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ADVANCING SUSTAINABLE AQUACULTURE PRODUCTION

The ARS aquaculture research program delivers new knowledge and technologies that improve domestic aquaculture production efficiency and product quality while minimizing impacts on natural resources. This work advances the efforts of more than 2,900 aquaculture farmers producing more than $1.5 billion worth of goods annually to meet the potential market demand generated by 300 million U.S. consumers. Aquaculture production is growing because demands for healthy seafood products are increasing even as stocks of wild-caught seafood are dwindling from overfishing and other stressors. Developing technologies that reduce production costs and maintain or improve product quality will help U.S. aquaculture producers meet that increasing demand. Ultimately, the ARS aquaculture research program will ensure that a healthy, competitive, and sustainable aquaculture sector is able to produce an abundant, safe, and affordable supply of seafood products. The following accomplishments highlight ARS FY 2019 advances in catfish, salmon, trout, and oyster production.

ARS advances blue catfish breeding. Over the last 15 years, U.S. catfish production has been shifting from purebred channel catfish to hybrids of channel and blue catfish. ARS scientists in Stoneville, Mississippi, found that the Rio Grande strain of blue catfish shows superior growth and meat yield relative to other blue catfish strains. ARS will release approximately 10,000 4- to 6-year-olds, 20,000 2-year-olds, and 100,000 fingerlings of the Rio Grande strain to farmers during FY 2020. These scientists, in cooperation with Louisiana State University and ARS scientists in Fort Collins, Colorado, have also established a collection of cryopreserved blue catfish sperm from multiple strains of approximately 300 blue catfish males. This collection is crucial for developing hybrid blue catfish germplasm since blue male catfish must otherwise be sacrificed to obtain sperm for hybrid production.

Improved North American Atlantic salmon germplasm. Commercial salmon farming in the United States is expected to increase fivefold over the next 3 years, which will require support from an Atlantic salmon breeding program. ARS researchers in Franklin, Maine, bred an improved salmon strain and provided eggs to industry. This new strain with increased growth, enhanced processing characteristics, and improved resistance to sea lice will improve the industry's production efficiency and sustainability.

Superior ARS trout germplasm now used commercially. ARS researchers in Aberdeen, Idaho, developed rainbow trout germplasm noted for growth on feeds containing plant protein ingredients. The second largest commercial rainbow trout egg retailer in the United States, Riverence, obtained this germplasm and is now selling eggs from these lines. The company is expressly marketing these eggs for their hardiness and improved growth rates.

The pathogen *Yersinia ruckeri* can sense its host. ARS researchers in Leetown, West Virginia, demonstrated that the pathogen *Yersinia ruckeri* shuts off production of its flagellum when it senses its rainbow trout host. Absence of the flagellum during infection is critical for the bacteria to avoid recognition and subsequent destruction by the fish's immune system. These insights will guide development of new vaccines for disease control.

Sequencing the eastern oyster genome. In collaboration with the Eastern Oyster Genome Consortium, ARS researchers produced a high-quality, chromosome-level genome assembly for the eastern oyster. The genomic resources developed through these efforts will speed selective breeding strategies that can keep pace with industry priorities and consumer demands.