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The Ohio Aquaculture Research and Development Integration Program Newsletter is published biannually to share the Program

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Ohio Aquaculture Research and Development Integration Program (OARDIP) Newsletter

The Ohio State University

New Aquaculture Facility in Piketon

By O'Bryant Paul, Research Assistant

The Ohio State University Aquaculture Research Center has recently finished construction of a new building and a broodfish tank system at the OSU South Centers in Piketon. The 5400 square foot agricultural pole style building is housing a sixty 6-foot tank system for our genetically improved broodstocks.

The building features two 20-foot doors which allows for cross-ventilation, moisture control and temperature modification. The

structure will now allow for photo period manipulation of individual tanks due to the elimination of outside elements.

The new facility greatly enhances our research capacity and bio-security for breeding programs.



(above) The Aquaculture Research Center at OSU South Centers in Piketon, Ohio



(left) Sixty 6-foot tank system (a view before the construction of the building)

(right) Aquaculture new (left) and old Buildings at Piketon



On-farm test of genetically improved yellow perch is underway

By Hanping Wang, Ph.D., Principal Scientist

The Ohio State University Aquaculture Research Center has developed the third generation of improved lines of yellow perch. On-farm test of the genetically improved fish is under way.

Four geographic locations at different latitudes were selected for the test: two research farms/stations at OSU Aquaculture Research Center in Piketon (OH, 39°N) and the University of Wisconsin-Stevens Point Northern Aquaculture Demonstration Facility (NADF, WI, 46°N), and two commercial farms at Mill Creek Perch Farms (MCPF, OH, 40.5°N) and Coolwater Farms, LLC (CWF, WI, 43°N).

The selected sites are raising the fish side by side in replicated ponds with the same sized fingerlings of the species from their farm. We are approaching two types of tests:

1. Rearing the improved fish and control line in separate ponds, each having two replicates
2. Raising improved fish and control line in two communally ponds to avoid environmental effects, and use molecular markers to assign improved and control fish to their family of origin for trait comparison.

In the autumn of year one, we will harvest all of the ponds and evaluate the key production

parameters of fingerling production (e.g., survival, growth, feed conversion). In year two, we will harvest all of the ponds and evaluate the key production parameters for raising

the two groups of fish to market size (e.g., survival, growth, feed conversion for separate rearing).

On-site demonstration evaluation will be held to disseminate testing results at harvest. At the completion of this project, we expect to distribute some of our improved strains to fish farmers in the north central region.



Harvesting one of the on-farm tests of genetically improved yellow perch.



This project is being funded by the North Central Region Aquaculture Center (NCRAC)

Acknowledgements

OARDIP is currently supported by these major contributors:

- **USDA National Institute of Food and Agriculture (NIFA)**
- **North Central Region Aquaculture Center (NCRAC)**
- **Ohio Agriculture Research and Development Center (OARDC)**
- **Ohio Sea Grant**
- **Ohio Soybean Council**
- **The Ohio State University Extension**

OSU South Centers Celebrates 20th Anniversary

- A Review of Aquaculture Program *By Julie Strawser-Moose, Information Associate*

On September 15, over 300 people visited OSU South Centers to celebrate its 20th anniversary. Visitors included legislators, OSU dignitaries, former staff, supporters, friends and family. Aquaculture was one its original programs and it celebrated its 20th birthday as well.



Following a luncheon and recognition program, the facility was open to the public for tours, activities and lots of fun. Self-guided tours were offered where participants could see the hatchery, feed fish, learn about pond systems and even pet a sturgeon, a hit with all of the kids. For many, this was their first exposure to fish farming.



Paul O'Bryant (right) helped kids pet the sturgeon during the 20th Anniversary Open House

The Ohio State University Aquaculture Program was initiated in 1990 to develop, expand and support the aquaculture industry in Ohio. The purpose was to develop a profitable aquaculture industry in Ohio through research and Extension programs. Initially, research and outreach were to focus on development of applied technologies for production of food fish and adoption of technologies from other regions. Facility design and construction consumed the majority of the first several years.

When the Aquaculture Facility in Piketon first opened, it consisted of only 1 staff and 15 ponds.

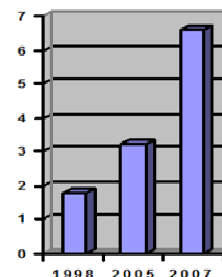
Today it boasts two aquaculture centers (Piketon and Bowling Green), 16 ponds and more than 300 tanks, two research buildings (wet lab), a greenhouse and a state-of-the-art genetics lab, and 7 faculty and staff. The combination of the wet lab, pond facility and genetic lab make Piketon a unique station to assume genetic improvement and other research programs and extension activities for the aquaculture industry. For the past 10 years, the facility has secured 60 projects, published 49 papers, and attracted more than ten scientists and international scholars to work at Piketon's Aquaculture Center.



Dean Rapp (right) discusses the tank system to a visitor. Dean was one of the first employees hired at OSU South Centers when it opened.

The industry has made great strides since the department's development, and the number of fish farmers has been growing significantly in Ohio. The industry currently consists of over 250 fish farms catering to niche markets like pond stocking and food fish markets. Aquaculture sales in Ohio have tripled in the past 10 years, and aquaculture has an estimated economic impact of \$49.5 million in Ohio.

Aquaculture sales in Ohio have tripled in the past 10 years



Value (\$1,000,000) of aquaculture products sold in Ohio

Bait Bytes in Bowling Green Aquaculture Center

By Shawn McWhorter, Research Associate

Bowling Green Aquaculture Center (BGAC) received funding from a foundation for baitfish research development. Another great piece of news is from Reed Mariculture, one of the largest live feed companies in the U.S. The organization has seen such value and promise in the work being done at the BGAC. They have donated nearly \$45,000.00 worth of algal concentrates used in our live feed (rotifer) culture.

Great progress has been made in the culture of spot fin shiners (*Notropis spiloptera*) BGAC. The first significant stride forward was the discovery that this species requires a live first feed (being an altricial species like yellow perch) and the subsequent development of the culture systems and protocols needed to raise the rotifers to feed the shiners. The second significant step forward was that we could raise the salt water rotifer (*Brachionus plicatilis*) and to successfully nurse this species using the cultured rotifer.

Another issue that plagued the facility (as well as other operations hatching spot fins) was the fungus issues we were having with the eggs. Using standard anti-fungal treatments proved fruitless and hatch rates were extremely low. Almost by accident it was discovered, through observation of eggs removed from the egg transfer devices, there

is at least one species of macro invertebrate that eats the fungus off the eggs! We immediately stopped disinfecting the eggs when brought into the barn, and our survival rates rose from approximately 15% to that approaching 40%! The work being pursued now is the development of "First Feed Protocols." This project will focus on:

- the number of rotifers needed per fish
- the daily increase in the number of rotifers needed per fish
- the length of time the fish need to be fed live feeds
- the weaning time required to move the fish from live feeds to a prepared diet
- the length of time this weaning process will be needed

All in all the bottle necks encountered in the culture of these fish have been discovered, evaluated, and overcome at an ever increasing rate.

We believe that this species has a very bright future in Ohio Aquaculture and the Bowling Green facility will continue to ferret out new techniques and information and pass this onto the culturists raising them and those interested in starting to culture this species.

Spotfin Shiners and rotifer culture system at Bowling Green Aquaculture Center



Growing Spotfin Shiners in Southern Ohio

By Laura Tiu, Ph.D., Aquaculture Specialist

The Spotfin shiner is a new aquaculture species in Ohio that has potential to help supply the Lake Erie baitfish market. Spotfin shiner spawning techniques have been developed at the OSU Bowling Green Aquaculture Center.

A demonstration of the feasibility and profitability of growing out spotfin shiners from fry to market size in one growing season is being conducted at the OSU Piketon Aquaculture Facility. On July 27, 2011, 550,000 spotfin shiner fry, about ½ inch long, were stocked into a one acre pond.

Over the summer, data will be collected on the stocking density, growth, nutrition, mortality, and management of spotfin shiners. The harvest target is 1200 pounds of 2 inch spotfin shiners by September 2011.

The spotfins will be marketed to retail baitfish establishments in an effort to calculate the production costs for small scale baitfish culture. Look for results in our Winter newsletter.



OCARD Field Day

By Julie Strawser-Moose, Information Associate

Ohio State University's South Centers at Piketon, located off State Route 32 in Pike County, may not look like the ideal place for yellow perch, lake sturgeon, largemouth bass and blue gill. But it's full of surprises. The facility boasts the only aquaculture genetics lab in the Midwest and is the cornerstone of research and education for Ohio's \$6 million aquaculture industry.

Farmers, businesses, fish enthusiasts, and just the plain curious visited the OSU South Centers Aquaculture



Field Day on June 25 to learn more about the aquaculture program, how its research benefits the industry, and gain knowledge about aquaculture species from the popular (yellow perch) to the new (baitfish) to the unique (shrimp).

The field day consisted of a morning lecture series on various introductory aquaculture topics. In the afternoon, there was a self-guided walking tour of the South Centers Ohio Center for Aquaculture Research and Development (OCARD) facility.

Visitors stopped at various stations to learn more about fish breeding and genetics, pond management and construction, indoor aquaculture production and culture demonstrations. OSU Extension educators and aquaculture researchers were on hand to explain research, exhibit various fish species and answers questions.

Field days and workshops are held throughout the year at various locations around Ohio. Contact the aquaculture program at tiu.2@osu.edu for more information.

New Publications

Evaluation of one-stage and two-stage selection in yellow perch I: genetic and phenotypic parameters for body weight of F₁ fish reared in ponds using microsatellite parentage assignment

Cao, X. J., H. P. Wang, H. Yao, P. O'Bryant, D. Rapp, W.M. Wang, and R. MacDonald

Abstract: Two selection methods, one-stage selection (OSS) and two-stage selection (TSS), for improving efficiency and profitability of selective breeding of yellow perch were evaluated, through examining the genetic and phenotypic parameters for body weight of F₁ fish using microsatellite parentage assignment in this study.

Approximately 94% of the sampled yellow perch progeny were assigned to single parental pairs using eight microsatellite markers, which confirmed the applicability of the communal rearing technique in yellow perch breeding. Within OSS, the genetic correlation between one-year-weight (OYW) and two-year-weight (TYW)

was high (0.98), indicating that the growth of yellow perch recorded at year one could predict their growth for year two. Whilst mean family weights and family estimated breeding values (EBVs) for weight between year one and year two were found to be significantly correlated, suggesting year one fast growing yellow perch families continued to be the fast growing families in year two.

Two-year random fish undergoing TSS were significantly heavier than those undergoing OSS. In addition, top males and females with TSS were heavier than those with OSS.

Based on these results we concluded that the two-stage selection was more desirable and effective for yellow perch breeding comparing to one-stage selection in terms of improving selection efficiency and reducing costs.

Journal of Animal Sciences (2011)

jas.fass.org/content/early/2011/08/26/jas.2011-3902.full.pdf.

Family-tank interactions on early growth performance of yellow perch reared in single family tanks versus mixed-family tanks as inferred using molecular pedigrees.

Wang, H.P., H. Yao, P. O'Bryant, D. Rapp, G.K. Wallat, and R. MacDonald.

Abstract: From 17 families, 400 fingerlings were evenly stocked into four replicates of each of 5 groups: single family from an Ohio strain, single family from a North Carolina strain, 3 families from the cross of five strains, 12 families from the cross of five strains, and a combination of all 17 families.

After rearing for 27 weeks, the progeny from the 17 families could be confidently assigned to their family of origin at the rate of 97.9%. The cross-bred multi-families (12-family and 3-family groups) from different strains gained significantly more

weight than both single family groups in separate tanks throughout most of the experiment ($P < 0.05$); but no significant differences were detected in body weight among the four groups in the all-family communal tanks ($P > 0.05$).

Both single families grew significantly faster in the all-family communal tanks than in single family tanks by the end of experiment ($P < 0.05$). In addition, there was no correlation detected between family mean weight obtained from the multi-family tanks (12-family and 3-family groups) and the family mean weight in the all-family tanks. These results indicated there were strong effects of genotype by environment interactions on early growth performance of yellow perch.

Aquaculture research (2011)

doi:10.1111/j.1365-2109.2010.02767.x.

New Publications (continued from page 6)

Microsatellite evaluation of hatchery stocks and wild populations of largemouth bass *micropterus salmoides* across North America and Asia.

Wang, D., H. P. Wang, X. F. Ma, H. Yao and G. Wallat.

Abstract: Although largemouth bass *Micropterus salmoides* has shown its extremely economic and ecological significances throughout North America and Asia, little is known about its genetic variation globally across hatchery and wild populations. In this study, the genetic variance and structure of largemouth bass from multiple cultured and wild populations across the United States and China were analyzed using eight microsatellite loci.

The major results from the analyses are as follows:

1. The result of F_{ST} showed largemouth bass had high genetic differentiation, and the gene flow indicated the genetic exchange among wild populations was difficult
2. There were obvious relations between genetic distances and geographical distributions of the wild populations
3. Some loci failed to be amplified in hatchery populations, which might be due to high sensitivity of these loci under pressure environment and selective breeding
4. Allelic richness was similar from cultured/hatchery populations to wild populations
5. Effective population size in hatcheries could promote high levels of genetic variation among individuals and minimize loss of genetic diversity.

The results of this study would provide valuable information for developing future selective breeding program and appropriate conservation policies in largemouth bass.

Abstract in the Proceedings (2011)

The World Aquaculture Society Conference. March 1-5, 2011. New Orleans, USA.