

Florida Aquaculture Plan



November 2018



Prioritized recommendations for applied research and economic development by the Aquaculture Review Council for the purposes of creating new technologies, improved farm productivity, increased farm income and employment, and other economic and environmental benefits to the state of Florida.

Dear Floridians:

On behalf of the Aquaculture Review Council, it is my distinct pleasure and honor to present a revised and updated *Florida Aquaculture Plan* as required by the Florida Aquaculture Policy Act. The *Plan* consists of aquacultural research and development recommendations as required by statute ([597.003\(1\)\(b\) Florida Statutes](#)) that are provided to guide public investment into answering these challenges.

Florida aquaculture is an extraordinarily diverse agribusiness. We culture approximately 1,500 species or varieties of fish, plants, mollusks, crustaceans, corals, and reptiles for food and non-food markets, including: seafood (fish and shellfish), freshwater and marine aquarium hobbyists, high fashion leather, water gardening, bait, biological control, and “seed” for national and international aquaculturists to culture.

Societal, political, and economic trends have accelerated global trade, fuel and feed cost volatility, and information exchange and technology sharing. These factors require unceasing innovation by Florida farmers to remain competitive. Florida’s aquaculturists are adapting to change by investigating new species to culture (e.g., marine ornamentals, mollusks, and food fish), new markets (e.g., biofuel), and new, sustainable production systems (e.g., alternative energy).

We are very appreciative of the State of Florida’s history of investing public funds to support applied research, extension, and education to benefit the aquaculture farmers, product distributors, and equipment manufacturers and suppliers. Public investment has been and is critical to our continued success and ability to respond to unexpected technical and economic change.

To learn more about Florida aquaculture, visit the Florida Department of Agriculture and Consumer Services’ website, FreshFromFlorida.com, or contact the Division of Aquaculture at (850) 617-7600.

Thank you,

A handwritten signature in black ink, appearing to read "Allen Register". The signature is fluid and cursive, with the first name "Allen" being more prominent than the last name "Register".

Allen Register, Chair
Aquaculture Review Council



Applied Aquaculture Research and Development Priorities

An annual Florida Aquaculture Plan is authorized by statute to communicate research and economic development needs by Florida aquaculturists to state government and the public. The goal for identifying these priorities is to support public funding to conduct practical research that will:

- Diversify production.
- Prove the practicality of new technologies.
- Improve farm productivity and sustainability.
- Reduce input costs.
- Increase farm-gate income.

This applied research answers biological or technical challenges that benefit aquafarmers raising aquatic plants, clams and oysters, crustaceans, alligators and turtles, and fish for food, aquariums, pond stocking, and bait.

Research Priorities

A. Species

1. Determine ornamental fish and invertebrate species reproduction and grow-out characteristics of priority species identified by the Florida Tropical Fish Farms Association.
2. Determine production techniques for new bivalve species which have a demonstrated economic need and can be feasibly produced, processed, and marketed at a commercial scale.
3. Examine the commercial feasibility of producing and marketing emerging marine and freshwater food fish or crustacean species in outdoor ponds, raceways, tanks or indoor tank or raceway systems to include an economic analysis of production costs and potential market returns.
4. Examine the commercial feasibility of producing and marketing live marine and freshwater sportfish or bait species in outdoor ponds, raceways, tanks or indoor tank or raceways systems to include an economic analysis of production and marketing costs and potential returns.
5. Develop a genetic selection program for hard clams, including native species (*Mercenaria campechiensis*), which improves production characteristics (e.g. high temperature tolerance) in real-world farm conditions.
6. Develop a public, polyploid oyster-broodstock line in Florida for the emergent oyster aquaculture industry.
7. Determine techniques for optimal growth and propagation of commercially important aquatic plant and moss species.

B. Production Cycle Improvements

1. Evaluate and recommend water conservation practices.
2. Investigate and compare costs of alternative energy sources (e.g., electric, propane, solar) to heat small and large scale grow-out systems.
3. Develop or compare methods to estimate shrimp or fish numbers or biomass in ponds.
4. Masculinize (improve color and/or finnage) ornamental fish through approved chemical or environmental treatments.
5. Achieve the labeling of a chemical pond treatment to eliminate predacious zooplankton (e.g. Dylox 420L).
6. Increase upland aquaculture farm efficiency by identifying methods and technologies that can reduce production costs.
7. Develop methods to evaluate bivalve molluscan shellfish production technologies relative to environmental effects, cost effectiveness and efficiency.
8. Investigate remote technologies for bivalve molluscan shellfish growing area surveillance and security.
9. Evaluate the chemical and biological (i.e. phytoplankton species) characteristics of shellfish hatchery production waters which maximizes the survival and growth of commercially important bivalve species at early life stages.
10. Scale-up for commercial application emerging technologies to mitigate off-flavor compounds in food fish recirculating production systems.
11. Investigate Integrated Aquaculture Systems (IAS) and Integrated Multi-Trophic Aquaculture (IMTA) to improve recirculating aquaculture system economics.
12. Develop water quality specific mineral supplement recommendations for low-salinity marine shrimp grow-out.
13. Develop alligator recirculating production system technologies to reduce water and energy consumption/costs.

C. Animal and Plant Health

1. Identify and develop disease diagnostic tools, and potential treatment and prevention options.
2. Investigate methods to control microbial communities in aquaculture hatcheries and larval rearing systems.
3. Develop a protocol to nest, incubate and hatch alligators to increase hatch rates and reduce or eliminate umbilical scarring.
4. Develop a protocol for rearing alligators to increase growth rates and reduce scarring from bites (density levels, frequency of feeding, water level and optimum grow out house temperature).
5. Develop an environmental health monitoring program for shellfish hatcheries.
6. Investigate methods to control aquatic plant predators (i.e. *Physella* spp., *Marisa* spp., Lepidoptera, Amphipoda).

D. Nutrition

1. Develop or improve live feed species and production protocols for marine and freshwater aquaculture species.
2. Evaluate alternative feed ingredients and dietary formulations to reduce feed costs and increase growth and reproduction of Florida aquaculture species.
3. Collect, identify, isolate and culture new, native marine phytoplankton strains isolated from Florida waters for use in Florida hatcheries (for bivalves, fish, shrimp and other uses).

E. Environment

1. Conduct a science-based risk analysis (assessment and management) of non-native species that informs responsible cultivation and regulatory decisions.
2. Quantify disturbed and undisturbed habitat biotic and abiotic resistance to non-native species introduction.
3. Assess interactions between coastal aquatic environments and shellfish aquaculture lease sites, focusing on metrics such as carrying capacity, primary productivity and species interactions.
4. Determine upper/lower temperature tolerances, of priority ornamental species, to inform regulatory decisions.
5. Establish a baseline of essential biological and chemical water conditions (i.e. chemical water parameters, phytoplankton food sources, positive or negative interactions of bacteria or other pathogens) necessary for the efficient production of bivalve (hard clams and oysters) larvae ($\leq 4\text{mm}$) utilizing Florida's Atlantic and Gulf coast waters.

F. Food Safety

1. Develop and obtain FDA approval of an enzyme-linked immunosorbent assay (ELISA) and/or liquid chromatography-mass spectrometry (LC-MS) test for determination of brevetoxin concentrations in shellfish (oyster, clam or mussel) meats.
2. Assess and develop harvest management and/or monitoring tools in compliance with NSSP harvest/handling requirements to assure product quality of cultured oysters.

G. Marketing

1. Conduct a Florida aquaculture promotion/public education campaign.
2. Test Florida aquaculture product branding opportunities (i.e. social media campaign, product source and quality benefits).
3. Create and conduct an aquarium fish and plant promotional campaign to increase sales and product values.
4. Describe and define options and markets for the re-use or recycle of materials used in aquaculture farming, processing and shipping, including compostable plastic.

5. Develop an aquaculture-based model for agricultural tourism, and evaluate potential economic, educational, and/or marketing impacts.
6. Identify domestic markets for grade 2 and 3 green, salted alligator skins.
7. Identify designers/manufacturers in Florida and the US and educate them on marketing off grade hides.

H. Economic Analysis

1. Conduct a Florida aquaculture development analysis to: 1) define aquaculture resource needs: water, soils, temperature; 2) describe and map geopolitical regions of the state that welcome aquaculture activities, agriculture zoning, potential municipal partnerships that will accept effluents, and farming segments that will accept effluents for crop irrigation; and 3) combine and provide this information as a GIS tool to state and county economic development officials.

I. Education

1. Support school education programs leading to certification(s) of competency in aquaculture.
2. Create an outreach campaign to promote the environmental benefits provided by Florida's aquaculture industry to community stakeholders, consumers, and conservation organizations.
3. Develop a continuing education/licensing program for aquaculture workers and processors in Florida.

For additional information, please contact:

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Cover images, clockwise from top left: Pompano, ornamental crayfish, aquaponic system, oyster aquaculture farm