



**HKD Stuttgart National Aquaculture Research Center
USDA-ARS Stuttgart, Arkansas**

MARCH – MAY 2024

QUARTERLY RESEARCH HIGHLIGHTS

For More Information: Dr. Yulin Jia, Acting Research Leader/Center Director
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- Recent Scientific Publications**

This addresses USDA-ARS Research Goal: Disease Control in Aquaculture.

Farmer, B.D., D.L. Straus, J.A. Johnson, C.K. Ledbetter and M.B. Deshotel. 2024. Repeated copper sulfate treatments have no effect on growth and survival of juvenile Walleye. *North American Journal of Aquaculture*, 86:250-254. <http://doi.org/10.1002/naaq.10333>

Experiments were conducted to evaluate the effects of repeated copper sulfate exposure on the growth and survival of juvenile walleye. The data indicated that fish exposed to copper sulfate had higher survival compared to fish not exposed. Both groups had similar weight increases and neither differed in length.



Juvenile Walleye

Growth Parameter	Control Tanks	Treated Tanks
Survival (% ± SEM)	85.1 ± 8.0%	96.1 ± 3.9%
Weight (g ± SEM)	25.2 ± 0.64	25.3 ± 0.82
Length (cm ± SEM)	14.5 ± 0.12	14.6 ± 0.14
Growth rate (mm/day)	1.2	1.2

Summary of Walleye growth parameters for copper sulfate-treated and non-treated tanks.

Liu, D., **D.L. Straus**, L.-F. Pedersen, C. Good, C. Lazado and T. Meinelt. 2024. Towards sustainable water disinfection with peracetic acid in aquaculture: A review. *Reviews in Aquaculture*, 1-26. <http://doi.org/10.1111/raq.12915>

Peracetic acid is a disinfectant that is used around the world in many industries to prevent harmful pathogens from being spread to humans while not contributing harmful residues to the environment. One of the newest industries to adopt the use of peracetic acid is aquaculture. Its effectiveness on pathogens while not harming fish suggests it has great potential. This review discusses the various research that has been done on the use of peracetic acid in aquaculture by our collaborators and other scientists around the world.



In April, **Dr. Dave Straus** and his international colleagues (pictured above at an international conference) published a comprehensive review of the use of peracetic acid in aquaculture. These are the world experts on this subject from China, Denmark, Germany, Norway, and here in the U.S.

Andersen, L.K., Abernathy J.W., **Farmer, B.D.**, Lange, M.D., **McEntire, M.E.**, Rawles S.D., Gene expression profiles of white bass (*Morone chrysops*) and hybrid striped bass (*M. chrysops* x *M. saxatilis*) gill tissue following *Flavobacterium covae* infection. Comparative Immunology Reports. Accepted. <https://doi.org/10.1016/j.cirep.2024.200144>

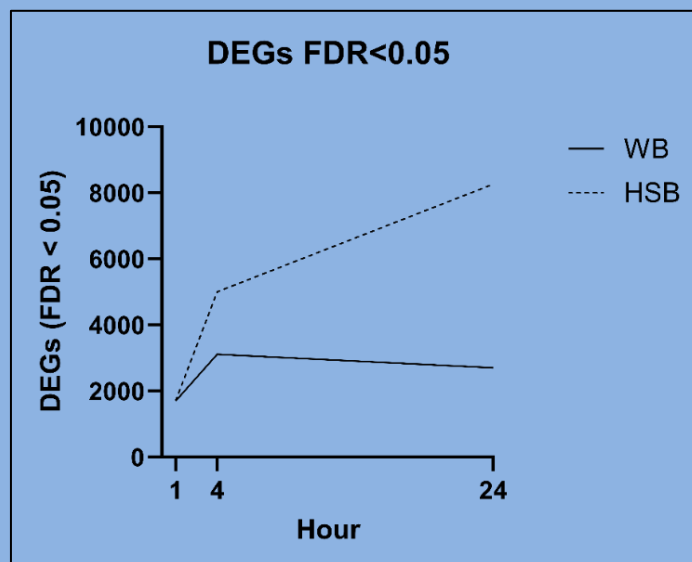


Figure 2. The number of differentially expressed genes (DEGs, false discovery rate, FDR, adjusted p-values < 0.05) in gill tissue of white bass (WB) and hybrid striped bass (HSB) at timepoints 1 h, 4 h, and 24 h post-infection with *Flavobacterium columnare* determined via pairwise comparisons to the species-specific 0 h control condition.

This addresses USDA-ARS Research Goal: Improve the performance of hybrid striped bass fingerlings in intensive production systems.

Green, B.W., Rawles, S.D., **Ray, C.L., McEntire, M.E.** Accepted for publication. Relationship between stocking rate and production of stocker hybrid tilapia and water quality in a mixotrophic biofloc system. *Journal of the World Aquaculture Society* (Accepted 24 May 2024).

Intensified production of stocker-size tilapia can be accomplished using the biofloc technology production system. Stocker-size tilapia (ca. 10-200 g/fish) are raised for subsequent stocking for grow-out to market size. The relationship between stocking rate and the production of stocker-size hybrid tilapia (*Oreochromis aureus* x *O. niloticus*) was evaluated in two studies in outdoor mixotrophic biofloc tanks. Hybrid tilapia were stocked in 18.6-m² (15.7-m³) tanks at 50-150 fish/m² (59-178 fish/m³) in 25 fish/m² (30 fish/m³) increments in Study 1 and grown for 141-143 days. Stocking rates evaluated in 4.7-m² (3.6-m³) tanks during Study 2 over 78-79 days ranged from 100-300 fish/m² (132-396 fish/m³) in 25 fish/m² (33 fish/m³) increments. Linear regression models best described growth to stocker size in both studies. Fish yield increased linearly with stocking rate and ranged from 20.1-38.3 kg/m³. Individual weight at harvest was inversely related to stocking rate and ranged from 389.8 to 163.4 g/fish and 155.2 to 81.4 g/fish in Studies 1 and 2, respectively. Partial budget analyses suggested positive net changes in profit with incremental increases in stocking rate for producing a 75-g stocker. Water quality concentrations were impacted directly by daily feed ration and total feed fed, which increased linearly with stocking rate. In Study 2, whole body dry matter, protein, protein retention and lipid were unaffected by

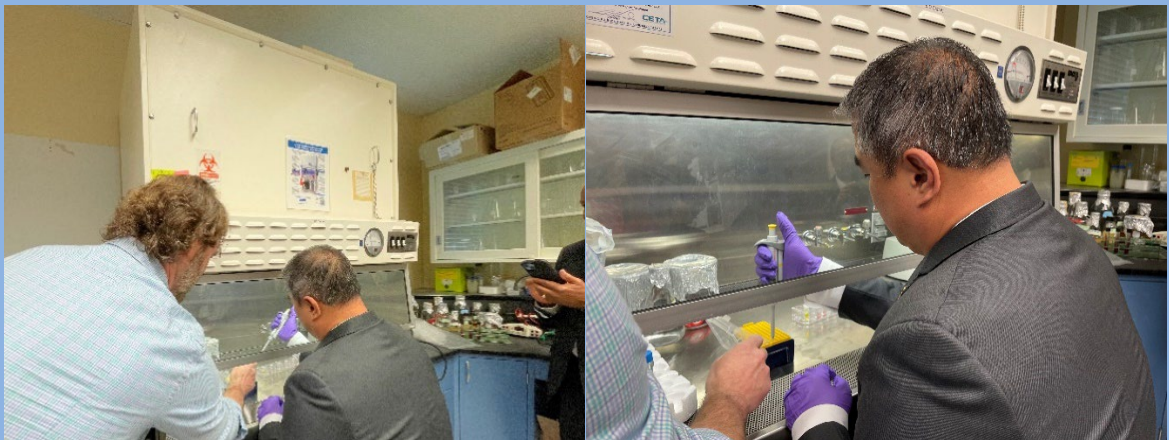
stocking rate, whereas whole body ash increased with stocking rate. Whole body energy retention significantly decreased with stocking rate. The outdoor mixotrophic biofloc production system is well-suited for intensive production of hybrid tilapia stockers. Additional replicated research and economic analysis will determine stocking rate and culture duration to produce specific-sized stocker hybrid tilapia.

- **Technology Transfer**

- ✓ **Interactions with the Research Community**

Several times during this quarter, Dr. Dave Straus met with graduate students and their University of Arkansas at Pine Bluff (UAPB) professor about ongoing research we are conducting to produce triploid hybrid striped bass via temperature shock. Ms. Cindy Ledbetter helped tutor the students at Keo Fish Farms and instructed them at SNARC on using our XpertCount instrument to count hatched larvae from the various triploid shock treatments.

On April 30, 2024, three USDA-ARS Administrators visited Stuttgart, AR: Mr. Joon Park, Associate Administrator, Research Operations & Management (Washington DC), and Mr. Archie Tucker and Dr. Prasana Gowda, Area Director and Assistant Director of the Southeast Area (Stoneville, MS). Mr. Park presented a budget update to all scientists and employees at the DB NRRC and SNARC, and Dr. Yulin Jia presented overviews of DB NRRC and SNARC research accomplishments. After the employee meeting, visitors were given a tour of the facility by Dr. Adam Fuller, which included a hands-on demonstration on disease control lab practices, discussions on genetic improvement, and production management nutrition strategies.



Dr. Michael Deshotel instructs Mr. Joon Park on proper sample handling procedures using a fluorescently tagged solution to protect against contamination.

While attending the North Carolina Aquaculture Industry Growth Visioning Workshop, 21 March 2024, Carteret Community College, Moorehead City, NC, as part of the 2024 North Carolina Aquaculture Development Conference, Dr. Bart Green met with Drs.

Harry Daniels and Ben Reading and Mr. Mike Frinsko, North Carolina State University collaborators to discuss StriperHub research progress.



North Carolina State University research collaborators in StriperHub, Drs. Bart Green, Harry Daniels, Ben Reading, and Mr. Mike Frinsko.

✓ **Fish Distributed**

On May 22, 2024, the last shipment (four total shipments) of SNARC improved white bass broodstock were transported to Keo Fish Farms (Keo, AR) for performance evaluation as part of a Cooperative Agreement. To date, over 97% of the broodstock were successfully reproduced yielding a total of 4.8 million fry. The goal of the Agreement is to determine the performance and suitability of improved white bass for use in industry as a replacement for wild broodstock.



SNARC improved white bass are currently under evaluation at Keo Fish Farms, Keo, AR.

- **Stakeholder Interactions**



On March 15, 2024, Drs. **Yulin Jia** and **Dave Straus** attended the 65th Annual Rural Life Conference hosted by the University of Arkansas at Pine Bluff (UAPB). The conference focused on providing residents of rural communities in Arkansas with beneficial information that contributes to the improvement of their communities. They presented posters and videos of ongoing research at SNARC and talked to many attendees at the Conference. Our new Southeast Area Outreach Specialist, Ms. Daphney Cole-Smith, provided information about ARS and recruiting as part of the USDA-1890 liaison exhibit.



On April 29, 2024, Dr. Dave Straus hosted the Aquaculture Extension Program Director from The Ohio State University who was accompanied by two Ohio fish farmers. They toured our facility and Dr. Dave answered all their questions. Dr. Bart Green discussed his past bio-floc research with them.

Dr. Dave Straus and Ms. Cindy Ledbetter visited Keo Fish Farm weekly throughout spawning season (April through May) to talk with stakeholders and assist with ongoing triploid hybrid striped bass research and Electron Microscopy of hybrid striped bass egg treatments.

Dr. Dave Straus and Ms. Cindy Ledbetter visited Anderson Minnow Farm about upcoming research needed for control of unwanted organisms like crayfish and tadpoles from shipments which could violate federal Lacey Act, which addresses the illegal trafficking of wildlife, fish, and plants.

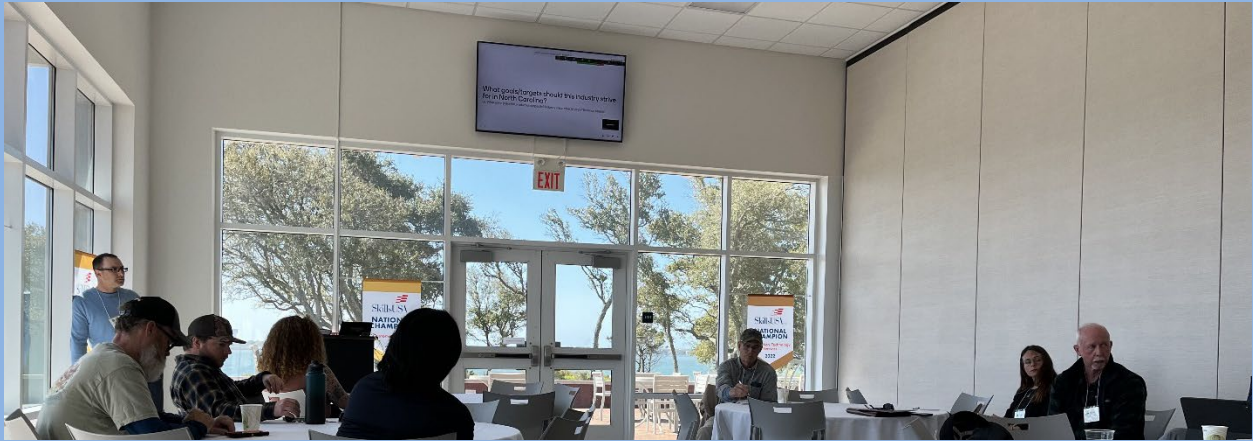


Participants at the NC Aquaculture Industry Growth Visioning Workshop

Dr. Bart Green attended the North Carolina Aquaculture Industry Growth Visioning Workshop, 21 March 2024, Carteret Community College, Moorehead City, NC, as part of the 2024 North Carolina Aquaculture Development Conference. As part of the workshop, he participated in the Pond-based Systems breakout session that addressed identifying industry goals/targets, barriers that limit the industry and its growth, technological solutions to stimulate industry growth, determining industry workforce development needs. The workshop included a tour of the Carteret Community College Aquaculture Facility, and visits to Carolina Gold Oyster Company processing facility and North Carolina State University Marine Aquaculture Research Center.



NC Aquaculture Industry Growth Visioning Workshop plenary session



NC Aquaculture Industry Growth Visioning Workshop pond-based systems breakout session



Dr. Green presenting "Organic carbon addition to reduce ammonia."



Dr. Green presenting “SNARC white bass national breeding program: Highlights.”

- **Education and Outreach**

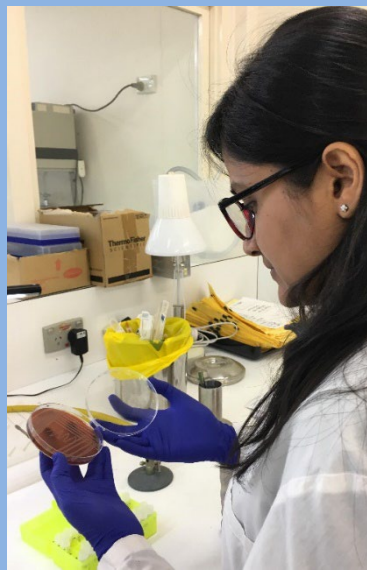
In response to an influenza outbreak, Dr. Michael Deshotel gave a presentation about germs to an elementary school in Little Rock, AR. The school experienced an outbreak of influenza amongst the students and staff and was forced too temporarily close. Dr. Deshotel went to the school and taught the elementary classes about pathogens (germs) and the importance of handwashing. The presentation included interactive demonstrations with student volunteers that showed how pathogens are transmitted and handwashing demos how soap and hand sanitizers reduce bacteria. Students were asked to write a synopsis describing what they learned.





Cassidy Reddout is a post-doctoral research associate at the Harry K. Dupree Stuttgart National Aquaculture Research Center. She's originally from Helotes, Texas and received her undergraduate degree in Animal Science with a certificate in Meat Science from Texas A&M University. She completed her Ph.D. in animal science with a focus on stress physiology and immunology at Oklahoma State University. Her doctoral research was centered around determining how factors such as maternal experience and vaccination history effected individual stress and immune responses in swine and cattle. Currently, under Dr.

Michael Deshotel she is working on identifying sequences for immunoglobulins in white bass to develop monoclonal antibodies for use in immune assays to better quantify immune phenotypes in response to vaccination and other important immunological timepoints.



Nipa Gupta is a faculty member at Hajee Mohammad Danesh Science & Technology University, Bangladesh. She received her undergraduate degree in Fisheries Science from Hajee Mohammad Danesh Science & Technology University, Bangladesh and her Master of Science in Aquaculture from Ghent University, Belgium. She moved to Australia to pursue her PhD at Murdoch University in March 2018. During her PhD, she worked for a large Fisheries Research Development Corporation (FRDC), Australia-funded project to improve disease resistance in yellowtail kingfish. She investigated the determinants of virulence and host immune responses to infection in the bacterial species, *Photobacterium damsela* subspecies *damsela* (Pdd). She demonstrated that experimental vaccines against Pdd improved the health status of yellowtail kingfish thus minimizing the use of antibiotics.

Antibiotics are the most common solution to treat aquaculture diseases caused by pathogenic microorganisms despite their negative effects on the environment and human health. Therefore, my research interests focus on better understanding and developing therapeutics for pathogens in lieu of antibiotics. Phage therapy has emerged as a promising strategy to prevent antimicrobial resistance because of its unique mechanism of action on specific bacteria while leaving the beneficial flora unharmed. At SNARC, under Dr. Michael Deshotel she will work on a project to evaluate the prophylactic and therapeutic efficacy of phages to control bacterial diseases in warm water aquaculture. She will propagate bacteriophages, perform animal challenges, interpret results, and collaborate with experts worldwide to develop evidence-based policies and processes.

See the web version of all HKDSNARC research highlights at:

<https://www.ars.usda.gov/southeast-area/stuttgart-ar/harry-k-dupree-stuttgart-national-aquaculture-research-cntr/news/httpswwwarsusdagovumbracocontentcontentedit167576-text-arsuserfiles602810002024-highlights-upload20file/>