Lionfish movements to/from reefs observed during study of effect of density on lionfish behavior at Eleuthera, Bahamas in 2012 (Lionfish Invasion project)

Website: https://www.bco-dmo.org/dataset/3991
Data Type: Other Field Results
Version: 1
Version Date: 2013-07-09

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
An observational field study was conducted on natural patch reefs with varying lionfish densities to determine if local invasive lionfish density affects lionfish behavior. This dataset contains counts of lionfish present on reefs at the start and end of each reef visit, to get a measure of collective foraging range. The observations took place on natural reefs near Rock Sound, Eleuthera, Bahamas from 16 July to 30 August 2012.

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Coverage

Spatial Extent: **N**:24.87336 **E**:-76.24447 **S**:24.79488 **W**:-76.28902
Temporal Extent: 2012-07-06 - 2012-08-30

Dataset Description

An observational field study was conducted on natural patch reefs with varying lionfish densities to determine if local invasive lionfish density affects lionfish behavior. This dataset contains counts of lionfish present on reefs at the start and end of each reef visit, to get a measure of collective foraging range. The observations took place on natural reefs near Rock Sound, Eleuthera, Bahamas from 16 July to 30 August 2012.

Also see related dataset from sub-project "Effect of invasive lionfish density on behavior": lionfish density effect on behavior

Related Publications:
Benkwitt, C.E. In Prep. Higher invasive lionfish densities lead to increased collective foraging range.

Acquisition Description

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. Focal lionfish were observed for 10 minute intervals and all activity was recorded. The number of lionfish on each reef was counted at the beginning of the observation period and again at the end, to get a measure of how many were leaving/returning to the reef from the surrounding seagrass.

Processing Description

BCO-DMO Processing Notes:
- Modified parameter names to conform with BCO-DMO naming conventions.
- Added lat and lon values for each site included in the original metadata.
- Replaced blanks with 'nd' to indicate 'no data'.
- 08-Jan-2018: removed embargo from dataset.

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Parameters

Parameter	Description	Units
site	Name of individual reef site.	text
lat	Latitude of the reef site.	decimal degrees
lon	Longitude of the reef site.	decimal degrees
surface_area	Surface area of reef (meters squared).	m^2
time_of_day	Classified as Dawn, Midday, or Dusk	text
date	Date of observation (month/day/year).	mm/dd/YYYY
count_start	Number of lionfish present at the reef at the start of the observation.	integer
count_end	Number of lionfish present at the reef at the end of the observation.	integer
density_start	Lionfish density at site at the start of the observation (number of lionfish per meter squared).	#/m^2
density_end	Lionfish density at site at the end of the observation (number of lionfish per meter squared).	#/m^2
change_in_count	Change in number of lionfish on reef from the start of the observation to the end of the observation.	integer
change_in_density	Change in density of lionfish on reef from the start of the observation to the end of the observation (number per meter squared).	#/m^2
highest_count	Highest number of lionfish seen on the reef during any observation period.	integer
highest_density	Highest density of lionfish seen on the reef during any observation period (number per meter squared).	#/m^2

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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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