Experimental results determining fecundity of Aratus pisonii populations in mangrove and salt marsh habitats in South Eastern US mangrove forests during 2013 (Variation in Metabolic Processes project)

Website: https://www.bco-dmo.org/dataset/639229
Data Type: Other Field Results
Version:
Version Date: 2016-02-25

Project
» Linking Variation in Metabolic Processes as a Key to Prediction (Variation in Metabolic Processes)

Contributors	Affiliation	Role
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Dataset Description

This data is part of a project exploring the impact of climate-change induced range expansion on traditional ecogeographic patterns of life history. Data were collected June-August 2013.

Related Datasets:
A. pisonii: egg size
A. pisonii: fitness and diet
A. pisonii: larval starvation resistance
A. pisonii: latitudinal body size
A. pisonii: predation
A. pisonii: range expansion
A. pisonii: reproductive effort
A. pisonii: herbivory
A. pisonii: mangrove tree survey

Related Reference:
Riley ME, Griffen BD (2017) Habitat-specific differences alter traditional biogeographic patterns of life history in a climate-change induced range expansion. PLOS One 12(5):e0176263.

Methods & Sampling

To determine egg weight and fecundity, ovigerous females were collected from mangrove and salt marsh habitats and placed upon ice. Eggs were removed from the pleopods of each female, egg stage (eyed/noneyed) was determined, and crabs with recently extruded, noneyed eggs were dissected to ensure

that they were post-vitellogenic (i.e. all eggs were extruded). A subset of eggs was taken from each individual and counted under a dissecting microscope. These subsets were dried at 65°C for 48 hours and weighed. We then determined the relationship between egg count and dry egg mass using a linear regression, and used the slope of this relationship (which indicates the average dry mass of a single egg) along with total brood dry weight to calculate total fecundity for individuals from both habitats.

Data Processing Description

BCO-DMO Processing:
- added conventional header with dataset name, PI name, version date
- renamed parameters to BCO-DMO standard
- replaced spaces with underscores; removed commas
- added lat and lon for mapping purposes
- reordered columns

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Data Files

File
Apisonii_fecundity.csv (Comma Separated Values (.csv), 2.65 KB) MD5:c14b2bd704a1cc3385671c6890a66247 Primary data file for dataset ID 639229

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Related Datasets

IsRelatedTo

Griffen, B. D. (2016) **Aratus pisonii survey in native mangrove and novel salt marsh habitats in South Eastern US mangrove forests during 2013 (Variation in Metabolic Processes project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 2016-02-25) Version Date 2016-02-25 http://lod.bco-dmo.org/id/dataset/639205 [view at BCO-DMO]
Relationship Description: Aratus pisonii dataset collected as part of the same study "Habitat-specific differences alter traditional biogeographic patterns of life history in a climate-change induced range expansion" Riley & Griffen (2017).

Griffen, B. D. (2016) **Comparing egg size in Aratus pisonii populations from mangrove and salt marsh habitats in South Eastern US mangrove forests during 2013 (Variation in Metabolic Processes project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). Version Date 2016-03-01 http://lod.bco-dmo.org/id/dataset/639282 [view at BCO-DMO]
Relationship Description: Aratus pisonii dataset collected as part of the same study "Habitat-specific differences alter traditional biogeographic patterns of life history in a climate-change induced range expansion" Riley & Griffen (2017).

Griffen, B. D. (2016) **Comparing larval quality in Aratus pisonii populations from mangrove and salt marsh habitats in South Eastern US mangrove forests during 2013 (Variation in Metabolic Processes project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). Version Date 2016-02-25 http://lod.bco-dmo.org/id/dataset/639320 [view at BCO-DMO]
Relationship Description: Aratus pisonii dataset collected as part of the same study "Habitat-specific differences alter traditional biogeographic patterns of life history in a climate-change induced range expansion" Riley & Griffen (2017).

Griffen, B. D. (2016) **Comparing predation pressure on Aratus pisonii in mangrove and salt marsh habitats South Eastern US mangrove forests during 2013 (Variation in Metabolic Processes project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). Version Date 2016-02-25 http://lod.bco-dmo.org/id/dataset/639301 [view at BCO-DMO]

Relationship Description: Aratus pisonii dataset collected as part of the same study "Habitat-specific differences alter traditional biogeographic patterns of life history in a climate-change induced range expansion" Riley & Griffen (2017).

Griffen, B. D. (2016) **Impact of diet variation on physiological and reproductive condition of A. pisonii in South Eastern US mangrove forests during 2013 (Variation in Metabolic Processes project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 2016-02-25) Version Date 2016-02-25 http://lod.bco-dmo.org/id/dataset/639095 [view at BCO-DMO]
Relationship Description: Aratus pisonii dataset collected as part of the same study "Habitat-specific differences alter traditional biogeographic patterns of life history in a climate-change induced range expansion" Riley & Griffen (2017).

Griffen, B. D. (2016) **Mangrove tree distribution and characteristics in a dwarf mangrove systems in the South Eastern US mangrove forests during 2013 (Variation in Metabolic Processes project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). Version Date 2016-03-01 http://lod.bco-dmo.org/id/dataset/639360 [view at BCO-DMO]
Relationship Description: Aratus pisonii dataset collected as part of the same study "Habitat-specific differences alter traditional biogeographic patterns of life history in a climate-change induced range expansion" Riley & Griffen (2017).

Griffen, B. D. (2016) **Survey comparing Aratus pisonii reproductive effort in native and novel habitats in South Eastern US mangrove forests during 2013 (Variation in Metabolic Processes project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). Version Date 2016-02-25 http://lod.bco-dmo.org/id/dataset/639267 [view at BCO-DMO]
Relationship Description: Aratus pisonii dataset collected as part of the same study "Habitat-specific differences alter traditional biogeographic patterns of life history in a climate-change induced range expansion" Riley & Griffen (2017).

Griffen, B. D. (2017) **Relationship between leaf herbivory, tree characteristics, and refuge availability in a Belize mangrove forest during 2013 (Variation in Metabolic Processes project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). Version Date 2017-08-03 http://lod.bco-dmo.org/id/dataset/639335 [view at BCO-DMO]
Relationship Description: Aratus pisonii dataset collected as part of the same study "Habitat-specific differences alter traditional biogeographic patterns of life history in a climate-change induced range expansion" Riley & Griffen (2017).

Griffen, B. D. (2017) **Survey examining latitudinal body size patterns in Aratus pisonii collected from South Eastern US mangrove forests in 2013 (Variation in Metabolic Processes project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). Version Date 2017-08-03 http://lod.bco-dmo.org/id/dataset/639250 [view at BCO-DMO]
Relationship Description: Aratus pisonii dataset collected as part of the same study "Habitat-specific differences alter traditional biogeographic patterns of life history in a climate-change induced range expansion" Riley & Griffen (2017).

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Parameters

Parameter	Description	Units
habitat	Dominant habitat: mangrove forest; marsh; mixed marsh	unitless
site	Site identification	unitless
lat	Latitude; north is positive	decimal degrees
lon	Longitude; east is positive	decimal degrees
crab	individual crab identification	unitless
carap_width	Carapace width	millimeters
egg_stage	Egg stage: eyed or not eyed	unitless
eggs_subsample	Number of eggs in subsample	eggs
eggs_wgt_subsample	Egg subsample weight (mg)	milligrams
eggs_wgt_total	Total brood weight (g)	grams
eggs_total_estimate	Total fecundity estimate (number of eggs)	eggs

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Microscope - Optical
Dataset-specific Description	Dissecting microscope
Generic Instrument Description	Instruments that generate enlarged images of samples using the phenomena of reflection and absorption of visible light. Includes conventional and inverted instruments. Also called a "light microscope".

Dataset-specific Instrument Name	
Generic Instrument Name	scale or balance
Generic Instrument Description	Devices that determine the mass or weight of a sample.

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Deployments

Griffen_mangroves

Website	https://www.bco-dmo.org/deployment/639093
Platform	Univ_S_Carolina
Start Date	2013-06-01
End Date	2015-12-31
Description	Aratus pisonii (Mangrove Tree Crab) studies

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Project Information

Linking Variation in Metabolic Processes as a Key to Prediction (Variation in Metabolic Processes)

Description from NSF award abstract:
A major goal of biological and ecological sciences is to understand natural systems well enough to predict how species and populations will respond to a rapidly changing world (i.e., climate change, habitat loss, etc.). A population under any conditions will grow, shrink, or disappear altogether depending on how efficiently individuals consume resources (food), utilize that food metabolically, and eventually reproduce. However, making accurate predictions based on these metabolic processes is complicated by the realities that each species has different resource requirements and that no two individuals within a species are exactly alike. Rather, individuals vary and this variation, both within and across species, is central to many ecological and evolutionary processes. Developing the ability to predict responses of biological systems to a changing world therefore requires a mechanistic understanding of variation. The goal of this project is to improve this mechanistic understanding by examining variation within a metabolic context across a range of species that have a spectrum of commonly-seen resource requirements. Further, the work capitalizes on a unique biological characteristic of this group of species that allows control and manipulation of individual reproduction, facilitating experimental study of the mechanistic links between variation in individual consumption, metabolism, and reproduction. The foundation this research is a combination of field measurements and laboratory experiments using both well-established and newly-developed techniques to quantify these links. The result will be a quantitative framework to predict how individuals will respond reproductively to changes in resource use. Because of the close link between individual reproduction and population dynamics, this research will contribute substantially to predictions in population dynamics under realistic conditions where individuals use more than a single resource, and improve the prediction of responses to current and future ecological changes.

The following publications and data resulted from this project:

Belgrad, B. and B. Griffen. 2016. Predator-prey interactions mediated by prey personality and predator identity.*Proc. Roy. Soc. B*: In Review. [2016-01-20]
P. herbstii mortality data: Mortality of crabs when exposed to either a single blue crab, toadfish, or no predator for a week
P. herbstii personality data: Refuge use of crabs when exposed to predator odor cues from either blue crabs, toadfish, or control of no cue
P. herbstii predator behavior data: Refuge use and mobility of blue crabs and toadfish while in mesocosms for

a week - behavior measured during two days.

Belgrad, B. and B. Griffen. 2016. The influence of dietary shifts on fitness of the blue crab, *Callinectes sapidus*. *PloS One. DOI: 10.1371/journal.pone.0145481.*
Blue crab activity: Activity of crabs fed different diets over a summer
Blue crab egg size: Volume of eggs for crabs fed different diets
Blue crab hepatopancreas index (HSI): Weight of hepatopancreas for crabs fed different diets
Blue crab hepatopancreas lipid content: Hepatopancreas lipid content of crabs fed different diets
Blue crab reproductive tissue analysis (GSI): Gonadosomatic index of blue crabs on various diets
Blue crab survival: Blue crab survival data during the dietary study

Knotts ER, Griffen BD. 2016. Individual movement rates are sufficient to determine and maintain dynamic spatial positioning within *Uca pugilator* herds. *Behavioral Ecology and Sociobiology* 70:639-646
Uca pugilator: behavior change with carapace marking: Search space behavior due to carapace treatment (control, nail polish, and food dye)
Uca pugilator: field spatial position: Assessment of individual's position within a herd at 3 min. intervals; for proportion of time found at edge of herd
Uca pugilator: herd position proportion: Individual's proportion of time spent in an edge/alone position among a herd
Uca pugilator: search space distribution: Search space that crabs traveled; to evaluate the sample's distribution of exploratory behavior

Belgrad, B. and B. Griffen. 2015. Rhizocephalan infection modifies host food consumption by reducing host activity levels. *Journal of Experimental Marine Biology and Ecology*. 466: 70-75.
E. depressus digestion time : Time taken for food to pass through gut of flat-backed mud crabs infected by a parasite
E. depressus metabolism: Respiration rate of infected/uninfected flat-backed mud crabs
E. depressus reaction time to prey: Time taken for infected/uninfected flat-backed mud crabs to react to the presence of prey

Blakeslee, A.M., C.L. Keogh, A.E. Fowler, B. Griffen. 2015. Assessing the effects of trematode infection on invasive green crabs in eastern North America. *PLOS One* 10(6): e0128674.(pdf)
Carcinus: hemocyte density: Counts of circulating hemocyte density in Carcinus maenas
Carcinus: parasites physiology behavior: Behavior and physiology of Carcinus maenas infected with trematode parasite

Griffen BD, Norelli AP (2015) Spatially variable habitat quality contributes to within-population variation in reproductive success. *Ecology and Evolution* 5:1474-1483.
P. herbstii diet: sampling site characteristics (Eco-Evo 2015)
P. herbstii diet: body measurements (Eco-Evo 2015)
P. herbstii diet & reproduction (Eco-Evo 2015)
P. herbstii: collection sites (Ecol-Evol 2015)

Griffen BD, Riley ME (2015) Potential impacts of invasive crabs on one life history strategy of native rock crabs in the Gulf of Maine. Biological Invasions 17:2533-2544.
Cancer consumption and reproduction (Bio.Inv. 2015): Lab experiment linking dietary consumption and reproduction

Griffen BD, Vogel M, Goulding L, Hartman R (2015) Energetic effects of diet choice by invasive Asian shore crabs: implications for persistence when prey are scarce. *Marine Ecology Progress Series* 522:181-192.
Hemigrapsus diet 1 (MEPS 2015)
Hemigrapsus diet 2 (MEPS 2015)

Hogan and Griffen (2014). The Dietary And Reproductive Consequences Of Fishery-Related Claw Removal For The Stone Crab *Menippe* Spp. Journal of Shellfish Research, Vol. 33, No. 3, 795–804.
Stone crab: 052012-DietChoiceExp1: Prey choice for 2-clawed and 1-clawed Stone Crabs (Menippe spp.)
Stone crab: 052012-LongTermConsumption: Long-term consuption for 2-clawed and 1-clawed Stone Crabs (Menippe spp.), summer of 2012
Stone crab: 062013-DietChoiceExp2: Prey choice for 2-clawed and 1-clawed Stone Crabs (Menippe spp.)
Stone crab: 062013-PreySizeSelection: Prey Size selection ranking for 2-clawed and 1-clawed Stone Crabs (Menippe spp.)

Riley M, Johnston CA, Feller IC, and Griffen B. 2014. Range expansion of *Aratus pisonii* (mangrove tree crab) into novel vegetative habitats. *Southeastern Naturalist* 13(4): 43-38

A. pisonii: range expansion: Aratus pisonii survey in native mangrove and novel salt marsh habitats

Riley M, Vogel M, Griffen B. 2014. Fitness-associated consequences of an omnivorous diet for the mangrove tree crab *Aratus pisonii*. *Aquatic Biology* 20:35-43, DOI: 10.3354/ab00543
A. pisonii: fitness and diet: Impact of diet variation on physiological and reproductive condition of A. pisonii

Toscano BJ, Newsome B, Griffen BD (2014) Parasite modification of predator functional response. Oecologia 175:345-352b
E. depressus - parasite and feeding (Oecologia, 2014): Feeding with and without parasitic barnacle infection
E. depressus - parasite and prey handling (Oecologia, 2014): Food handling with and without parasitic barnacle infection
E. depressus - parasite study - field survey (Oecologia, 2014): Parasitised field survey

Toscano BJ, Griffen BD (2014) Trait-mediated functional responses: predator behavioural type mediates prey consumption.*Journal of Animal Ecology* 83:1469-1477
P. herbstii - activity and feeding (JAE, 2014): Activity level and feeding with and without predator cue

Toscano BJ, Gatto J, Griffen BD (2014) Effects of predation threat on repeatability of individual crab behavior revealed by mark recapture. *Behavioral Ecology and Sociobiology* 68:519-527
P. herbstii - recapture behavior (BESB, 2014): Mud crabs refuge use and activity level - initial measurements
P. herbstii - refuge use (BESB, 2014): Effect of predation threat on repeatability of individual crab behavior revealed by mark-recapture

Griffen BD, Altman I, Bess BM, Hurley J, Penfield A (2012) The role of foraging in the success of invasive species. Biological Invasions. 14:2545-2558
Hemigrapsus seasonal diet (Bio.Inv. 2012): Percent herbivory and gut fullness for Hemigrapsus sanguineus at different times of year

Griffen BD, Toscano B, Gatto J (2012) The role of intraspecific trait variation in mediating indirect interactions. Ecology 93:1935-1943
P. herbstii refuge use (Ecology, 2012): Proportion of time that Panopeus herbstii spent using refuge habitats in a lab experiment
P. herbstii: Field personality distribution (Ecology, 2012): Field distribution of personality types in the mud crab Panopeus herbstii relative to tidal height
P. herbstii: Trait mediated indirect effect (Ecology, 2012): Influence of refuge use by the mud crab Panopeus herbstii on consumption of bivalves

Riley ME, Griffen BD (2017) Habitat-specific differences alter traditional biogeographic patterns of life history in a climate-change induced range expansion. PLOS One 12(5):e0176263
A. pisonii: egg size: Comparing egg size in Aratus pisonii populations from mangrove and salt marsh habitats
A. pisonii: fecundity: Determining fecundity of Aratus pisonii populations in mangrove and salt marsh habitats
A. pisonii: larval starvation resistance: Comparing larval quality in Aratus pisonii populations from mangrove and salt marsh habitats
A. pisonii: latitudinal body size: Survey examining latitudinal body size patterns in Aratus pisonii
A. pisonii: predation: Comparing predation pressure on Aratus pisonii in mangrove and salt marsh habitats
A. pisonii: reproductive effort: Survey comparing Aratus pisonii reproductive effort in native and novel habitats
A. pisonii: herbivory: Relationship between leaf herbivory, tree characteristics, and refuge availability
A. pisonii: mangrove tree survey: Mangrove tree distribution and characteristics in a dwarf mangrove system

Cannizzo ZJ, Dixon SR & Griffen BD (2018). An anthropogenic habitat within a suboptimal colonized ecosystem provides improved conditions for a range-shifting species. Ecology and Evolution, 8(3):1524-1533.
A. pisonii: behavior: Proportion of time the mangrove tree crab Aratus pisonii spent in different behaviors related to diet and energy storage
A. pisonii: dock-marsh thermal: Thermal readings from under a dock and in a nearby salt marsh
A. pisonii: sun-shade: Proportion of time that mangrove tree crab Aratus pisonii spent in sun and shade in three habitats, 2015-2016.
A. pisonii: thermal picture: Thermal condition of A. pisonii in three habitats: under dock, mangroves, saltmarsh

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1129166

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