

# 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)

**Website:** <https://www.bco-dmo.org/dataset/639095>

**Data Type:** experimental

**Version:** 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

Fitness-associated consequences of an omnivorous diet for the mangrove tree crab *Aratus pisonii*. Data were collected June-August 2012.

### Related Reference:

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.

### Related Datasets:

[A. pisonii: egg size](#)  
[A. pisonii: fecundity](#)  
[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](#)

## Methods & Sampling

For complete description of methodology, see [pdf](#)

## Data Processing Description

### BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date, reference information
- renamed parameters to BCO-DMO standard
- changed NA and blank cells to nd (no data)
- added site, lat and lon for mapping purposes

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## Data Files

File
<b>Apisonii_diet.csv</b> (Comma Separated Values (.csv), 6.21 KB) MD5:40d3c21c4ed6efdd84fbb923698f407
Primary data file for dataset ID 639095

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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) **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)**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). Version Date 2016-02-25 <http://lod.bco-dmo.org/id/dataset/639229> [[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
site	location of red mangrove tree leaf collection	unitless
lat	Latitude; north is positive	decimal degrees
lon	Longitude; east is positive	decimal degrees
crab	individual crab identification	unitless
Rm_diet	R. mangle as proportion of diet	unitless
cricket_diet	Cricket as proportion of diet	unitless
food_offered	Amount of food offered daily (% of body weight)	percent
dry_wgt_0	Estimated dry weight at day=0	grams
carap_width_0	Carapace width at day=0	millimeters
carap_width_42	Carapace width at day=42	millimeters
gut_width_42	Gut width at day=42	millimeters
survived	Survived experiment?	unitless
molted	Molted during experiment?	unitless
consum_day	Mean daily food consumption	grams
consum_cricket	Mean daily cricket consumption	grams
consum_Rm	Mean daily R. mangle consumption	grams
consum_wgt	Mean daily food consumption	grams/ body weight (grams)
consum_cricket_wgt	Mean daily cricket consumption	grams/ body weight (grams)
consum_Rm_wgt	Mean daily R. mangle consumption	grams/ body weight (grams)
assimilation	Mean assimilation efficiency	percent
larval_mass	Total larval mass produced	grams
ovary_mass	Post-experimental ovary mass	grams
hepatopan_mass_end	Post-experimental hepatopancreas mass	grams
body_mass_no_ovary_hep	Post-experimental body mass without ovary or hepatopancreas	grams
body_biomass_end	Post-experimental total body biomass	grams
gonadosomatic_index	Gonadosomatic Index	unitless
hepatosomatic_index	Hepatosomatic Index	unitless

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## Deployments

### Griffen mangroves

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

## 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](https://doi.org/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 \(Eco-Evo 2015\)](#)

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 consumption 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
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1129166</a>

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