Results of a controlled lab experiment investigating consumption of bridled gobies by lionfish at the Tropical Marine Lab at Lee Stocking Island, Bahamas in 2011 (Lionfish Invasion project)

Website: https://www.bco-dmo.org/dataset/3938
Data Type: experimental
Version: 1
Version Date: 2013-05-06

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 a controlled lab experiment investigating consumption of bridled gobies by lionfish at the Tropical Marine Lab at Lee Stocking Island, Bahamas in 2011.

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Coverage

Spatial Extent: **Lat**:23.773461 **Lon**:-76.105208

Dataset Description

During the summer of 2011, investigators examined the effects of lionfish predation on bridled goby populations through both a manipulative field experiment and a controlled lab experiment. This dataset includes results obtained from the controlled lab experiment. The lab experiments were conducted at the Lobster Lab at the Perry Institute for Marine Science on Lee Stocking Island, Bahamas.

Related Datasets from sub-project "Lionfish predation on bridled gobies":
lionfish goby density expt

Related Publications:
Pusack, TJ, ACD Davis, and MA Albins. In Prep. Relative effects of invasive Pacific lionfish vs. native Atlantic grouper on mortality of bridled goby. Ecology.

Methods & Sampling

The investigators documented the gape refuge of bridled gobies accorss various sizes of lionfish. Bridled gobies, ranging in size from 1 to 6 cm total length, were offered to lionfish, ranging from 4 to 21 cm total length. The investigators recorded the time until detection by lionfish of goby, time to strike, strike sucess, and ingestion success. Each trial was 30 minutes, but some trials were allowed to go longer to see if the lionfish would ever eat the goby.

Data Processing Description

BCO-DMO Processing Notes:
- Modified parameter names to conform with BCO-DMO naming conventions.
- Added lat and lon for the site from the metadata provided.
- Replaced blanks with 'nd' ('no data').
- 09-Jan-2018: removed embargo on dataset.

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Data Files

File
goby_consumption.csv (Comma Separated Values (.csv), 13.09 KB) MD5:6109973ce8da2b908a7af2ad7e933888 Primary data file for dataset ID 3938

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Parameters

Parameter	Description	Units
site	Name of the location where the experiments took place.	text
lat	Latitude of the site.	decimal degrees
lon	Longitude of the site.	decimal degrees
fish_id	Unique number for each lionfish in the experiment.	dimensionless
lionfish_len_tot	The total length of the lionfish in centimeters.	cm
goby_len_tot	The total length of the bridled goby in centimeters.	cm
detection_time_elapsed	The time point when a directed movement towards the bridled goby was observed. Each trial was 30 minutes total (0:30:00).	H:MM:SS
num_strikes	The number of strikes a lionfish took in each trial.	integer
success	Whether or not the lionfish made a successful strike on the goby. 1 = succesful strike 0 = unsuccessful strike	1 or 0 (yes or no)
strike_time_elapsed	The time point that the successful strike occured. If the time is 0:30:00, then the lionfish never attempted a strike. Each trial was 30 minutes, but some trials were allowed to go longer to see if the lionfish would ever eat the goby.	H:MM:SS
ingestion_time_elapsed	The time point that the lionfish had the bridled goby completely in its mouth. If blank and success = 1, the goby was swallowed whole (the ingestion time = the time of strike).	H:MM:SS

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Deployments

PIMS_Hixon

Website	https://www.bco-dmo.org/deployment/59038
Platform	Tropical Marine Lab at Lee Stocking Island
Start Date	2009-05-30
End Date	2012-08-18
Description	Various lab experiments were conducted between 2009 and 2012 at the facilities at the Perry Institute for Marine Science Tropical Marine Lab (at Lee Stocking Island, Bahamas) for the project "Ecological Release and Resistance at Sea: Invasion of Atlantic Coral Reefs by Pacific Lionfish".

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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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