# Fairy basslet counts and density prior to manipulation experiments conducted at reefs near Eleuthera, Bahamas in 2012 (Lionfish Invasion project)

**Website**: https://www.bco-dmo.org/dataset/3922
**Data Type**: Other Field Results
**Version**: 1
**Version Date**: 2013-04-24

**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**
Fairy basslet counts and density prior to manipulation experiments conducted at reefs near 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 - 2012

## Dataset Description

This dataset contains counts of fairy basslet at reefs near Eleuthera, Bahamas prior to any manipulation of lionfish or basslet density.

To rigorously test whether and how lionfish have altered prey density-dependent dynamics, a manipulation was conducted of both basslet and lionfish densities in a cross-factored design, such that differences in patterns of mortality between treatments could be attributable to lionfish predation alone. Because density-dependent basslet mortality was attributed to predators aggregating preferentially near high prey concentrations, predatory behavior of both native and invasive predators was also examined in order to determine whether differences in any aggregative response could explain different patterns of prey mortality.

Related Datasets from sub-project "Lionfish alter density dependence in fairy basslet":
fairy basslet census Eleuthera
predator surveys Eleuthera

### Methods & Sampling

During the summer of 2012, a field experiment was conducted on 14 isolated patch reefs near the Cape Eleuthera Institute, Eleuthera, Bahamas. Reefs were paired into blocks by location, size, depth, and vertical relief so that reefs in each block demonstrated similar environmental characteristics. Reefs were then randomly assigned to one of two lionfish treatments:  low lionfish reefs (where divers regularly removed lionfish), and high lionfish reefs  (where lionfish were added to maintain differential lionfish densities. At each reef, the investigator selected two isolated populations of fairy basslet on small ledges sufficiently separated from each other and from other suitable basslet habitat to inhibit emigration or immigration. Populations were then randomly assigned to either receive artificially increased recruitment or remain unmanipulated. Following the establishment of treatments, the investigator returned to census each population after two days, four days and weekly thereafter, with a final census after four weeks. During each census, the investigator recorded the size of each basslet (adult and juvenile), the total population size, any predators within 2-m of the target basslet ledge, and whether those predators where actively hunting among the experimental basslet populations.

### Data Processing Description

BCO-DMO Processing Notes:
- Added lat and lon for each site from the metadata provided.
- Converted lat and lon from degrees and decimal minutes to decimal degrees.
- Modified parameter names to conform with BCO-DMO naming conventions.
- Replaced 'Y' and 'N' with 'Yes' and 'No' where applicable.
- 28-Dec-2017: removed embargo from dataset.

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## Data Files

| File |
|---|
| **fairy_basslet_base_density.csv** (Comma Separated Values (.csv), 1.69 KB) MD5:4539766bf55e2921e1a06301f940069b<br>Primary data file for dataset ID 3922 |

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## Parameters

| Parameter | Description | Units |
|---|---|---|
| site | Name of reef site. | text |
| lat | Latitude of reef site. | decimal degrees |
| lon | Longitude of reef site. | decimal degrees |
| pair | Number of reef pair (each pair forms one experimental block). | integer |
| ledge_tag | Two-digit numeral corresponding to ear tag ledge marker. | dimensionless |
| lionfish_present | Indicates whether lionfish were added (Yes) or removed (No). | Yes or No |
| area | Area of ledge. | square meters |
| basslet_baseline_abund | Baseline abundance (count) of fairy basslet of all sizes. | integer |
| basslet_density | Baseline density of fairy basslet in fish/m^2. | fish per square meter |
| basslet_added | Indicates whether or not fairy basslet where added to ledge experimentally. | Yes or No |

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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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