variations in feed conversion, both between fish and throughout growth, will improve how we select fish for better feed conversion through selective breeding.

WVCAA Visit Harrison Co. Fish Farm

The West Virginia County Agents Association featured a field trip on April 15 to Rainbowhead Farms in Harrison County. Participants saw how ponds, cages, a floating raceway, and net pens were used for production and marketing. This visit was part of the annual spring meeting, a two-day event that draws agricultural agents from across the state.

Mike Nardella dips trout from a floating raceway as county agents tour Rainbowhead Farms.

Trout School to be held October 6-7

Don't miss this great opportunity to learn about farming trout. Two full days of activity are designed for current and future trout farmers, county agents, suppliers, agriculture instructors, students, and any organization or individual interested in culturing trout. The event will be held at Reymann Memorial Farm near Wardensville. The course will feature classroom instruction and hands-on activities to enhance the knowledge of participants using flowing water systems. For more information, contact Ken Semmens or consult the WVU Aquaculture Extension Web site.

Recovering Proteins and Fats From Fish Processing By-products

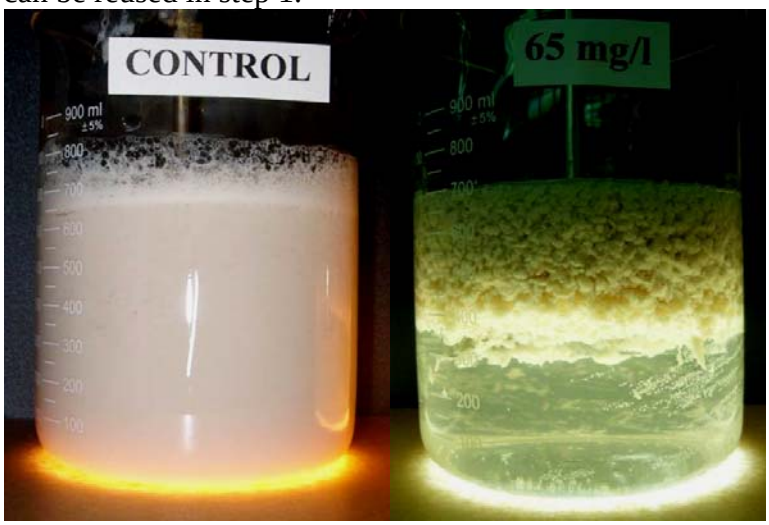
By Jacek Jaczynski, Ph.D.

Fish filleting operations generate significant amounts of by-products such as frames, heads, guts, and the like. In the United States, most of these by-products are land-filled and only limited amounts are rendered for animal feeds due to high poly-unsaturation of fish lipids, and therefore, the propensity to develop rancid off-odors. Aquaculture production has quadrupled during the past two decades, yet the industrial methods to recover fillets from fish have not changed; therefore, the amount of the by-products has increased correspondingly.

Commercial filleting of 100 kg of rainbow trout or tilapia typically yields 40 or 30 kg of fillets and 60 or 70 kg of by-products, respectively. The trout and tilapia by-products contain about 20 and 23 kg of fish meat, respectively, which accounts for about 50% and 75% of the total weight of trout and tilapia fillets, respectively. The by-products also contain valuable omega-3 fatty acids (i.e., lipids) that have been shown to be beneficial to human cardiovascular health. This meat and lipids left on the by-products are inevitably lost if the by-products are land-filled. However, if this fish meat and lipids are recovered from the by-products and then used to develop value-added human food products or other value-added applications, it could account for additional significant source of revenue for a processor. The reduced amount of the by-products would also contribute to alleviation of the ever-increasing environmental issues associated with fish processing. Therefore, there is a need to develop a protein and lipid recovery technology from fish processing by-products.

There are five basic steps in the isoelectric solubilization/precipitation to recover functional muscle proteins from fish processing by-products:

(1) Homogenization of the by-products with water in order to increase surface area for subsequent solubilization reaction.
(2) Solubilization of fish muscle proteins at either basic or acidic pH due to electrostatic repulsion between the proteins and electrostatic interaction between water dipoles and charged protein molecules.
(3) Separation of protein solution from fish lipids and solid matter (i.e., bones, skin, etc.).
(4) Precipitation of fish muscle proteins and their isoelectric point (pH = 5.5).
(5) Separation of the precipitated proteins from the water that can be reused in step 1.



Picture 3. Protein flocculation can further enhance separation of the fish muscle proteins in the decanter-centrifuge in the recovery system. On the left are fish muscle proteins without flocculant. On the right are muscle proteins following 10-min reaction with commercially available flocculant. The optical density of the effluent water (bottom right) is comparable to that of clear water, and therefore, the water can be re-used in the recovery system.

This system has been tested and allows recovery of functional proteins that can be used to develop value-added food and nonfood products. This system can be easily scaled up by replacing pilot-scale bio-reactors and decanter-centrifuges with commercially available industrial-scale counterparts.

Researchers at West Virginia University have also designed a commercial bio-reactor recovery system capable of processing more than 11 metric tons (25,000 pounds) of the by-products per day. This system is modular and can be expanded by using more bio-reactor modules to suit particular processing needs. It is technologically feasible to recover functional muscle proteins and lipids from fish processing by-products at the pilot scale using isoelectric solubilization/precipitation. This technology, if implemented at commercial scale, may result in increased overall profitability of the fish processing industry as well as alleviate some environmental concerns associated with fish processing.

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This publication is available, in a printable format, on the Web at:
www.wvu.edu/~agexten/aquaculture/newsletter.htm