

# Regulations Pertaining to Non-native Fish in Florida Aquaculture<sup>1</sup>

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## Introduction

Florida aquaculture is extremely diverse, with commercial production of a wide variety of warm-water and tropical species of ornamental, food, bait, and sport fish. In 2012, the farm-gate value of Florida aquaculture was US\$69 million, with 40% of that value in ornamental fish (USDA-NASS 2013). The ornamental segment of Florida aquaculture is dominated by the production of non-native species. Other non-native species such as tilapia and sturgeon are produced for food, and grass carp is produced for control of aquatic weeds.

Although non-native aquatic organisms are important to Florida aquaculture and the economy of the state, the culture of non-native fish presents challenges to the industry and to natural resource authorities in Florida (Hill 2008). In particular the aquaculture industry should be aware of the considerable local, state, and national concern over the potential ecological, economic, or human health problems arising from non-native fish in natural environments (e.g., competition with native species) (Hill 2008, 2009). Florida's large human population, numerous aquaculture production facilities, abundant water, and warm climate can allow non-native species to be introduced, become established, and thrive (Hill 2002). Currently, there are at least 37 species of non-native freshwater fish reproducing in Florida (Hill 2002; Shafland et al. 2008; USGS 2013). Although Florida producers culture or have cultured nearly all of

these species, introductions also occur by a variety of other means such as legal, intentional releases for sport fishing and aquatic weed control, and illegal releases of pet fish by aquarium hobbyists. Regardless of the actual source of the introduction (e.g., aquaculture escape or aquarium release), unauthorized introductions are illegal and undesirable.

In Florida, there are two agencies primarily responsible for regulating the use of non-native species in aquaculture—the Florida Fish and Wildlife Conservation Commission (FWC) and the Florida Department of Agriculture and Consumer Services (FDACS), Division of Aquaculture. The Institute of Food and Agricultural Sciences (IFAS) of the University of Florida assists these agencies by conducting research related to non-native species and by providing extension services to these agencies and the aquaculture industry. In addition to these state agencies, the United States Fish and Wildlife Service (USFWS) regulates the importation of wildlife species (including fish and some other aquatic organisms) and their interstate trade. This publication provides a brief overview of the roles of each agency and the regulations pertaining to the use of non-native fish in Florida aquaculture.

As a word of caution, regulations change, and this publication serves only as a guide to familiarize interested parties with the regulatory framework for Florida. In addition, this publication concentrates on regulations pertaining to non-native fish; regulations for other non-native aquatic

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organisms (e.g., snails and plants) may differ. For more information, contact FWC, FDACS Division of Aquaculture, or other appropriate agency (see Appendix for contact information).

## Florida Fish and Wildlife Conservation Commission (FWC)

The FWC is the agency with primary legal responsibility for regulating and managing Florida's fish and wildlife resources (Florida Constitution 2011). It prohibits the release of non-native fish and other aquatic organisms without a permit (FAC 2010a; Florida Statutes 2012 a,b). Visit the FWC Nonnative Species website (<http://myfwc.com/Non-natives>) for the most current information (FWC 2013a).

The FWC maintains lists of conditional (Table 1; FAC 2010b) and prohibited (Table 2; FAC 2010c) aquatic species and regulates their possession, sale, and use in Florida. Conditional species may be possessed only under permit from FWC (FAC 2010a), unless authorized under an aquaculture certificate from FDACS. Permits may be granted to commercial aquaculture facilities (through FDACS), public aquaria, or for scientific research. Any facility housing conditional species must have adequate safeguards to prevent escape or accidental release of adults, juveniles, or eggs. Outdoor facilities must have pond banks at least a foot above the 100-year flood elevation, be secure from public intrusion, and have no discharge to waters of the state or have barriers to prevent escape in discharge (FAC 2010a). Similarly, indoor facilities must be secure and have screened or no discharge. Prohibited species (or their hybrids) may not be imported, sold, possessed, or transported in Florida; limited exceptions are made for public aquaria and scientific research (FAC 2010a). Some saltwater species also are prohibited and may not be imported (Table 2; FAC 2010c). Permits for possession of prohibited freshwater species are issued by the Exotic Species Coordination Section (FWC 2013b).

The FWC has broad authority to protect the aquatic resources of Florida through eradication of reproducing or non-reproducing populations of non-native fishes (and other aquatic organisms). In addition to rule-making and enforcement responsibilities, FWC has important administrative, management, research, and public education functions concerning non-native fishes in Florida.

## Florida Department of Agriculture and Consumer Services (FDACS)

The FDACS Division of Aquaculture has regulatory authority over all aquaculture facilities in Florida. Each aquaculture facility must be inspected and certified by FDACS. Aquaculture certificates are issued annually, and they list the aquatic species (usually to family or genus level) that a given facility may culture. Written authorization is required to possess or culture conditional species. A unique certificate number must be included on all pertinent records associated with the shipment or sale of aquaculture products (e.g., invoices, receipts, and bills of lading).

Florida Aquaculture Best Management Practices (BMPs) govern the conduct of aquaculture, and this program is administered by FDACS (FDACS 2007). There are general aquaculture BMPs as well as BMPs specific to certain groups (e.g., sturgeon) or production systems. A certified producer must comply with all appropriate BMPs. The BMPs incorporate practices for biosecurity and prevention of escape and are consistent with Florida statutes and FWC rules. In brief, all production facilities must take steps to reduce the possibility of escape by non-native fishes through implementation of redundant management or physical controls, including, for example, maintenance of pond berms at least one foot above the 100-year flood elevation, screening of outlets, chemical sterilization of discharge, stocking native predatory fish into detention ponds, and fencing of property.

Certified facilities are subject to unannounced BMP compliance visits by FDACS staff. During these visits, FDACS personnel inspect the facility, including the species cultured and the design, operation, and management of production systems to determine if BMPs have been effectively implemented and maintained. Facilities not in compliance receive on-site guidance followed by written communication including a course of corrective action. Violation and non-compliance may result in suspension or revocation of the facility's aquaculture certificate and an administrative fine.

All parties interested in conducting aquaculture in Florida should read the most current edition of the BMPs and consult with FDACS Division of Aquaculture (See Appendix).

## United States Fish and Wildlife Service (USFWS)

The USFWS has regulatory and enforcement authority over importation of fish and other aquatic animal species into the US and over their interstate transportation. Aquatic species may be listed as “injurious wildlife” and thereby placed under the Lacey Act, which prohibits their importation and interstate transfer. More information on the Lacey Act may be found at the USFWS Injurious Wildlife webpage. <http://www.fws.gov/injuriouswildlife/>; (USFWS 2013a).

Current injurious aquatic organisms include (USFWS 2012):

- Walking catfish, family Clariidae (13 genera, ~100 species)
- Mitten crabs (genus *Eriocheir* – 3 species)
- Zebra mussel (*Dreissena polymorpha*)
- Snakehead (family Channidae; 2 genera, *Channa* and *Parachanna*, totaling 28 known species)
- Silver carp (*Hypophthalmichthys molitrix*)
- Largescale silver carp (*Hypophthalmichthys harmandi*)
- Black carp (*Mylopharyngodon piceus*)
- Bighead carp (*Aristichthys nobilis*)
- Salmonids: live or dead whole fish, live fertilized eggs, or gametes (unless with health certificate)

Currently, bighead carp, black carp, silver carp, and walking catfish are conditional, and mitten crabs, snakeheads, and zebra mussels are prohibited by Florida regulations.

The USFWS inspects shipments of fish imported into the United States. Information on import and export of wildlife can be found at the USFWS Office of Law Enforcement website: <http://www.fws.gov/le/businesses.html> (USFWS 2013b). The USFWS has designated certain ports for consolidation and more efficient processing of wildlife imports and exports. In Florida, Miami is a designated port and major port-of-entry for ornamental fish and, to a lesser extent, non-native food fish. Non-designated ports may be used only if inspection services are available. For example, Tampa is a non-designated port, but numerous shipments are processed there. The USFWS requires an Import/Export License for such activities and all shipments must be declared on Form Number 3-177 (USFWS 2013c). Information on inspection of shipments and import/export regulations may be obtained from the Miami Port (for Miami),

Groveland Supervisory or Tampa/St. Petersburg Port (for Tampa), or Atlanta Regional (for Miami or Tampa) offices of the USFWS (see Appendix) and the USFWS wildlife import/export website (USFWS 2013b). FDACS Division of Aquaculture also can assist producers with information on importing and exporting.

## Summary

Non-native species comprise the bulk of aquaculture in Florida. These species are important economically, and there are regulations concerning their possession, sale, and transportation. The FWC has the primary role in regulating and managing non-native aquatic species in Florida. FDACS regulates and certifies all aquaculture facilities in Florida, and it publishes aquaculture BMPs that include provisions for biosecurity and prevention of escape by non-native species. Lastly, the USFWS regulates importation and interstate transfer of non-native aquatic species. It is important for producers to stay informed about current regulations relating to non-native species.

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## Appendix

Florida Department of Agriculture  
and Consumer Services  
Division of Aquaculture  
1203 Governors Square Boulevard  
Fifth Floor  
Tallahassee, FL 32301  
850-488-5471  
<http://www.floridaaquaculture.com>

Florida Fish and Wildlife Conservation Commission  
Division of Freshwater Fisheries Headquarters  
620 South Meridian Street  
Tallahassee, FL 32399  
850-488-0331  
<http://www.myfwc.com>

Florida Fish and Wildlife Conservation Commission  
Division of Law Enforcement  
620 South Meridian Street  
Tallahassee, FL 32399  
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<http://www.myfwc.com>

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U.S. Fish and Wildlife Service  
Atlanta Regional Office—Law Enforcement  
1875 Century Boulevard, Suite 380  
Atlanta, GA 30345  
404-763-7959  
<http://www.fws.gov/southeast/law/>

US Fish and Wildlife Service  
Groveland, FL Supervisory Office  
20501 Independence Blvd.,  
Groveland, FL 34736-8573  
352-429-1037  
<http://www.fws.gov/southeast/lawnew/nFL.html>

US Fish and Wildlife Service  
Tampa/St. Petersburg Port Office  
8710 West Hillsborough Ave., #366  
Tampa, FL 36615  
813-348-1500  
<http://www.fws.gov/southeast/lawnew/nFL.html>

US Fish and Wildlife Service  
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10426 NW 31<sup>st</sup> Terrace  
Miami, FL 33172  
305-526-2610  
<http://www.fws.gov/southeast/lawnew/sFLPR.html>

Table 1. Conditional freshwater fish and aquatic invertebrates in Florida (<http://myfwc.com/wildlifehabitats/nonnatives/conditional-prohibited-species/conditional/>).

<p><b>Dorados</b></p> <ol style="list-style-type: none"> <li>1. <i>Salminus affinis</i></li> <li>2. <i>Salminus brasiliensis</i></li> <li>3. <i>Salminus franciscanus</i></li> <li>4. <i>Salminus hilarii</i></li> </ol>
<p><b>Tilapia</b></p> <ol style="list-style-type: none"> <li>1. <i>Oreochromis aureus</i> (Blue tilapia)</li> </ol> <p>i. Exception: <i>O. aureus</i> may be possessed, cultured and transported without a permit in Citrus County in the North Central Region and in all counties of the Northeast, South and Southwest Regions</p> <ol style="list-style-type: none"> <li>2. <i>Oreochromis urolepis</i> (Wami or Rufigi tilapia)</li> <li>3. <i>Oreochromis mossambicus</i> (Mozambique tilapia)</li> <li>4. <i>Oreochromis niloticus</i> (Nile tilapia)</li> </ol>
<p><b>Asian carp</b></p> <ol style="list-style-type: none"> <li>1. <i>Ctenopharyngodon idella</i> (Grass carp)</li> </ol> <p>i. Rules and restrictions for <i>C. idella</i> described in 68A-23.088, F.A.C.</p> <ol style="list-style-type: none"> <li>2. <i>Hypophthalmichthys molitrix</i> (Silver carp)</li> <li>3. <i>Hypophthalmichthys nobilis</i> (Bighead carp)</li> <li>4. <i>Mylopharyngodon piceus</i> (Black carp)</li> </ol>
<p><b>Catfishes</b></p> <ol style="list-style-type: none"> <li>1. <i>Ictalurus furcatus</i> (Blue catfish)</li> </ol> <p>i. Exception: <i>I. furcatus</i> may be possessed in the Suwannee River and its tributaries and north and west of the Suwannee River</p> <ol style="list-style-type: none"> <li>2. <i>Clarias batrachus</i> (Walking catfish)</li> </ol>
<p><b>Nile perches</b></p> <ol style="list-style-type: none"> <li>1. <i>Hypopterus macropterus</i> (Spikey bass)</li> <li>2. <i>Lates angustifrons</i> (Tanganyika lates)</li> <li>3. <i>Lates calcarifer</i> (Barramundi)</li> <li>4. <i>Lates japonicus</i> (Japanese lates)</li> <li>5. <i>Lates longispinis</i> (Rudolf lates)</li> <li>6. <i>Lates macrophthalmus</i> (Albert lates)</li> <li>7. <i>Lates mariae</i> (Bigeye lates)</li> <li>8. <i>Lates microlepis</i> (Forktail lates)</li> <li>9. <i>Lates niloticus</i> (Nile perch)</li> <li>10. <i>Lates stappersii</i> (Sleek lates)</li> <li>11. <i>Psammoperca waigensis</i> (Waigieu seaperch)</li> </ol>
<p><b>Arowanas</b> (except silver arowana, <i>Osteoglossum bichirrosom</i>)</p> <ol style="list-style-type: none"> <li>1. <i>Osteoglossum ferreirai</i> (Black arowana)</li> <li>2. <i>Scleropages aureus</i></li> <li>3. <i>Scleropages formosus</i> (Asian bonytongue)</li> <li>4. <i>Scleropages jardinii</i> (Australian bonytongue)</li> <li>5. <i>Scleropages legendrei</i></li> <li>6. <i>Scleropages leichardti</i> (Spotted bonytongue)</li> <li>7. <i>Scleropages macrocephalus</i></li> </ol>
<p><b>Bony-tongue fishes</b></p> <ol style="list-style-type: none"> <li>1. <i>Arapaima gigas</i> (Arapaima)</li> <li>2. <i>Heterotis niloticus</i> (Heterotis)</li> </ol>
<p><b>Freshwater stingrays</b> — Family Potamotrygonidae, all species; Genera: <i>Paratrygon</i>   <i>Plesiotrygon</i>   <i>Potamotrygon</i></p>
<p><b>Bass</b></p> <ol style="list-style-type: none"> <li>1. <i>Micropterus salmoides salmoides</i> (Northern largemouth bass)</li> </ol> <p>i. Exception: intergrade largemouth bass (northern largemouth bass x Florida largemouth bass <i>Micropterus salmoides floridanus</i>) may be possessed in the Suwannee River and its tributaries and north and west of the Suwannee River</p>
<p><b>Crayfish</b></p> <ol style="list-style-type: none"> <li>1. <i>Procambarus clarkii</i> (Red swamp crayfish)</li> </ol> <p>i. Pond aquaculture is prohibited but <i>P. clarkii</i> may be possessed west of the Apalachicola River or imported for direct sale to food wholesalers and food retailers for re-sale to consumers without permit</p> <ol style="list-style-type: none"> <li>2. <i>Procambarus zonangulus</i> (White river crayfish)</li> </ol> <p>i. Pond aquaculture is prohibited but <i>P. zonangulus</i> may be possessed west of the Apalachicola River or imported for direct sale to food wholesalers and food retailers for re-sale to consumers without permit</p> <ol style="list-style-type: none"> <li>3. <i>Cherax quadricarinatus</i> (Australian red claw crayfish) in tank culture systems only</li> </ol>

Table 2. Fish and other aquatic organisms prohibited in Florida

<p><b>Mussels</b>            1. <i>Dreissena polymorpha</i> (Zebra mussel)            2. <i>Dreissena bugensis</i> (Quagga mussel)  <b>Crayfish</b> - Genus <i>Cherax</i> (except <i>C. quadricarinatus</i> in a closed system)</p>
<p><b>Sunfish</b>            1. <i>Lepomis cyanellus</i> (Green sunfish)</p>
<p><b>Electric catfishes</b> — Family Malapteruridae, all species; Genera: <i>Malapterus</i>   <i>Paradoxoglanis</i></p>
<p><b>African tigerfishes</b> — Genus <i>Hydrocynus</i></p>
<p><b>Walking catfishes</b> — Family Clariidae (except <i>Clarias batrachus</i>); Genera: <i>Bathyclarias</i>   <i>Channallabes</i>   <i>Clariallabes</i>   <i>Clarias</i>   <i>Dinotopterus</i>   <i>Dolichallabes</i>   <i>Encheloclaris</i>   <i>Gymnallabes</i>   <i>Heterobranchus</i>   <i>Horaglanis</i>   <i>Platyallabes</i>   <i>Platyclaris</i>   <i>Tanganikallabes</i>   <i>Uegitglanis</i>   <i>Xenoclaris</i></p>
<p><b>Parasitic catfishes</b> — Family Trichomycteridae; Genera: <i>Acanthopoma</i>   <i>Ammoglanis</i>   <i>Apomatoceros</i>   <i>Bullockia</i>   <i>Copionodon</i>   <i>Eremophilus</i>   <i>Glanapteryx</i>   <i>Glaphyropoma</i>   <i>Haemomaster</i>   <i>Hatcheria</i>   <i>Henonemus</i>   <i>Homodiaetus</i>   <i>Ituglanis</i>   <i>Listrura</i>   <i>Malacoglanis</i>   <i>Megalocentor</i>   <i>Microcambeva</i>   <i>Miuroglanis</i>   <i>Ochmacanthus</i>   <i>Paracanthopoma</i>   <i>Parastegophilus</i>   <i>Paravandellia</i>   <i>Pareiodon</i>   <i>Plectrochilus</i>   <i>Pseudostegophilus</i>   <i>Pygidianops</i>   <i>Rhizosomichthys</i>   <i>Sarcoglanis</i>   <i>Schultzichthys</i>   <i>Scleronema</i>   <i>Silvinichthys</i>   <i>Stauroglanis</i>   <i>Stegophilus</i>   <i>Stenolicmus</i>   <i>Trichogenes</i>   <i>Trichomycterus</i>   <i>Tridens</i>   <i>Tridensimilis</i>   <i>Tridentopsis</i>   <i>Typhlobelus</i>   <i>Vandellia</i></p>
<p><b>Electric eel</b> — Family Electrophoridae            1. <i>Electrophorus electricus</i> (Electric eel)</p>
<p><b>Lampreys</b> — Family Petromyzonidae; Genera: <i>Caspiomyzon</i>   <i>Entosphenus</i>   <i>Eudontomyzon</i>   <i>Geotria</i>   <i>Ichthyomyzon</i>   <i>Lampetra</i>   <i>Lethenteron</i>   <i>Mordacia</i>   <i>Petromyzon</i></p>
<p><b>Piranhas &amp; pirambebas</b> — Subfamily Serrasalminae; Genera: <i>Catoprion</i>   <i>Citharinus</i>   <i>Pristobrycon</i>   <i>Pygocentrus</i>   <i>Serrasalmus</i></p>
<p><b>Snakeheads</b> — Family Channidae; Genera: <i>Channa</i>   <i>Parachanna</i></p>
<p><b>Tilapia</b> (except conditional tilapia species); Genera: <i>Alcolapia</i>   <i>Oreochromis</i>   <i>Sarotherodon</i>   <i>Tilapia</i></p>
<p><b>Trahiras</b> — Family Erythrinidae; Genera: <i>Erythrinus</i>   <i>Hoplerythrinus</i>   <i>Hoplias</i></p>
<p><b>Airsac catfishes</b> - Family Heteropneustidae</p>
<p><b>Crabs</b>  <i>Eriocheir</i>, all species including <i>E. sinensis</i> (Mitten crab)</p>
<p><b>Weever fishes</b> — Family Trachinidae, all species; Genera: <i>Echiichthys</i>   <i>Trachinus</i></p>
<p><b>Stonefishes</b>            1. <i>Aploactis asperus</i> (Dusky velvetfish)            2. <i>Erosa erosa</i> (Pitted stonefish)            3. <i>Leptosynanceia asteroblepa</i> (Stonefish)            4. <i>Scorpaena papillosa</i> (Red Rock Cod)            5. <i>Synanceia alula</i> (Stonefish)            6. <i>Synanceia horrida</i> (Estuarine stonefish)            7. <i>Synanceia nana</i> (Red Sea stonefish)            8. <i>Synanceia platyrhyncha</i> (Stonefish)            9. <i>Synanceia verrucosa</i> (Stonefish)            10. <i>Trachicephalus uranoscopus</i> (Stargazing stonefish)</p>

**Box 1. Asian Swamp Eels and Walking Catfish on Aquaculture Facilities.**

Some producers have expressed concern over potential regulatory action against them if their facility is invaded by Asian swamp eels. The Asian swamp eel, although it has received considerable press and agency attention, is not specially listed by Florida or the U.S. federal government and is thus regulated like any other non-native fish in the state. Therefore, state and federal agencies will not take legal or regulatory action against Florida aquaculture producers that have pest Asian swamp eels on their property. By way of comparison, walking catfish is listed as a restricted species in Florida in Rule 68A-23.008(2) F. A.C. and as “injurious wildlife” by the USFWS (50 CFR 16.13). Walking catfish has invaded fish farms in Florida since the 1960s, but its presence as a pest is not grounds for legal or regulatory action.