

Energy content of mangrove crab, *A. pisonii*, eggs from three habitats along the Florida eastern coast, 2016

Website: <https://www.bco-dmo.org/dataset/741158>

Data Type: experimental

Version: 1

Version Date: 2018-07-16

Project

» [Linking Variation in Metabolic Processes as a Key to Prediction](#) (Variation in Metabolic Processes)

| Contributors | Affiliation | Role |
|--------------------------------------|---|------------------------------------|
| Griffen, Blaine D. | University of South Carolina | Principal Investigator |
| Cannizzo, Zachary J. | University of South Carolina | Co-Principal Investigator, Contact |
| Copley, Nancy | Woods Hole Oceanographic Institution (WHOI BCO-DMO) | BCO-DMO Data Manager |

Abstract

This dataset includes calculations of the energy content of eggs of mangrove tree crabs, *A. pisonii*, from three habitats: mangrove, saltmarsh and mangrove collected along the eastern Florida coast in 2016.

Table of Contents

- [Coverage](#)
- [Dataset Description](#)
 - [Acquisition Description](#)
 - [Processing Description](#)
- [Parameters](#)
- [Instruments](#)
- [Project Information](#)
- [Funding](#)

Coverage

Spatial Extent: N:30.1325 E:-80.28611 S:27.43 W:-81.38556

Temporal Extent: 2016-06-14 - 2016-10-13

Dataset Description

This dataset includes calculations of the energy content of eggs of mangrove tree crabs, *A. pisonii*, from three habitats: mangrove, saltmarsh and mangrove collected along the eastern Florida coast in 2016.

Acquisition Description

A. pisonii reproductive season. Crabs were immediately placed on dry ice and stored at -80 °C until dissection at which time the size and gut-width were determined and the whole egg clutch was carefully removed from the pleopods and dried to constant weight at 60-70°C.

We pelletized a subset of the egg cultch and used a Parr semi micro bomb calorimeter to determine the

energy content of the eggs (kJ/g) per the manufacturers instructions

The mass of the sample that was successfully combusted was calculated by first subtracting the mass of the sample dish before calorimetry from the mass of the sample dish after calorimetry. This value, the un-combusted sample, was then subtracted from the mass of the pelletized eggs.

The energy content of the combusted sample was calculated using the rise in temperature during calorimetry, the fuse correction, the W correction factor for the bomb, and the mass of the combusted sample following manufacturer instructions.

Locations, Florida East Coast:

Round Island Park: 27o33'33"N 80o19'53"W

Pepper Park: 27o29'42"N 80o18'12"W

North Causeway Park: 27o28'28"N 80o19'12"W

Oslo Road: 27o35'14"N 80o21'55"W

Anastasia State Park: 29o52'40"N 81o16'32"W

Guana-Tolomato-Matanzas NERR: 30o0'49"N 81o20'42"W

Vilano Inlet: 29o55'16"N 81o17'57"W

Palm Valley/Nocatee Canoe Launch: 30o07'57"N 81o23'08"W

St. Augustine Yacht Club: 29o53'09"N 81o17'08"W

Boating Club Road: 29o56'34"N 81o18'31"W

Processing Description

BCO-DMO Processing

- added ISO_Date columns; removed Month (name), Month_Num, and Date (d-Mon) column from display
- reduced decimal precision of GW_CW from 9 to 3 places

[[table of contents](#) | [back to top](#)]

Parameters

| Parameter | Description | Units |
|------------|--|------------------------|
| ID | Individual ID number given to each crab | unitless |
| ISO_Date | Date in ISO format (yyyy-mm-dd) | unitless |
| Habitat | The habitat where the crab was collected and observed. | unitless |
| Site | Site of observation/collection. RI= Round Island Park; PP=Pepper Park; NC=North Causeway Park; Oslo=Oslo Road; ANA=Anastasia State Park; GTM= Guana-Tolomato-Matanzas NERR; VM=Vilano Inlet; PV= Palm Valley/Nocatee Canoe Launch; YC=St. Augustine Yacht Club; BC=Boating Club Road | unitless |
| CW | Size of crab; measured as carapace-width | millimeters (mm) |
| GW | Gut width measured as the width of cardiac stomach. | millimeters (mm) |
| GW_CW | gut-width:carapace-width ratio | unitless |
| Egg_Stage | Developmental stage of eggs as non-eyed or eyed (eye-spot visible). | unitless |
| Sample | Individually assigned sample number for bomb-calorimeter | unitless |
| Pellet_W | Mass of pelletized eggs used for bomb calorimetry. | grams |
| Bomb | Identification of bomb used to perform calorimetry | unitless |
| Dish_Pre | Mass of sample dish before calorimetry. | grams |
| Dish_Post | Mass of sample dish - including unburned sample - after calorimetry. | grams |
| Temp_rise | Rise in temperature during calorimetry as reported by calorimetry. | degrees Celcius |
| Fuse | Fuse correction factor determined after calorimetry | unitless |
| Corr_W | Mass of sample that was successfully combusted | grams |
| BombW | W correction factor for individual bomb | unitless |
| E_Wcorr_kJ | Energy content of combusted sample. | kiloJoules/gram (kJ/g) |

[[table of contents](#) | [back to top](#)]

Instruments

| | |
|---|---|
| Dataset-specific Instrument Name | |
| Generic Instrument Name | Scale |
| Dataset-specific Description | Used to measure wet and dry weights of eggs |
| Generic Instrument Description | An instrument used to measure weight or mass. |

| | |
|---|--|
| Dataset-specific Instrument Name | Parr semimicro bomb calorimeter |
| Generic Instrument Name | bomb calorimeter |
| Dataset-specific Description | Used to determine the energy content of the eggs. |
| Generic Instrument Description | A device for determining heats of combustion by igniting a sample in a high pressure of oxygen in a sealed vessel and measuring the resulting rise in temperature. |

[[table of contents](#) | [back to top](#)]

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 weekP. herbstii personality data: Refuge use of crabs when exposed to predator odor cues from either blue crabs, toadfish, or control of no cueP. 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 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): 43-38A.
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/ab00543A.
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):e0176263A.
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

[[table of contents](#) | [back to top](#)]

Funding

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

[[table of contents](#) | [back to top](#)]