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The Perfect Invader

Lionfish are an invasive non-native species, meaning that they as a species are not native to our local Gulf of Mexico and Atlantic waters. They are wreaking havoc to the Reef systems that they invade and are a major threat to biodiversity which can have profound ecological and economic impacts (Molnar, Gamboa, Revenga and Spalding 485). They are actually native to the Indo-Pacific regions and are a very popular home aquarium fish throughout the United States. The invasive lionfish in the Atlantic Ocean have been unmanaged since 1986, and since then, have had 28 years of uncontrolled population explosions. There have been over fifty-six separate species observed in the stomach contents of lionfish, both prey and game fish. So how are lionfish causing so much damage, why are they so successful in surviving throughout the Gulf of Mexico, and why should we try to manage their population? They have a strong genetic makeup which has helped them survive as soon as the first lionfish entered into local waters; they also have venomous spines, no natural predators, similar genetic makeup and no closed breeding season. Lionfish (*Pterois*) are becoming a serious threat to local waters and will continue to destroy the native environment, ecology, and fishing industry if left unmanaged.

The outbreak started in 1985, when an original six to eight lionfish were released into the wild through the Aquarium Trade (Hansard). Precisely how they were released is not one hundred percent certain, whether it was accidentally or purposely released, it is not clear (Williams and Grosholz 3). The genetic makeup of these original captive-bred fish released is stronger than wild lionfish because they received medication in captivity in order to live longer in home aquariums. When released into the wild, at least one of the (most likely more) lionfish were gravid, and released eggs into the water. These eggs then floated freely until the current picked them up and carried them to the Atlantic Coast. These genetically stronger eggs hatched, releasing the newly invasive species to the underwater environment where they claimed Reefs and structures at the bottom of the ocean as home. (Emerald Coast Reef Association). In addition to their enhanced genetic makeup, Lionfish have even more techniques which make them a strong invasive species.

Lionfish have a breeding pattern much different than local native fish. Where native fish have different seasons and a certain age long into their lives that they breed, lionfish do not. They become sexually mature at one year of age when they are about seven inches long (Hansard). They breed year round, every 2-5 days, laying an average of 30,000 venomous eggs each time they breed (Emerald Coast Reef Association). They are armored with thirteen venomous spines along their backs as well as venomous pelvic and anal fins. They can live up to fifteen years, each producing about 2 million eggs per year, and during this time, their offspring are also breeding. In addition to their excessive reproduction rates, they have a high consumption rate of native fish and crustaceans. The environment is taking a toll from the constantly growing number of lionfish. There are fifty-six known species of fish (including

snapper and grouper) that are consumed by lionfish, and they can consume up to 60 prey fish in just one feeding (Hansard). This behavior is threatening the sustainability of Florida's entire fishing industry, which is a leading component in Florida's economy (Molnar, Gamboa, Revenga and Spalding 485). With prey fish being consumed exponentially by lionfish, there is much less food source for trophy fish such as grouper, snapper and other game fish. Lionfish can also consume fish that are more than half of their size. They not only consume prey and game fish, but also consume the ecologically important fish and crustaceans that clean the reefs such as parrotfish and cleaner shrimp. With a reduced number of cleaner fish there is an increased susceptibility for native fish to get sick, creating an unbalanced ecosystem. They are very gluttonous feeders and their stomachs can expand thirty times their normal size in order to accommodate the increase of food. They also have a remarkable capability to "hibernate" when there is a lack of food and are able to survive for months on end without eating when there is no prey available.

One way to control the enormous population outbreak would be to aggressively target lionfish. They are edible and have a good tasting meat, which tastes very similar to grouper so lionfish meat can be harvested and marketed as a replacement for grouper, which is overfished (Rosenthal). There is a viable lionfish population control program that can be implemented in order to harvest these fish. Here is how it will work. Lionfish will be removed from the environment by voluntary divers and for every one hundred lionfish removed, the State Fish and Wildlife will reward the divers with no cost fishing exemptions cards (Emerald Coast Reef Association). This exemption card allows one extra game fish of one's choice in or out of season. This will provoke divers and spear fishers to constantly hunt lionfish year round which

over time will greatly reduce the lionfish population. Another, more difficult, scientific approach would be for geneticists to take a certain number of lionfish and alter the genes to create a flawed gene that would act as a self-destruct button and then release these fish back into the wild to spread the gene among other lionfish (Hansard). By using these methods of population management, there would be a decrease in lionfish and an increase in health and sustainability to the environment.

This invasive species threatens the native species and local fishing industry and lionfish derbies are a great way to increase public awareness, education about the problem, as well as providing samples for science and while at the same time removing a lot of fish out of the waters. These kinds of events can help the environment, save the reefs and create a new type of sport fish by hunting strictly for lionfish. In order to hunt lionfish, an individual will not use his or her hands but instead use a spear pole to kill the fish and put it into a Zookeeper, which is a safe containment tube to keep the lionfish in while underwater. Since lionfish have no natural predators, they do not fear humans and will not swim away when encountered, making it an easy target. However, a diver must still use caution when hunting these fish considering the venomous spines. Upon being stung, an individual will experience an intense sharp, throbbing pain which has been described as feeling like fire and will blister and swell. In the worst case scenarios, the sting may include symptoms such as headache, nausea, abdominal pain, delirium, seizures, paralysis of limbs, changes in blood pressure, breathing difficulties, heart failure and tremors, pulmonary edema, and loss of consciousness. While there have been many sting victims, deaths are a rare occurrence to humans. Where there is no anti-venom, the best

and most effective treatment is to soak the inflicted area in hot water until the swelling and pain subsides (Lionfish Sting First Aid Treatment | Envenomation Response and Care).

Lionfish are an invasive species that will become unmanageable if nothing is done to control the population. They have a strong genetic makeup and are sexually mature at one year of age, laying 30,000 venomous eggs every two to four days with no population cap (Emerald Coast Reef Association). They have no natural predators and consume prey fish at an unsustainable rate (Hansard). Through the use of exemption cards and Derby prize money, public awareness and motivation can be raised to hunt this species. Lionfish are destroying ecosystems, and they are doing it very effectively. The biggest barrier to finding a solution to control the population is the belief that it is impossible. Since they cannot be eradicated completely, the next best solution that can yield the most results is aggressively targeting and hunting this species in order to control the population which is a highly ambitious goal, but with the motivation it is absolutely achievable.

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