Results of fairy basslet (Gramma loreto) surveys on historically monitored ledges near Lee Stocking Island, Bahamas following invasion by red lionfish (Pterois volitans), 2009-2012 (Lionfish Invasion project)

Website: https://www.bco-dmo.org/dataset/3915
Data Type: Other Field Results
Version: 1
Version Date: 2013-04-17

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

Contributors	Affiliation	Role
Hixon, Mark	Oregon State University (OSU)	Lead Principal Investigator
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Abstract
Results of fairy basslet (Gramma loreto) surveys on historically monitored ledges near Lee Stocking Island, Bahamas following invasion by red lionfish (Pterois volitans), 2009-2012.

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Coverage

Spatial Extent: **N**:23.80456 **E**:-76.10725 **S**:23.80456 **W**:-76.1362
Temporal Extent: 2009-07-10 - 2010-12-19

Dataset Description

Results of fairy basslet (*Gramma loreto*) surveys on historically monitored ledges near Lee Stocking Island, Bahamas following the invasion by red lionfish (*Pterois volitans*). (Part of sub-project titled, "Fairy basslet post-lionfish invasion monitoring".)

Methods & Sampling

Censuses were made of historically monitored fairy basslet populations near Lee Stocking Island, Bahamas, providing an unprecedented before-after comparison for detecting the effects of the invasion by red lionfish.

Using historical data as a pre-invasion baseline, these data were used to quantify changes in abundance and density of fairy basslet at the local population level, correlated with the local density of lionfish. Analysis indicates an overall negative population trend since the onset of the invasion.

Data Processing Description

BCO-DMO Processing Notes:
- Modified parameter names to conform with BCO-DMO naming conventions.
- Added lat and lon values for the reef site included in the original metadata.
- Replaced blanks with 'nd' to indicate 'no data'.
- Added the 'species_name' column, based on 'species_code'.
- Transposed columns to rows for the length bins; added 'lenbin_min' and 'lenbin_max' columns, based on values reported in metadata.
- 28-Dec-2017: removed embargo from dataset.

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Data Files

File	
fairy_basslet_post-invasion.csv	(Comma Separated Values (.csv), 160.43 KB) MD5:a8ec73fbff20adea0f0356359c28b40a
Primary data file for dataset ID 3915	

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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
date	Date of survey in mm/dd/YYYY format.	unitless
day	2-digit day of month when survey took place.	dd (01 to 31)
month	2-digit month of year when survey took place.	mm (01 to 12)
year	4-digit year when survey took place in YYYY format.	unitless
ledge_tag_orig	Two-digit numeral corresponding to historical ear tag ledge marker.	dimensionless
ledge_tag_new	Two-digit numeral corresponding to replaced ear tag ledge marker.	dimensionless
species_code	4-letter genus species code (typically first two letters are the first two of the genus and last two letters are the first two of the species).	code
species	Scientific name of species (Genus species).	text
count_total	Total abundance of fairy basslet of all sizes for a given date at a given location.	integer
notes	Notes regarding nearby predators, visibility, etc.	text
lenbin_min	Minimum of length bin range (centimeters).	cm
lenbin_max	Maximum of length bin range (centimeters).	cm
num_fish_len	Number of individuals observed of given length range.	integer
lat	Latitude of the specific reef location.	decimal degrees
lon	Longitude of the specific reef location.	decimal degrees

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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, Pterois volitans, 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, Zardoz, 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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