CONTROLLING INVASIVES

Sea Grant research provides insight into

LIONFISH REMOVAL EFFORTS

Sea Grant research across five state programs has focused on mitigating impacts from the lionfish invasion in the Western Atlantic and Caribbean by investigating different management strategies.

Results from this effort have shown that both lionfish densities and native fish production play a role in whether or not lionfish have a negative impact on native fish populations.

- How native fish populations are impacted by lionfish depends on their own reproductive effort, growth rates and natural predation, as well as competition with lionfish.
- If lionfish densities are low enough that they won't affect native fish populations than lionfish removals will have no impact on those reefs, positive or negative.
- However, where lionfish densities are high enough to negatively impact native fish production, removal efforts must be conducted with sufficient frequency to keep lionfish populations below the "threshold density," or the density of lionfish that will negatively impact native fishes.
- Different reef types will respond differently to lionfish removal efforts. In areas with higher lionfish densities, it appears that immigration of lionfish from adjacent areas may contribute to repopulating reefs immediately following removal efforts.
- It is important to consider the reef type, initial lionfish density, size of area to be managed and desired final lionfish density in order to establish a lionfish removal strategy.

Read on to learn more about each study in detail.

Location of study sites	Biscayne National Park (northern FL Keys)	Florida Keys, St. Croix	Puerto Rico
Type of reef habitat studied	Continuous (reef ledges)	Hardbottoom, patch, fringing	Continuous
Area included within study	18,000 m^2	42,000 m^2 (FL); 40,000 m^2 (USVI)	15,840 m^2
Initial lionfish density (per 2,500 m^2)	80	5-55 (FL); 5-23 (USVI)	6
Removal frequency	Monthly or every four months	Every other month	Once
% of lionfish removed from removal sites	92%	45-85%	56%
# of lionfish removed	355	N/A	22

Table 1 Three research projects studied different aspects related to lionfish removal efforts in the northern Florida Keys, Puerto Rico, and St. Croix. This table shows the general design of each of the three research projects.

Sea Grant 50 YEARS

$480K

in Sea Grant funds used to conduct research and develop outreach products to mitigate the spread of lionfish

5

Sea Grant programs collaborating on this effort (Florida, Georgia, North Carolina, South Carolina, Puerto Rico)

Outreach Products

Informational website

http://seagrantsatlantic.org/invasives/

Publications

Lionfish: Is it Safe to Eat? (SGEF 210)

Invasive Species of Florida's Coastal Waters: The Red Lionfish (SGEF 208)

NOAA Sea Grant
seagrant.noaa.gov

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UF IFAS UNIVERSITY of FLORIDA

STUDY 1: CHRIS STALLINGS, USF & MARK ALBINS, AUBURN UNIVERSITY

In the Florida Keys, researchers tested the effect of lionfish removal effort on lionfish density and size structure at continuous reef ledges along the eastern side of Biscayne National Park.

Six sites were designated as "no removal" control sites, while six were "one-month removal" and six as "four-month removal" sites. Biscayne National Park staff were asked to remove all lionfish that they could find within the designated sites.

After each removal, lionfish were counted along with native fishes in the area.

What did their results show?

Lionfish density decreased in the one month removal sites compared to the four month removal and control sites. In other words, only the sites with highest removal efforts ended up having fewer lionfish than the other sites.

What does this mean?

This suggests that infrequent lionfish derbies and other removal efforts will probably not have a significant effect on the number of lionfish in this area.

What else did they find?

Surprisingly, the mass of lionfish did not change with treatment. This suggests that perhaps larger fish were moving onto the reefs that were being "cleaned" of lionfish most frequently.

The results also suggest that lionfish and a small native grouper called a Graysby are competing for the same type of food.


Photo: Kara Wall, USF

Graysby fish ate different types of food on reefs where lionfish were abundant, suggesting that Graysby had to find alternate food sources when having to compete with lionfish.

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STUDY 2: LAD AKINS, R.E.E.F. & STEPHANIE GREEN, OREGON STATE UNIVERSITY

Researchers compared and contrasted the effectiveness of different lionfish removal methods in the Florida Keys and St. Croix, U.S. Virgin Islands. The methods studied were regular removals every other month by divers in both locations and one-time, annual removals during lionfish derbies in the Florida Keys National Marine Sanctuary.

What did their results show?

In the bi-monthly removals, effort required to remove lionfish increased significantly over the course of the study. This might have been because lionfish densities were reduced because of the prior removals, but also could have been as a result of lionfish starting to avoid divers. On average, divers were able to remove between 65 and 75 percent of the lionfish at each site.

Bi-monthly removals were not frequent enough to keep lionfish populations below desired levels at patch reefs and hardbottom sites in the U.S. Virgin Islands or on continuous reefs in the northern Florida Keys.

Lionfish removal did not affect the density of native predators, such as groupers.

In the Florida Keys, derbies were effective at removing an average of more than half of lionfish present from the derby area. In one derby, 707 lionfish were removed from a 129-km^2 area in a single day. These annual derbies could have contributed to a continual decline in lionfish densities within sites in the Florida Keys National Marine Sanctuary over the study period.

The consistent or increasing size of lionfish on all habitat types in the U.S. Virgin Islands suggests that adult movement from adjacent sites was the main mechanism of recolonization.

What does this mean?

Annual lionfish derbies might have affected lionfish densities in the southern Florida Keys, but in many other areas, removal of lionfish by divers needs to occur more frequently than every other month to keep populations below desired threshold levels.

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STUDY 3: RICH APPELDOORN & CHELSEA HARMS TUOHY, UNIVERSITY OF PUERTO RICO

Researchers conducted surveys to record the abundance and size classes of lionfish and native predatory fish on inshore reefs in Puerto Rico. The researchers also tagged 18 lionfish on reefs adjacent to the removal area to see if they would move into the study site.

What did their results show?

Overall, the removal of lionfish had no detectable effect on the abundance of native fishes, predators or prey species on the Puerto Rican reef.

Lionfish densities in the "removal" area did not reach their original densities until nine months after the removals.

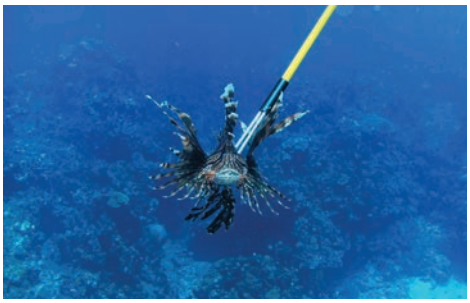
Lionfish biomass remained reduced even one year after the removals.

No tagged lionfish were observed in the removal area during the year.

There was no difference in the abundance of native predator or prey species before and after lionfish removal.

What does this mean?

This suggests that in areas with low lionfish densities, removal of lionfish might have no beneficial effect on the native fish populations.



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