Part 1 of a 2 part manipulative experiment to investigate the existence of cooperative synergy in defensive behaviors of ‘guard’ crustaceans at Gump Research Station, Moorea, French Polynesia from July 2006 (CDD_in_Reef_Fish project)

Website: https://www.bco-dmo.org/dataset/727093
Data Type: experimental
Version: 1
Version Date: 2017-10-05

Project
» Cryptic density dependence: the effects of spatial, ontogenetic, and individual variation in reef fish (CDD_in_Reef_Fish)

Contributors	Affiliation	Role
McKeon, C. S.	Smithsonian Marine Station (SMS)	Principal Investigator, Contact
Bolker, Ben	McMaster University	Co-Principal Investigator
McIlroy, Shelby E.	University of Hong Kong	Co-Principal Investigator
Stier, Adrian	University of Washington (UW)	Co-Principal Investigator
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Abstract
Part 1 of a 2 part manipulative experiment to investigate the existence of cooperative synergy in defensive behaviors of ‘guard’ crustaceans at Gump Research Station, Moorea, French Polynesia from July 2006 (CDD_in_Reef_Fish project).

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Coverage

Spatial Extent: **Lat**:-17.5 **Lon**:-149.8333333
Temporal Extent: 2006-07-10 - 2006-07-28

Dataset Description

This dataset is part 1 of a 2 part manipulative experiment to investigate the existence of cooperative synergy in defensive behaviors of ‘guard’ crustaceans at Gump Research Station, Moorea, French Polynesia. Please reference the Related Datasets for additional datasets.

Related Datasets:

- McKeon_et_al_2012 Multiple Defender Effects: https://www.bco-dmo.org/dataset/727093 (current page)
- McKeon_et_al_2012 Multiple Defender Effects Symbiont Behavior: https://www.bco-dmo.org/dataset/727125

Methods & Sampling

We used feeding trials to quantify the efficacy of defense for four exosymbiont treatment groups: Trapezia + Alpheus, Trapezia, Alpheus, and No Exosymbionts. Twenty replicates in total were conducted for each exosymbiont treatment in a temporally blocked design with two replicates in each of ten temporal blocks. Trials were conducted in a large octagonal flow-through seawater tank approximately 0.5 m deep and 2 m across. The tank was divided into eight equal sections using plastic screening. Each section was provisioned with a seastar refugium constructed from concrete blocks. We placed Pocillopora colonies into the tank from the field during mid- to late afternoon. To minimize variation driven by search time, a single Culcita was placed directly on top of the coral colony. The following morning, we measured the coral size (length, width, height) and the feeding scars left by the Culcita (length, width, depth). We calculated volume consumed as an ellipsoid (4= 3pabc , where a is half the length, b is half the width, and c is half the depth).

Data Processing Description

We calculated volume consumed as an ellipsoid (4/ 3*pi*abc, where a is half the length, b is half the width, and c is half the depth).

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- converted date from mm/dd/yyyy to yyyymmdd.
- adjusted NA values to nd for BCO-DMO system.

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Data Files

File	
McKeonetal_2012_Multipledefendereffects.csv	(Comma Separated Values (.csv), 6.84 KB) MD5:6b9016ed565af12678711ab0537940a7
Primary data file for dataset ID 727093	

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Related Publications

McKeon, C. S., Stier, A. C., McIlroy, S. E., & Bolker, B. M. (2012). Multiple defender effects: synergistic coral defense by mutualist crustaceans. Oecologia, 169(4), 1095–1103. doi:10.1007/s00442-012-2275-2
General

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Parameters

Parameter	Description	Units
Date	Date of experiment (in yyyymmdd format)	unitless

Treatment	Treatment applied (1: No exosymbionts; 2: Alpheus (Pair of Alpheus lottini only); 3: Trapezia (Pair of Trapezia serenei only); 4: Alpheus + Trapezia (Pair of Alpheus lottini and pair of Trapezia serenei))	unitless
Location	Location of culcita (side; top)	unitless
CircHorz	Horizontal circumference of i	centimeters (cm)
CircVert	Vertical circumference of Pocillopora cf. meandrina	centimeters (cm)
Length	Length of experimental coral colonies	centimeters (cm)
Width	Width of experimental coral colonies	centimeters (cm)
Height	Height of experimental coral colonies	centimeters (cm)
Volume	The volumes of corals used in the deterrence trials	cubic centimeters (cm^3)
Surface_Area_Rectangle	Surface area of experimental coral colonies	square centimeters (cm^2)
Culcita_Diameter	Diameter of Culcita novaeguineae used in experiment	centimeters (cm)
Predation_Binary	Presence or absence of predation event	unitless
PredWidth	Width of feeding scar	centimeters (cm)
PredHeight	Height of feeding scar	centimeters (cm)
PredDepth	Depth of feeding scar	centimeters (cm)
PredCirc	Circumference of feeding scar	centimeters (cm)
Predvolumerec	Volume consumed calculated as: 4/3(pi)*PredWidth*PredHeight*PredDepth	cubic centimeters (cm^3)
Proportion_vol_eaten	Predvolumerec/Volume	unitless (percent)
Predation_Location	Location of feeding scars on experimental coral colony	unitless

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Deployments

Osenberg_et_al_Moorea

Website	https://www.bco-dmo.org/deployment/644752
Platform	Osenberg et al Moorea
Start Date	2003-05-19
End Date	2015-07-12

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Project Information

Cryptic density dependence: the effects of spatial, ontogenetic, and individual variation in reef fish (CDD_in_Reef_Fish)

Coverage: Moorea, French Polynesia (-17.48, -149.82)

Description from NSF award abstract:
Ecologists have long been interested in the factors that drive spatial and temporal variability in population density and structure. In marine reef systems, attention has focused on the role of settlement-the transition of pelagic larvae to a benthic stage-and on density-dependent processes affecting recently settled juveniles. Recent data suggest that co-variance in settlement and subsequent density-dependent survival can obscure the patterns of density dependence at larger scales, a phenomenon called cryptic density dependence. This research will explore the mechanisms that underlie the spatial covariance of settlement and site quality - a process that has received little attention in the standard paradigm. These mechanistic studies of cryptic density dependence will facilitate the development of new frameworks for fish population dynamics that incorporate larval ecology, habitat quality, density dependence, life history, and the patterns and implications of spatial covariance among these factors. More generally, the work provides a specific empirical context, and a general theoretical treatment, of cryptic heterogeneity (hidden individual variation in demographic rates).

Note: Drs. Craig W. Osenberg and Ben Bolker were at the University of Florida at the time the NSF award was granted. Dr. Osenberg moved to the University of Georgia during the summer of 2014 (current contact information). Dr. Bolker moved to McMaster University in 2010 (current contact information).

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0242312

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