Cleaner and host species observed on Bahamian reefs under varying experimental conditions in Eleuthera, Bahamas in 2012 (Lionfish Invasion project)

Website: https://www.bco-dmo.org/dataset/3907
Data Type: Other Field Results
Version: 1
Version Date: 2013-04-03

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
Tuttle, Lillian J.	Oregon State University (OSU)	Scientist
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Abstract
Cleaner and host species observed on Bahamian reefs under varying experimental conditions in Eleuthera, Bahamas in 2012 (Lionfish Invasion project).

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Coverage

Spatial Extent: **N**:24.81488 **E**:-76.32305 **S**:24.77438 **W**:-76.34968
Temporal Extent: 2012-08-09 - 2012-08-31

Dataset Description

Results of an experiment conducted on Bahamian reefs in which clear plastic bottles were placed next to cleaning stations: one containing an invasive lionfish (*Pterois volitans;* PTVO), one containing a graysby grouper (*Cephalopholis cruentata*; CECR), and one empty. Cleaner and client species observed during each experimental interval are reported.

Related Publications:
Tuttle, L.J. In preparation. Do invasive red lionfish (Pterois volitans) alter cleaning behavior on Bahamian coral reefs? (To be submitted to Behavioral Ecology and Sociobiology).

Methods & Sampling

An experiment on Bahamian reefs was conducted in which cleaning stations were observed after placing clear-plastic bottles in random sequence next to the station: one with an invasive lionfish (*Pterois volitans*) inside, one

with an ecologically similar native predator (graysby grouper, *Cephalopholis cruentata*), and one as an empty bottle control. For many 10-minute intervals at each of 6 cleaning stations, all cleaners and clients within 2 m of the bottle were recorded and their total lengths were estimated (to the nearest cm). The time spent cleaning or being cleaned was also recorded.

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 full species names based on the species codes and metadata provided.
- Replaced blanks with 'none' in the species_code and species columns; replaced blanks with 'nd' (to indicate 'no data') in all other columns.
- 09-Jan-2018: removed embargo on dataset.

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Data Files

File
lionfish_cleaner_bottle_expt.csv (Comma Separated Values (.csv), 97.39 KB) MD5:07d684b61694109e85b17cc91ab17732 Primary data file for dataset ID 3907

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Parameters

Parameter	Description	Units
site	Name of reef on which the trial was run.	text
lat	Latitude of the experiment site.	decimal degrees
lon	Longitude of the experiment site.	decimal degrees
station_descrip	Identifying characteristics of cleaning station used in trial.	text
treatment	What the bottle contained during the observation period. CECR = Cephalopholis cruentata (gatsby grouper) PTVO = Pterois volitans (lionfish)	text
date	Date on which trial was run in mm/dd/YYYY format.	unitless
time_start	Time when observation period began; 24-hour clock. Converted from HH:MM:SS format to hours, minutes, and decimal minutes.	HHMM.mm
time_end	Time when observation period ended; 24-hour clock. Converted from HH:MM:SS format to hours, minutes, and decimal minutes.	HHMM.mm
time_elapsed	How long the observation period lasted, in minutes and seconds.	MM:SS
sequence	Order in which the treatment was executed, in relation to other 2 treatments (either first="1", second="2", or third="3").	dimensionless
species_cleaner1	Name of first cleaner species observed.	text
species_code_cleaner1	Species code of first cleaner organism.	text (code)
len_tot_cleaner1	Estimated total length of first cleaner in centimeters.	cm
species_cleaner2	Name of second cleaner species observed.	text
species_code_cleaner2	Species code of second cleaner organism.	text (code)
len_tot_cleaner2	Estimated total length of second cleaner in centimeters.	cm
species_cleaner3	Name of third cleaner species observed.	text
species_code_cleaner3	Species code of third cleaner organism.	text (code)
len_tot_cleaner3	Estimated total length of third cleaner in centimeters.	cm
species_client	Name of the client species.	text
species_code_client	Species code of client fish being cleaned by cleaner(s) in corresponding row.	text (code)
len_tot_client	Estimated total length of client in centimeters.	cm
notes	Notes related to the observations or trial.	text

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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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