

Predators observed at reefs near Lee Stocking Island, Bahamas from 2009-2012 (Lionfish Invasion project)

Website: <https://www.bco-dmo.org/dataset/3929>

Data Type: Other Field Results

Version: 1

Version Date: 2013-04-29

Project

» [Ecological Release and Resistance at Sea: Invasion of Atlantic Coral Reefs by Pacific Lionfish](#) (Lionfish Invasion)

Contributors	Affiliation	Role
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Abstract

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Coverage

Spatial Extent: N:23.80456 E:-76.10725 S:23.80456 W:-76.1362

Temporal Extent: 2011-07-11 - 2011-08-31

Dataset Description

Record of predators observed during reef surveys at Lee Stocking Island, Bahamas during July and August 2011. (Part of sub-project titled, "Lionfish effects on fairy basslet population dynamics".)

To quantify to what extent patterns in prey mortality have changed since the arrival of lionfish, the investigators replicated an in situ field manipulation of prey density that was originally conducted prior to the invasion using the same study sites. A controlled field experiment was conducted at two reefs near Lee Stocking Island, Bahamas, inhabited by 16 local populations of fairy basslet: eight with artificially enhanced recruitment versus eight with natural recruitment. Ledges were paired by habitat structure and one ledge from each pair was randomly assigned to receive artificially increased density of new basslet recruits, with the other in each pair left as a control.

Methods & Sampling

Using the same methods as Webster (2003), the investigators artificially enhanced basslet recruitment by capturing new settlers (<2 cm total length) with dip nets and transferring them to new populations far from their natal reefs. Censuses commenced 24 hours after recruit manipulations and continued weekly for two

months. At the end of the eight week study period, the investigators calculated net per capita loss (the proportional change in abundance from the beginning to the end of the experiment) for each population.

Data Processing Description

BCO-DMO Processing Notes:

- Modified parameter names to conform with BCO-DMO naming conventions.
- Added lat and lon for each site from the metadata provided.
- Added species name, based on species code, from the species list.
- Replaced blanks with 'nd' in length and hunting columns.
- Replaced blanks with 'none' in species_code and species columns.
- Replaced 'N' and 'Y' with "No" and "Yes" in the hunting column.
- 28-Dec-2017: removed embargo from dataset.

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Data Files

File
fairy_basslet_predator_surveys_LSI.csv (Comma Separated Values (.csv), 15.71 KB) MD5:cc31051917f74685e55725c4d5425275
Primary data file for dataset ID 3929

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Parameters

Parameter	Description	Units
site	Name of the reef site.	text
lat_site	Latitude of the reef site.	decimal degrees
lon_site	Longitude of the reef site.	decimal degrees
location	One of two proximate study sites: Outer WH = Outer White Horse study site Innner WH = Inner White Horse study site	text
lat	Latitude of the specific reef location.	decimal degrees
lon	Longitude of the specific reef location.	decimal degrees
date	Date of the reef census in mm/dd/YYYY format.	unitless
survey	Weekly survey 1-10.	dimensionless
ledge_tag	Two-digit numeral corresponding to ear tag ledge marker.	dimensionless
species	Name of the species.	text
species_code	Four-letter species code.	code
length	Length (in centimeters).	cm
hunting	Indicates whether predator was actively hunting as indicated by typical hunting behavior.	Yes/No

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Deployments

LSI_Reef_Surveys_09-12

Website	https://www.bco-dmo.org/deployment/59019
Platform	Tropical Marine Lab at Lee Stocking Island
Start Date	2009-05-30
End Date	2012-08-18
Description	Locations of coral reef survey dives and sightings, or collections of the invasive red lionfish, <i>Pterois volitans</i> , near Lee Stocking Island, Bahamas for the projects "Ecological Release and Resistance at Sea: Invasion of Atlantic Coral Reefs by Pacific Lionfish" and "Mechanisms and Consequences of Fish Biodiversity Loss on Atlantic Coral Reefs Caused by Invasive Pacific Lionfish" (NSF OCE-0851162 & OCE-1233027). All dives were made from various small vessels (17' to 24' l.o.a., 40 to 275 HP outboard motors, 1 to 7 GRT). Vessel names include, Sampson, Orca, Potcake, Lusca, Lucaya, Zardo, Parker, and Nuwanda.

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Project Information

Ecological Release and Resistance at Sea: Invasion of Atlantic Coral Reefs by Pacific Lionfish (Lionfish Invasion)

Website: <http://hixon.science.oregonstate.edu/content/highlight-lionfish-invasion>

Coverage: Bahamas; Cayman Islands; Mariana Islands; Philippines

Invasive species are increasingly introduced by human activities to new regions of the world where those species have never existed previously. In the absence of natural enemies (predators, competitors, and diseases) from their homeland, invasives may have strong negative effects on invaded ecosystems, especially systems with fewer species ("ecological release"), and may even drive native species extinct. However, if native natural enemies can somehow control the invaders ("ecological resistance"), then ecological disruption can be prevented or at least moderated. Most of the many invasive species in the sea have been seaweeds and invertebrates, and the few documented invasive marine fishes have not caused major problems. However, this situation has recently changed in a stunning and ominous way. In the early 1990s, lionfish (*Pterois volitans*) from the Pacific Ocean were accidentally or intentionally released from aquaria to the ocean in the vicinity of Florida. Camouflaged by shape and color, protected by venomous spines, consuming native coral-reef fishes voraciously, and reproducing rapidly, lionfish have subsequently undergone a population explosion. They now range from the mid-Atlantic coast of the US to the Caribbean, including the Bahamas. Native Atlantic fishes have never before encountered this spiny, stealthy, efficient predator and seldom take evasive action. In fact, the investigator has documented that a single lionfish is capable of reducing the abundance of small fish on a small coral patch reef by nearly 80% in just 5 weeks. There is great concern that invasive lionfish may severely reduce the abundance of native coral-reef fishes important as food for humans (e.g., grouper and snapper in their juvenile stages) as well as species that normally maintain the integrity of coral reefs (e.g., grazing parrotfishes that can prevent seaweeds from smothering corals). There are far more species of coral-reef fish in the Pacific than the Atlantic, so this invasion may represent a case of extreme ecological release with minor ecological resistance. Dr. Hixon and colleagues will study the mechanisms of ecological release in lionfish, as well as examine potential sources of ecological resistance in the heavily invaded Bahamas. Because very little is known about the ecology and behavior of lionfish in their native Pacific range, he will also conduct comparative studies in both oceans, which may provide clues regarding the extreme success of this invasion. In the Bahamas, the investigator will document the direct and indirect effects on native species of the ecological release of lionfish, both as a predator and as a competitor. These studies will be conducted at various scales of time and space, from short-term experiments on small patch reefs, to long-term experiments and observations on large reefs. Whereas direct effects involve mostly changes in the abundance of native species, indirect effects can be highly variable. For example, lionfish may actually indirectly benefit some native species by either consuming or outcompeting the competitors of those natives. The project will explore

possible ecological resistance to the invasion by determining whether any native Bahamian species are effective natural enemies of lionfish, including predators, parasites, and competitors of both juvenile and adult lionfish. Comparative studies of natural enemies, as well as lionfish ecology and behavior, in both the Atlantic and the Pacific may provide clues regarding the explosive spread of lionfish in the Atlantic.

Regarding broader impacts, this basic research will provide information valuable to coral-reef and fisheries managers fighting the lionfish invasion in the US, the Bahamas, and the greater Caribbean, especially if sources of native ecological resistance are identified. The study will fund the PhD research of U.S. graduate students, as well as involve assistance and participation by a broad variety of undergraduates and reef/fisheries managers, including women, minorities, native Bahamians, and native Pacific islanders. Participation in this project will promote education in marine ecology and conservation biology directly via Dr. Hixon's and graduate students' teaching and outreach activities, and indirectly via the experiences of undergraduate field assistants and various associates.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0851162

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