Physiological parameters derived from dissection of mangrove crabs, A. pisonii, from three habitats along Florida's east coast in 2015 and 2016

Website: https://www.bco-dmo.org/dataset/741114
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
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Abstract
This dataset includes multiple physiological parameters derived from dissection of mangrove tree crabs, A. pisonii, from three habitats: mangrove, saltmarsh and mangrove.

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Coverage

Spatial Extent: **N**:30.1325 **E**:-80.28611 **S**:27.43 **W**:-81.38556
Temporal Extent: 2015-06-17 - 2016-09-04

Dataset Description

This dataset includes multiple physiological parameters derived from dissection of mangrove tree crabs, A. pisonii, from three habitats: mangrove, saltmarsh and mangrove.

Acquisition Description

On each of 9 randomly selected days in each habitat, 15 individual adult A. pisonii were collected by hand and immediately placed on dry ice. In the mangrove and saltmarsh, we collected these crabs in three groups of five at three distinct tidal periods: just after losing access to the sediment on the flood tide, at

slack high tide, and just before regaining access to the sediment on the ebb tide. Crabs were kept frozen until dissection. Prior to dissection, we determined the sex and carapace width of each crab. Upon dissection we ascertained gut-width as the width of the cardiac stomach.

We ascertained the gut fullness of each crab to obtain a snap-shot of the quantity of food consumed during each tidal period by removing the gut contents and drying them at 60-70oC to constant weight. We standardized gut fullness by dividing the mass of the gut contents by the volume of the gut ( ) where a is a correction factor of 0.92.

We also separated the hepatopancreas, reproductive tissue (gonads and eggs), feces still in the intestines, the gut, and the somatic tissue of each crab and dried them to a constant weight at 60-70oC.

The dry mass of each parameter was determined by subtracting the mass of the weigh boat used for that parameter from the dry mass of that parameter on the weigh-boat.

Hepatosomatic index was calculated as the ratio of the dry masses of the hepatopancreas and the somatic tissue.
Gonadosomatic index was calculated as the ratio of the dry masses of the reproductive tissues and the somatic tissue.
Gut volume was calculated using the equation ( ) where a is a correction factor of 0.92.

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 Year and ISO_Date columns; removed Date (d-Mon) column from display
- reduced decimal precision of GV, GW_CW from 9 to 3; HIS, GSI and GC_GV from 9 to 4

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Related Publications

Cannizzo, Z. J., Dixon, S. R., & Griffen, B. D. (2018). An anthropogenic habitat within a suboptimal colonized ecosystem provides improved conditions for a range-shifting species. Ecology and Evolution, 8(3), 1521–1533. doi:10.1002/ece3.3739
Results

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Parameters

Parameter	Description	Units
ID	Individual ID number given to each crab	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; BP=Bear Point; ANA=Anastasia State Park; GTM= Guana-Tolomato-Matanzas NERR; PV= Palm Valley/Nocatee Canoe Launch; YC=St. Augustine Yacht Club	unitless
Year	Year of collection	unitless
ISO_Date	Date in ISO format (yyyy-mm-dd)	unitless
Tide	Tidal period of collection. 1=As crabs lost access to sediment on the flood-tide; 2=Slack-high tide; 3=Just before crabs regained access to the sediment on the ebb-tide	unitless
Sex	Sex of crab	unitless
Gravid	Reproductive state of female crabs. 0=non-ovigerous; 1-ovigerous (egg carrying)	unitless
CW	Size of crab; measured as carapace-width	mm
GW	Gut width measured as the width of cardiac stomach.	mm
GV	Gut volume measured as the volume of the cardiac stomach.	mm3
GW_CW	gut-width:carapace-width ratio	unitless
S_WB	Mass of weight boat for somatic tissue.	grams
S_Dry	Dry mass of somatic tissue on weigh boat.	grams
S	Dry mass of somatic tissue.	grams
F_WB	Mass of weigh-boat for feces.	grams
F_Dry	Dry mass of feces on weigh-boat.	grams
F	Dry mass of feces.	grams
G_WB	Mass of weigh-boat for reproductive tissue.	grams
G_Dry	Dry mass of reproductive tissue on weigh-boat.	grams
G	Dry mass of reproductive tissue	grams
H_WB	Mass of weigh-boat for hepatopancreas.	grams
H_Dry	Dry mass of hepatopancreas on weigh-boat.	grams
H	Dry mass of hepatopancreas.	grams
GT_WB	Mass of weigh-boat for gut.	grams
GT_Dry	Dry mass of gut on weigh-boat.	grams
GT	Dry mass of gut.	grams
GC_WB	Mass of weigh-boat for gut-content.	grams
GC_Dry	Dry mass of gut-content on weigh-boat.	grams
GC	Dry mass of gut-content.	grams
HIS	Hepato-somatic index of crab	unitless
GSI	Gonado-somatic index of crab	unitless
GC_GV	Ratio of the mass of the gut content and the volume of the gut	unitless

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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.

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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 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 summerBlue crab egg size: Volume of eggs for crabs fed different dietsBlue crab hepatopancreas index (HSI): Weight of hepatopancreas for crabs fed different dietsBlue crab hepatopancreas lipid content: Hepatopancreas lipid content of crabs fed different dietsBlue crab reproductive tissue analysis (GSI): Gonadosomatic index of blue crabs on various dietsBlue 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 70:639-646Uca 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 herdUca pugilator: herd position proportion: Individual's proportion of time spent in an edge/alone position among a herdUca 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. 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size: Comparing egg size in Aratus pisonii populations from mangrove and salt marsh habitatsA. pisonii: fecundity: Determining fecundity of Aratus pisonii populations in mangrove and salt marsh habitatsA. pisonii: larval starvation resistance: Comparing larval quality in Aratus pisonii populations from mangrove and salt marsh habitatsA. pisonii: latitudinal body size: Survey examining latitudinal body size patterns in Aratus pisoniiA. pisonii: predation: Comparing predation pressure on Aratus pisonii in mangrove and salt marsh habitatsA. pisonii: reproductive effort: Survey comparing Aratus pisonii reproductive effort in native and novel habitatsA. pisonii: herbivory: Relationship between leaf herbivory, tree characteristics, and refuge availabilityA. 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 storageA. pisonii: dock-marsh thermal: Thermal readings from under a dock and in a nearby salt marshA. 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
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