Aquatic Nuisance Species Status Report
Florida Fish and Wildlife Conservation Commission
October 2016 through April 2017
Prepared for Gulf & South Atlantic Regional Panel on Aquatic Invasive Species

Lionfish (*Pterois volitans/miles*)

The Florida Fish and Wildlife Conservation Commission (FWC) Lionfish Team hosted the third annual Florida Lionfish Derby workshop in October 2016. This annual event gathers feedback on FWC involvement in lionfish tournaments from stakeholders involved in lionfish derby organization, helps facilitate communication among members of the lionfish community, and discusses new ideas for management and education.

The FWC Lionfish Team attended the Lone Star Lionfish Symposium in Galveston, Texas in February 2017. The FWC was invited to provide leadership, guidance, and the Florida perspective on the lionfish invasion. Hosted by the Texas Parks and Wildlife Department, there were several other organizations in attendance to aide in the development of a Texas specific plan for how to manage the lionfish invasion.

Figure 1. Lionfish Removal and Awareness Day poster.

At the April 2017 Commission meeting, the FWC will discuss plans for a 2017 Lionfish challenge that will include both commercial and recreational components and will have a different prize structure from last year. This program will replace the previous year's Lionfish Challenge and the Panhandle Pilot Program. The new "Become the Predator" program is ramping up now. The FWC and local dive shops are working together to teach interested divers how to safely remove lionfish.

The FWC will host the 2017 Lionfish Removal and Awareness Day on May 20th and 21st with a 2-day festival in Pensacola. Six other events at locations around the state are scheduled to take place on the same weekend.

The FWC Lionfish Team recently began a new kids program called "Lionfish: Classroom Invasion." Currently, the primary focus of this program is to offer lionfish dissections at local high schools. The FWC will continue to develop this program throughout the year, but the handful of dissections that staff have done thus far have been an absolute hit! The kids really enjoy getting to see what is in a lionfish stomach and it introduces them to the severity of the invasion.

Lionfish Risk Screening

The increasing popularity of marine ornamental fish may increase propagule pressure through their deliberate or accidental release. The susceptibility of Florida waters to invasion by marine ornamental fishes is highlighted by lionfish. Currently, the only management position available to the FWC is reactive because little was known about these species until after establishment and ecological impacts were suspected. A solution to this problem is the testing, application, and implementation of risk screening tools which can be applied to a group of potential invasive species before they become a problem. The FWC has undertaken a more proactive approach to this problem by executing a contract with the University of Florida to evaluate, test, and modify (if needed) a risk screening tool, the Aquatic Species Invasiveness Screening Kit (AS-ISK) which can be used to identify potential marine invaders in Florida.

Pterois volitans and *P. miles* belong to the family Scorpaenidae, a large family of marine fishes with hundreds of species in 25 genera. Within this group of fish are additional species of lionfish in the genera *Dendrochirus*, *Parapterois*, and *Pterois.* Analyzing species closely related to known problematic species could be an efficient way to determine their potential risk of invasion.

The primary goal of this study is to evaluate the risk of invasion of lionfish in the genera *Dendrochirus*, *Parapterois*, and *Pterois*. The specific objectives of this two-year proposal include:

1. To produce a biological synopsis for *Dendrochirus*, *Parapterois*, and *Pterois* species;
2. To evaluate and test a recently developed risk screening tool, the AS-ISK, including assessment of the two well-known lionfish invaders;
3. To apply the AS-ISK to *Dendrochirus*, *Parapterois*, and *Pterois* species.

It is important to identify those species which pose an elevated risk and also those that pose little risk and can be safely traded in the marine ornamental fish industry. Results from these risk screens will be used by the FWC to determine the most appropriate responses to this group of marine fish.

Asian Tiger Prawns (*Penaeus monodon*)

During this report period, the FWC received two reports of tiger prawns from around the state with one specimen reported per incident. In November 2016 a tiger prawn report was received from Brevard County near Sebastian, the other from Monroe County near Key West in February 2017. One of the prawns was released, the disposition of the other prawn is unknown.

Nonnative Marine Molluscs

Florida has one of the most active artificial reef programs in the United States. In the Florida Keys, artificial reefs primarily consist of accidental and deliberately placed shipwrecks. These

structures can serve as novel habitats for introduced nonnative species which offer a higher likelihood of settlement and growth due to reduced competition with native species on natural habitats. These artificial reefs can also act as indicators for new nonnative species arrivals. Monitoring can detect new arrivals and identify Early Detection Rapid Response (EDRR) targets to safeguard the health of the nearby natural barrier reef.

Three nonnative molluscs, the orange cup coral (*Tubastraea coccinea)*, the giant foam oyster (*Hyotissa hyotis)*, and the vermitid worm-snail (*Thylacodes vandyensis)*, and two presumed nonnatives, the amathinid gastropod (*Cyclothyca pacei)*, and gryphaeid oyster (*Hyotissa mcgint*yi) have recently been discovered on intentionally sunken ships in the Florida Keys.

The vermitid worm-snail and orange cup coral are of particular concern to the FWC. Vermitids are potentially harmful to hard coral growth and survival and act as intermediate hosts for blood flukes that parasitize loggerhead turtles.

Figure 2. Orange cup coral collected in the Florida Keys. Photograph courtesy of Bill Sharp, FWRI.

Orange cup coral are successful space competitors possessing allelopathic qualities to outcompete potential space competitors. This trait along with high fecundity enhances their invasive potential. Orange cup coral are popular in the marine aquarium trade and marine products permittees are interested in their commercial harvest. It is unknown if harvesting activities may be an effective way to reduce the abundance of orange cup coral or if these activities may exacerbate the spread of orange cup coral into natural habitats. To address this concern, the FWC's Fish and Wildlife Research Institute has partnered with the FWC's Wildlife Impact Management Section (WIM) to undertake several manipulative field and laboratory studies to evaluate the competitive interactions between orange cup corcal and two native reef-building corals, Staghorn Coral (*Acropora cervicornis*; an ESA threatened species) and Lesser starlet coral (*Siderastrea radians*). The FWC's WIM Section has also begun contract negotiations with the University of Central Florida to conduct genetic analyses on the orange cup coral. The objectives of this study are:

1. To identify the number of *Tubastrea* species in the Florida Keys.
2. To characterize the amount of genetic differentiation among *Tubastrea* populations in the Keys.
3. To characterize the amount of genetic diversity present within *Tubastrea* populations in the Keys.

The results of these studies will be used to develop a management recommendation regarding the directed commercial harvest of orange cup coral.

Standardized Electrofishing Survey for Nonnative Freshwater Fish

Figure 3. Electrofishing nonnative fish in the Boynton Canal.

This program was designed to monitor native and nonnative fish populations in southeast Florida urban canals. This proactive means of detecting new or "rare' species can assist with EDRR to introductions of freshwater fishes in south Florida. To increase the power of this approach, the FWC's WIM Section coordinated with FWC's Division of Freshwater Fish Management staff to develop a modified sampling protocol based on their Long Term Monitoring program. The new protocol keeps 3 fixed-starting point transects that the Nonnative Fish and Wildlife Program has used since 1997. Additionally, 3-5 randomly chosen day-time transects were added to this protocol. Nighttime electrofishing transects specifically designed to target butterfly peacock bass (*Cichla ocellaris*) were removed from this protocol since impacts to native largemouth bass (*Micropterus salmoides floridanus)* were deemed minimal.

In October 2016, six canals were sampled using these modified protocols. The addition of new transects increased the mean number of exotic species collected per canal by 32% (0-4 additional species) and the number of native species collected increased by 27% (0-5 additional species). No new nonnative species were collected, but range extensions were documented for several established species including brown hoplo (*Hoplosternum littorale*), Nile tilapia (*Oreochromis niloticus*) and Midas cichlid (*Cichlasoma citrinellum*). The FWC collected clown knifefish (*Chitala ornata*) for the first time from the Biscayne Canal, but based on angler reports, they had been present in this canal for several years.

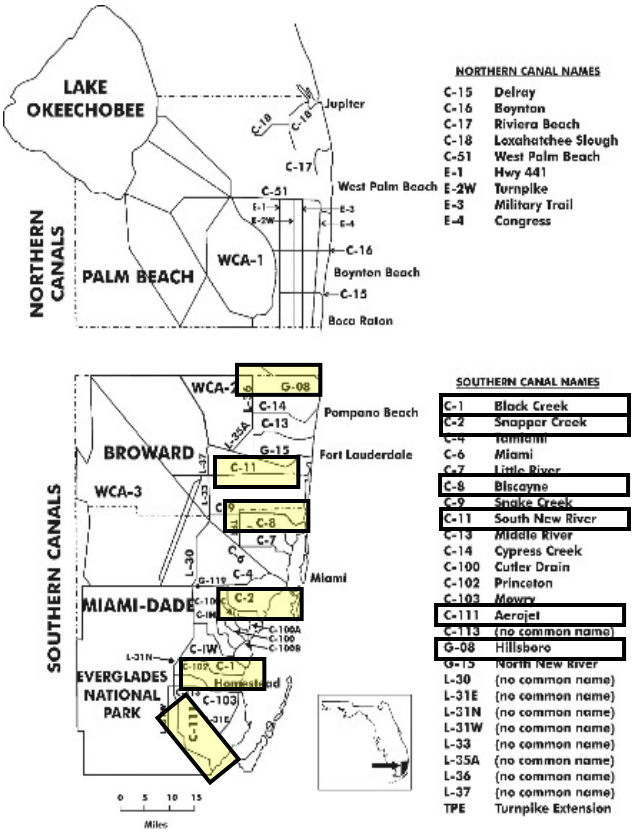

Figure 4. Canals sampled in October 2016 included the C-111, C-1, C-2, C-8, G-08, and C-11.

A total of 1,834 fish were collected in 548 daytime electrofishing pedal minutes from six study canals; four in Miami-Dade and two in Broward counties. Native fish (23 species) comprised 45% of the total catch and nonnative fish (22 species) comprised the remainder. Overall, an additional 5 nonnative and 3 native species were collected from the supplemental transects, but combined represent <1% of the total number of nonnative and native fish collected in these samples. Native sportfish, primarily bluegill (*Lepomis macrochirus)*, largemouth bass and redear sunfish (*L. microlophus*) comprised 88% of the native fish catch. Spotted tilapia (*Tilapia mariae)*, butterfly peacock bass, Mayan cichlid (*Cichlasoma urophthalmus)*, and African jewelfish (*Hemichromis letourneuxi)* were the principal nonnative fish species collected, making up 77% of the nonnative fish collected in these samples.

Fishbrain App

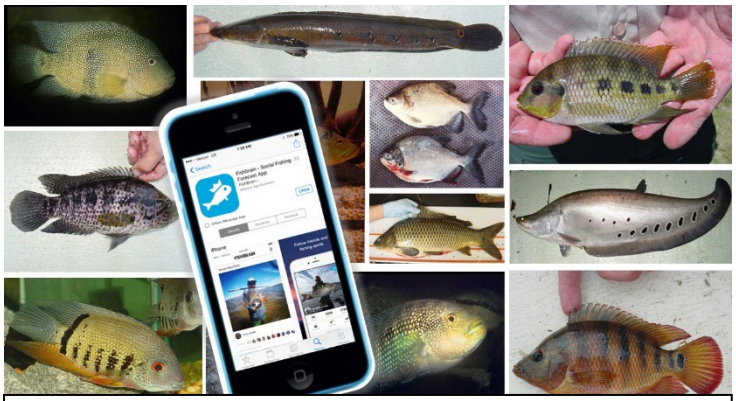

Figure 5. Fishbrain app with nonnative fish species of interest reported to the FWC.

The FWC along with U. S. Fish and Wildlife Service have partnered with Fishbrain AB, the world's largest free-to-use app and social network for anglers to collect information on nonnative freshwater fish. The FWC provided a list and pictures of 15 nonnative freshwater fish of interest to the company and now Fishbrain app users (estimated to be 250,000 in Florida alone) have the information required to record these nonnative species when they catch them. Fishbrain allows its users to log catches by recording the location, time, species, and a picture of their catch. The FWC will use this information to help determine the distribution of established nonnative fish and if a new species is discovered, implement management strategies to eradicate or minimize its potential impacts. Florida is the pilot state to test this tool and to date over 1,600 nonnative fish reports have been received. No new nonnative freshwater fish species have been reported

through this app to date and the location information is being reviewed for potential range expansions.

Nonnative Fish Slams

Figure 6. Locations of sites sampled in Big Cypress National Preserve during March 2017 Fish Slam.

Two FWC/U. S. Geological Survey sponsored Nonnative Fish Slams were held during this report period. Teams from multiple agencies and universities sampled waterbodies not frequented by biologists to document the nonnative fish fauna. In November 2016, 10 teams sampled 21 locations primarily in Miami-Dade and Palm Beach counties. A total of 20 nonnative freshwater fish species were collected, but no new species were documented during these efforts.

The March 2017 Fish Slam was held within the Big Cypress National Preserve in Collier County. Eight teams sampled 28 locations and collected 13 nonnative fish species. No new species were collected, but range expansions were documented for Nile tilapia (*Oreochromis niloticus*) and brown hoplo (*Hoplosternum littorale*). Sampling efforts were hampered by a 25,000 acre fire, but teams continued to visit sites between road closures.

Figure 7. Juvenile Bay snook from Pinecrest Gardens. Photograph courtesy of M. Brown, USGS.

A component of both Fish Slam events held during this report period was the continuing efforts to eradicate Bay Snook (*Petenia splendida*) using non-chemical methods. Removal took place in an isolated stream system inside Pinecrest Gardens in Pinecrest, FL. The number of Bay snook collected was the same during both Fish Slams (n = 31), but the size of fish appears to be getting smaller with 26 of 31 fish collected in March 2017 measuring <100 mm TL. Continued removal of adult Bay snook will decrease the reproductive output in this system and in conjunction with removing juveniles, may result in a successful eradication of this unwanted nonnative species. The FWC and USGS have interest in developing an eDNA probe for Bay snook. This technique would determine if removal efforts were successful in Pinecrest Gardens and could function as an EDRR tool for locations suspected of having Bay snook.

New Guinea Flatworm (*Platydemus manokwari*)

Figure 8. New Guinea flatworm.
Photo courtesy of Makini Sei, Drexel University.

New Guinea flatworms are considered one of the world's worst invasive species. Significant declines of native snails have been documented in invaded ranges. New Guinea flatworms have recently been discovered in parts of South Florida. A variety of land snails comprise a part of their diet which could impact populations of Florida's native snails including the Stock Island Tree Snail (*Orthalicus reses*; listed as a threatened species) and Liguus Tree Snail (*Liguus fasciatus*; listed as a species of special concern). New Guinea flatworms can also host at least two *Angiostrongylus* species of nematodes that can cause serious diseases in humans and other mammals. To address these concerns the FWC has executed a contract with researchers at Florida International University that will:

1. Determine distribution of New Guinea flatworm in south Florida;
2. Determine how New Guinea flatworms are dispersing and propose methods to limit their spread;
3. Determine the presence/prevalence of *Angiostrongylus* species in selected New Guinea flatworm populations; and
4. Determine predation effects of New Guinea flatworm on *Liguus* and *Orthalicus* tree snail populations in a selected hammock habitat to assess their effects on native tree snail populations.

The findings from this study will substantially increase the FWC's ability to manage New Guinea flatworms and minimize their potentially deleterious impacts on south Florida native snails.

Upcoming Events

8th Annual ECISMA Nonnative Fish Round-Up: A one-day event held in April that utilizes anglers to gather distribution information on nonnative fish in south Florida and promotes the consumptive use of nonnative freshwater fish. Anglers compete for prizes for catching the most nonnative fish weight, the biggest nonnative fish, and the most species of nonnative fish.

FWC/USGS Nonnative Fish Slam: The next Nonnative Fish Slam is scheduled for November 2017 and will likely focus on infrequently sampled areas in urban canal systems in Miami-Dade County.

Snakehead Round-Ups: The first Snakehead Round-Up of the 2017 season will be held in April. Monthly tournaments will be held through September. The FWC will act as the weigh-master and provide outreach materials to participants and spectators. These tournaments provide valuable data on effort and harvest of bullseye snakehead (*Channa marulius*) and catch rates of co-occurring largemouth bass. The organizer of the tournaments also sponsors the ECISMA Nonnative Fish Round-Up. Several of the participants are volunteers for the FWC that provide nonnative fish distribution information from their angling efforts throughout the year.