

Percent herbivory and gut fullness for *Hemigrapsus sanguineus* at different times of year in North Inlet Estuary, Georgetown, SC during 2012 (Variation in Metabolic Processes project)

Website: <https://www.bco-dmo.org/dataset/644932>

Data Type: experimental

Version:

Version Date: 2016-05-10

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 |
| Copley, Nancy | Woods Hole Oceanographic Institution (WHOI BCO-DMO) | BCO-DMO Data Manager |

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Coverage

Spatial Extent: Lat:43.04841 Lon:-70.71686

Temporal Extent: 2009-04-01 - 2009-10-31

Dataset Description

Related Reference: 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.

Methods & Sampling

We collected crabs during early morning receding tides in order to obtain crabs that had recently eaten and whose guts were full. We collected crabs from approximately 0.5 m above mean lower low water along the same 100-m stretch of beach. Crabs were frozen at -80 degrees C upon collection for later diet analysis. We dissected crabs and analyzed the contents of each gut using a dissecting microscope. We then determined the diet for each crab by identifying and quantifying individual food particles removed from the cardiac stomach using a dissecting microscope. Finally, we determined percent herbivory for each crab by spreading the contents of the stomach evenly over a 100 point grid and determining the food item that was closest to each point. The same person performed all gut fullness and diet assessments in order to standardize this process and ensure consistency throughout the project. During dissections, a muscle sample was also taken from a walking leg and was analyzed for stable isotopes (^{13}C and ^{15}N) using a EuroVector Elemental Analyzer.

Data Processing Description

Raw data are presented.

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date, reference information
- renamed parameters to BCO-DMO standard
- added site, lat, lon columns

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Data Files

| File |
|--|
| Hemigrapsus_diet.csv (Comma Separated Values (.csv), 12.98 KB) MD5:bea7b2339cad863ed17538e53604dbf3 Primary data file for dataset ID 644932 |

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Parameters

| Parameter | Description | Units |
|-----------------|--|-----------------|
| site | specimen collection location | unitless |
| lat | latitude; north is positive | decimal degrees |
| lon | longitude; east is positive | decimal degrees |
| crab | unique identifying number for each crab | unitless |
| date | collection date | yyyy-mm-dd |
| sex | gender of crab | unitless |
| eggs | whether crab was gravid with eggs (Y/N) | unitless |
| carap_width | carapace width of crab | millimeters |
| gut_width | width of gut | millimeters |
| gut_fullness | categorical gut fullness (0=empty; 1=1/4 full; 2=half full; 3=3/4 full; 4=completely full) | percent |
| red_algae | percent of gut contents that was red algae | percent |
| green_algae | percent of gut contents that was green algae | percent |
| barnacles | percent of diet that was barnacles | percent |
| mussel | percent of diet that was mussels | percent |
| crustacean | percent of diet that was crustaceans | percent |
| hydrozoan | percent of diet that was hydrozoans | percent |
| bryozoan | percent of diet that was bryozoans | percent |
| coralline_algae | percent of diet that was coralline algae | percent |
| whelk | percent of diet that was whelk | percent |
| ciliate | percent of diet that was ciliate | percent |
| amphipod | percent of diet that was amphipod | percent |
| animal_detritus | percent of diet that was unidentifiable; except that it was animal | percent |
| plant_detritus | percent of diet that was unidentifiable; except that it was plant or algae | percent |
| detritus | percent of diet that was completely unidentifiable | percent |
| delta13C | stable isotope value from crab muscle tissue | unitless |
| delta15N | stable isotope value from crab muscle tissue | unitless |
| pcent_herbivory | percent of food in gut that was algal or plant material | percent |

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Instruments

| | |
|---|---|
| Dataset-specific Instrument Name | |
| Generic Instrument Name | CHN Elemental Analyzer |
| Dataset-specific Description | EuroVector Elemental Analyzer |
| Generic Instrument Description | A CHN Elemental Analyzer is used for the determination of carbon, hydrogen, and nitrogen content in organic and other types of materials, including solids, liquids, volatile, and viscous samples. |

| | |
|---|---|
| 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". |

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Deployments

Griffen_lab

| | |
|-------------------|---|
| Website | https://www.bco-dmo.org/deployment/638572 |
| Platform | Univ_S_Carolina |
| Start Date | 2012-01-01 |
| End Date | 2016-12-31 |

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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](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 |
|--|-----------------------------|
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1129166 |

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