Proportion of time that mangrove tree crab Aratus pisonii spent in sun and shade in three habitats, 2015-2016. Cannizzo et al, (2018) Ecol & Evol.

Website: https://www.bco-dmo.org/dataset/741059
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 the proportion of time the mangrove crab, A. pisonii, spent in sun and shade in a mangrove, under a dock, and in a nearby salt marsh for a study of Aratus pisonii behavior. These data are presented in Cannizzo et al, (2018) Ecol & Evol.

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Coverage

Spatial Extent: **N**:30.1325 **E**:-80.28611 **S**:27.43 **W**:-81.38556
Temporal Extent: 2015-05-09 - 2016-07-23

Dataset Description

This dataset includes the proportion of time the mangrove crab, A. pisonii, spent in sun and shade in a mangrove, under a dock, and in a nearby salt marsh for a study of Aratus pisonii behavior. These data are presented in Cannizzo et al, (2018) Ecol & Evol.

Acquisition Description

We observed the behavior of individual crabs *in situ*. In each habitat, we collected groups of five adult *A. pisonii* by hand and determined the sex and carapace width (to the nearest 0.1mm) of each individual. The groups of crabs were made up of the first five individuals that we encountered and could capture and were drawn from all accessible habitat. We then painted the carapace of each crab an identifying color with nail polish to aid in identification and visibility. Following a short period of observation to ensure normal behavior, we released the crabs onto a single tree within 10 m of the collection tree of all individuals (mangrove), onto separate *S. alterniflora* stalks within 10 m of the area of collection (saltmarsh), or onto the same piling (dock) of the dock where all individuals were captured. Release in the saltmarsh occurred during the rising tide when the crabs had no access to the sediment.

We observed crabs in the mangrove and saltmarsh habitats from the time they lost access to the sediment until the receding tide once again allowed access to the sediment (~6h depending on site and day). In contrast, we observed crabs on docks from three hours before slack high tide until three hours after slack high tide. The total time of observation, in minutes, was recorded. We watched crabs from a distance using binoculars and monitored the individuals continuously throughout the observational period. The every five minutes, or at every change in location, the location of the crab in sun or shade was noted.

The proportions of time crabs were observed to spend in the sun, shade, and not visible were calculated as the total minutes the crab spent in each location divided by the total duration of the observational period in minutes.

Locations:
Florida East Coast:
Round Island Park: 27o33'33"N 80o19'53"W
Pepper Park: 27o29'42'N 80o18'12"W

Bear Point: 27o25'48"N 80o17'10"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
Palm Valley/Nocatee Canoe Launch: 30o07'57"N 81o23'08"W
St. Augustine Yacht Club: 29o53'09"N 81o17'08"W

Processing Description

BCO-DMO Processing
- added column for ISO_Date, joining year and month-day columns; removed display of Date (d-Mon) column
- reduced decimal precision of Sun, Shade, Invisible proportions from 9 to 2

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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

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Parameters

Parameter	Description	Units
Habitat	The habitat where the crab was collected and observed.	unitless
Site	Site of observation/collection. RI= Round Island Park; PP=Pepper Park; BP=Bear Point; NC=North Causeway Park; Oslo=Oslo Road; ANA=Anastasia State Park; GTM= Guana-Tolomato-Matanzas NERR; PV= Palm Valley/Nocatee Canoe Launch; YC=St. Augustine Yacht Club	unitless
Year	Year of observation/collection	unitless
ISO_Date	Date in ISO format (yyyy-mm-dd)	unitless
ID	individual ID number given to each crab	unitless
totduration	total duration in minutes of observational period.	minutes
Shade	proportion of time crab was observed in the shade during the observational period	unitless
Sun	proportion of time crab was observed in the sun during the observational period	unitless
Invisible	proportion of time crab was not visible to the observer during the observational period	unitless

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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. 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 parasiteE. depressus metabolism: Respiration rate of infected/uninfected flat-backed mud crabsE. 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 maenasCarcinus: 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 2012Stone 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 175:345-352bE. depressus - parasite and feeding (Oecologia, 2014): Feeding with and without parasitic barnacle infectionE. depressus - parasite and prey handling (Oecologia, 2014): Food handling with and without parasitic barnacle infectionE. 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 83:1469-1477P. 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 68:519-527P. herbstii - recapture behavior (BESB, 2014): Mud crabs refuge use and activity level - initial measurementsP. 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. 14:2545-2558Hemigrapsus 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 93:1935-1943P. herbstii refuge use (Ecology, 2012): Proportion of time that Panopeus herbstii spent using refuge habitats in a lab experimentP. herbstii: Field personality distribution (Ecology, 2012): Field distribution of personality types in the mud crab Panopeus herbstii relative to tidal heightP. 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 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
NSF Division of Ocean Sciences (NSF OCE)	OCE-1129166