Counts of Elacatinus gobies on Bahamian reefs with controlled lionfish densities from reef surveys conducted in Eleuthera, Bahamas in 2012 (Lionfish Invasion project)

Website: https://www.bco-dmo.org/dataset/3886
Data Type: Other Field Results
Version: 1
Version Date: 2013-03-11

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
This dataset includes counts of Elacatinus gobies on Bahamian reefs with controlled lionfish densities from reef surveys conducted in Eleuthera, Bahamas in 2012.

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Coverage

Spatial Extent: **N**:24.81645 **E**:-76.28745 **S**:24.75715 **W**:-76.3506
Temporal Extent: 2012-07-03 - 2012-07-15

Dataset Description

An experiment was conducted on Bahamian reefs (at Eleuthera, Bahamas) in which red lionfish (*Pterois volitans*) densities were controlled on 8 paired reefs, one reef of the pair having low lionfish density artificially sustained and the other reef of the pair having high lionfish density artificially sustained. Censuses were taken of lionfish and gobies of the genus *Elacatinus* at each reef.

Methods & Sampling

Before altering lionfish densities, baseline surveys were conducted in July 2012 in which investigators counted all gobies of the *Elacatinus* genus at each reef, along with their estimated total length and group size (number of individuals of the same species within 1 m). A month after establishing lionfish density treatments each reef was re-censused for all *Elacatinus* gobies. Of the 16 reefs, DP L02 and DP K02 were not re-censused because lionfish density treatments were never satisfactorily sustained. ND 07 and ND 06 were also not re-censused because they were used in a pilot study for which gobies were removed.

Data Processing Description

BCO-DMO Processing Notes:
- Added lat and lon for each site from the metadata provided.
- Added the species column containing species names, based on species code and the metadata provided.
- Modified parameter names to conform with BCO-DMO naming conventions.
- Replaced blanks with 'nd' to indicate 'no data'.
- 09-Jan-2018: removed embargo on dataset.

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Data Files

File
lionfish_and_goby_counts.csv (Comma Separated Values (.csv), 114.38 KB) MD5:6fb0cd0f94247accd0db88e779bc37a4 Primary data file for dataset ID 3886

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Parameters

Parameter	Description	Units
site_id	Name of reef on which census was conducted.	text
lat	Latitude of the site.	decimal degrees
lon	Longitude of the site.	decimal degrees
initial_census_date	Date on which initial census was conducted.	mm/dd/YYYY
initial_lionfish_count	Number of naturally occurring lionfish found at each dive site on the date of the original census.	integer
date	Date on which census was conducted.	mm/dd/YYYY
month	2-digit month of year on which survey was conducted.	mm (01 to 12)
day	2-digit day of month on which survey was conducted.	dd (01 to 31)
year	4-digit year when survey was conducted.	YYYY

reef_quadrant	Area of the reef in which goby was counted: 1=top right quarter; 2=top left quarter; 3=bottom left quarter; 4=bottom right quarter.	integer
substrate	Type of coral, sponge, or other substrate on which goby was found.	text
species_group_size	Number of conspecifics found within 1 meter of each other.	integer
species_code	Code representing the cleaner (goby) species: ELAT = Elacatinus atronasus; ELEV = Elacatinus evelynae; ELGE = Elacatinus genie.	text
species	Name of species.	text
len_tot	Estimated total length of goby in centimeters. Total length is sometimes given as a range instead of a single number. This was done for larger groups of gobies for which it would be impractical to estimate the size of every individual. Assume that the frequency distribution (categorized into 0.5 cm size-bins) is normal, with the specified minimum and maximum total lengths for each group of gobies. (Originally named 'Estimated TL').	cm

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Deployments

Eleuthera_Reef_Surveys_2012

Website	https://www.bco-dmo.org/deployment/59028
Platform	Cape_Eleuthera_Reefs
Start Date	2012-07-03
End Date	2012-08-28
Description	Reefs were surveyed near the Cape Eleuthera Institute, Eleuthera Bahamas during the summer of 2012 as part of the project "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).

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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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