General information about lionfish density and envrionmental conditions in Eleuthera, Bahamas from July to August in 2012

Website: https://www.bco-dmo.org/dataset/653775
Data Type: experimental
Version: 1
Version Date: 2016-08-10

Project
» Mechanisms and Consequences of Fish Biodiversity Loss on Atlantic Coral Reefs Caused by Invasive Pacific Lionfish (BiodiversityLossEffects_lionfish)

Contributors	Affiliation	Role
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Abstract
General information about lionfish density and envrionmental conditions in Eleuthera, Bahamas from July to August in 2012

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Coverage

Temporal Extent: 2012-07-16 - 2012-08-30

Dataset Description

This was an observational field study on natural patch reefs with varying lionfish densities to determine if lionfish behavior and movements change at different local lionfish and prey fish densities. Each reef was visited at three times of day: dawn, midday, and dusk, and two focal lionfish were observed during each visit at each reef. Behaviors of all lionfish were recorded the moment they were first sighted ("Initial behaviors"). One or two focal lionfish were observed for 10 minute intervals and all activity was recorded ("Focal behaviors"). The number of lionfish on each reef that arrived at or departed from each reef to/from the surrounding seagrass habtiat was recorded throughout each visit ("Movement"). Censuses of the native prey fish populations were conducted at the end of every visit ("Native fish surveys").

Methods & Sampling

This was an observational field study conducted from June - August 2012 to determine whether lionfish behavior and movements change at different local lionfish and prey fish densities. The study was conducted on sixteen reefs in Rock Sound, Elethera, The Bahamas. All reefs were at least 300 m from any reef on which lionfish removals had occurred, and were selected to encompass a range of natural lionfish densities and reef sizes.

A pair of divers visited each reef at three times of day: within 2 hours of sunrise (‘dawn’), greater than 3 hours from sunrise or sunset (‘midday’), and within 2 hours of sunset (‘dusk’). Upon arriving at a reef, observers counted the number of lionfish present by conducting lionfish-focused searches. For each lionfish, observers recorded the size (total length, visually estimated to the nearest cm), behavior, and location the moment it was sighted. Behaviors were categorized as resting (sitting on the substrate, not moving), hovering (in the water column oriented parallel to the bottom, but not moving), swimming (actively moving), or hunting (oriented head down with pectoral fins flared). Location was categorized as the microhabitat on which lionfish were observed (e.g. under a ledge, on top of the reef, in the surrounding seagrass) and later divided into two major categories: sheltering (hidden under structure) or exposed (on top of reef or in surrounding area). Then, 10-minute focal observations were conducted on two randomly-selected lionfish or a single lionfish when there was only one individual present per reef. During focal observations, a trained observer recorded the behavior of lionfish at 30-second intervals for 10 minutes using the same categories as above. The observers also noted any strikes at prey, successful kills, and obviously aggressive interactions (chases, posturing) between lionfish or between lionfish and other species. Throughout the entire visit to each reef, divers noted the time when any lionfish departed from or arrived at the reef and its behavior. A lionfish was defined as departing from the reef if it traveled at least 10 m from the reef. A lionfish was considered arriving at a reef if it swam in from the surrounding areas and had not been previously observed at that reef during that observation period. At the conclusion of the focal observations, the divers re-counted the number of lionfish present while conducting a survey of resident native fishes. Divers recorded the abundance and body size (TL) of all fish 1 - 15 cm TL, native mesopredators that are ecologically similar to lionfish (e.g. *Cephalopholis cruentata* [graysby grouper]), and top predators (e.g. *Epinephelus striatus* [Nassau grouper]) on and within 1 m of the reef.

Data Processing Description

All data were entered by one person, and then subsequently checked to ensure accuracy. Note that several reefs included in the data file were not included in any analyses because they were too close to other reefs, and/or too small, and/or were not visited at all three time periods: CEI 83 Sat, CEI 97 Oct, CEI Biscuit, CEI Biscuit-2, CEI Biscuit-3, CEI Friendly, CEI Friendly Dat, CEI Friendly Sat 3, and CEI Nicola Sat.

DMO Notes:

-reformatted column names to comply with BCO-DMO standards
-replaced all spaces with "_"
-replaced all blank cells with "nd"

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Data Files

File
behaviorMovement_reefObservationData.csv (Comma Separated Values (.csv), 3.12 KB) MD5:991a14fdc7b304123c3a81680821a18b Primary data file for dataset ID 653775

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Related Publications

Benkwitt, C. (2016). Invasive lionfish increase activity and foraging movements at greater local densities. Marine Ecology Progress Series, 558, 255–266. doi:10.3354/meps11760
General

Benkwitt, C. E. (2016). Central-place foraging and ecological effects of an invasive predator across multiple habitats. Ecology, 97(10), 2729–2739. doi:10.1002/ecy.1477
General

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Parameters

Parameter	Description	Units
date	Date that reef was surveyed; mm/dd/yy	unitless
reef	Reef id where lionfish were observed	unitless
time_period	Time of observation; classified as either dawn midday or dusk	unitless
site_size	Size of reef	meters
max_lionfish_number	Maximum number of lionfish observed on reef at during that observation	count
max_lionfish_density	Maximum density of lionfish observed on reef during that observation	max count per site area
prey_density	Total density of prey fishes (0-5 cm total length) on reef during that observation	count per meter
cloud_cover	Percent of cloud cover	percent
current	Strength of current underwater: L = low M = medium	unitless

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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

Mechanisms and Consequences of Fish Biodiversity Loss on Atlantic Coral Reefs Caused by Invasive Pacific Lionfish (BiodiversityLossEffects_lionfish)

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

Coverage: Three Bahamian sites: 24.8318, -076.3299; 23.8562, -076.2250; 23.7727, -076.1071; Caribbean Netherlands: 12.1599, -068.2820

The Pacific red lionfish (Pterois volitans), a popular aquarium fish, was introduced to the Atlantic Ocean in the vicinity of Florida in the late 20th century. Voraciously consuming small native coral-reef fishes, including the juveniles of fisheries and ecologically important species, the invader has undergone a population explosion that now ranges from the U.S. southeastern seaboard to the Gulf of Mexico and across the greater Caribbean region. The PI's past research determined that invasive lionfish (1) have escaped their natural enemies in the Pacific (lionfish are much less abundant in their native range); (2) are not yet controlled by Atlantic predators, competitors, or parasites; (3) have strong negative effects on populations of native Atlantic fishes; and (4) locally reduce the diversity (number of species) of native fishes. The lionfish invasion has been recognized as one of the major conservation threats worldwide.

The Bahamas support the highest abundances of invasive lionfish globally. This system thus provides an unprecedented opportunity to understand the direct and indirect effects of a major invader on a diverse community, as well as the underlying causative mechanisms. The PI will focus on five related questions: (1) How does long-term predation by lionfish alter the structure of native reef-fish communities? (2) How does lionfish predation destabilize native prey population dynamics, possibly causing local extinctions? (3) Is there a lionfish-herbivore-seaweed trophic cascade on invaded reefs? (4) How do lionfish modify cleaning mutualisms on invaded reefs? (5) Are lionfish reaching densities where natural population limits are evident?

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1233027

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