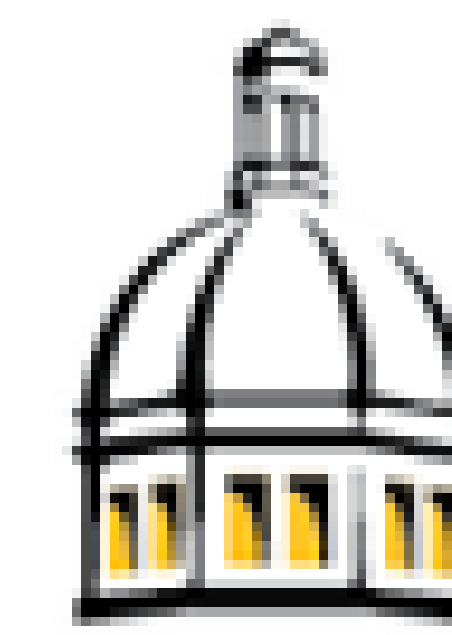


# Seasonal variation of dry energy density of Gulf Menhaden and blue crab from the Gulf of Mexico

Anna M. Swigris<sup>1</sup>, Alaina Woods<sup>2</sup>, Robert T. Leaf<sup>3</sup>, Megumi Oshima<sup>3</sup>, Taylor Daley<sup>3</sup>

<sup>1</sup>University of Florida, Gainesville, FL, <sup>2</sup>Paul Smith's College, Paul Smith's, NY, <sup>3</sup>Department of Coastal Sciences, The University of Southern Mississippi, Ocean Springs, MS



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## Introduction

- Gulf Menhaden and blue crab are believed to be key prey species in the Gulf of Mexico.
- Variations in ecosystem productivity are reflected in caloric value of resident animals.
- One measure of caloric value is dry energy density.
- Bomb calorimetry quantifies dry energy density.
- Understanding trophic interactions can inform an understanding of ecosystem dynamics including predator-prey relationships.

## Objectives

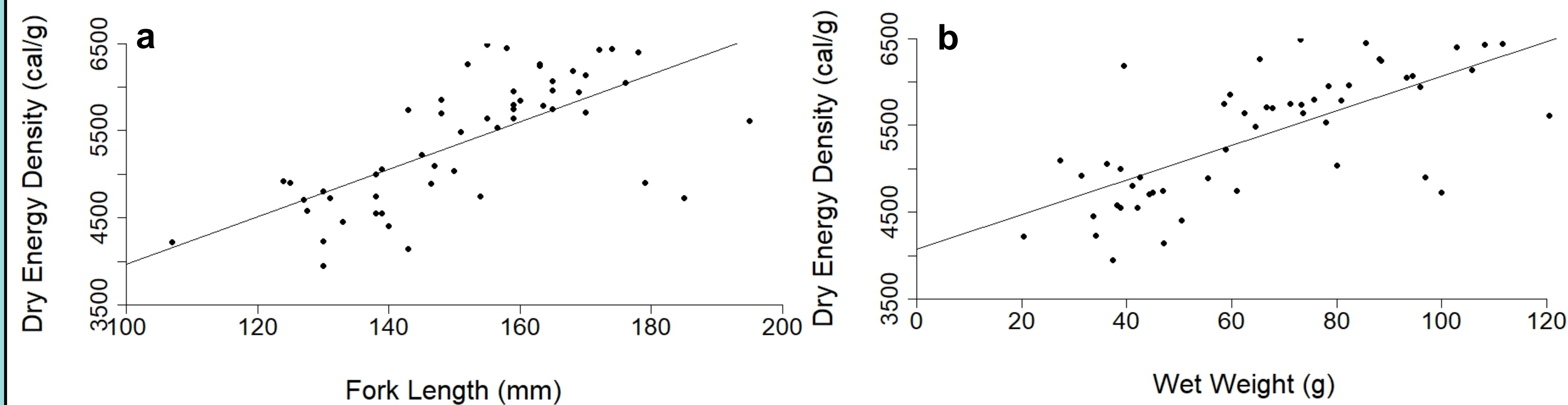
- 1) Determine appropriate methods to process fish and crabs for calorimetry analysis.
- 2) Evaluate seasonal variation in dry energy density of Gulf Menhaden
- 3) Compare dry energy densities of Gulf Menhaden and blue crabs

## Materials and methods

- We collected crabs in June and July 2017 using crab traps, seine nets, cast nets, and one flounder trap.
- We used frozen menhaden collected from coastal LA by gillnetting during spring to fall seasons, March to October.
- We weighed and measured fork length (FL) on 53 menhaden and carapace width (CW) on eight crabs.
- FL ranged from 107mm to 195 mm, and CW ranged from 91mm to 165 mm.
- We homogenized and freeze dried each sample.
- We ground each sample into a powder and compressed the powder into a pellet weighing between 1.0 and 1.9 g.
- We combusted each pellet in a Parr 6100 Bomb Calorimeter to determine dry energy density in calories per gram, correcting for fuse wire and nitric acid.

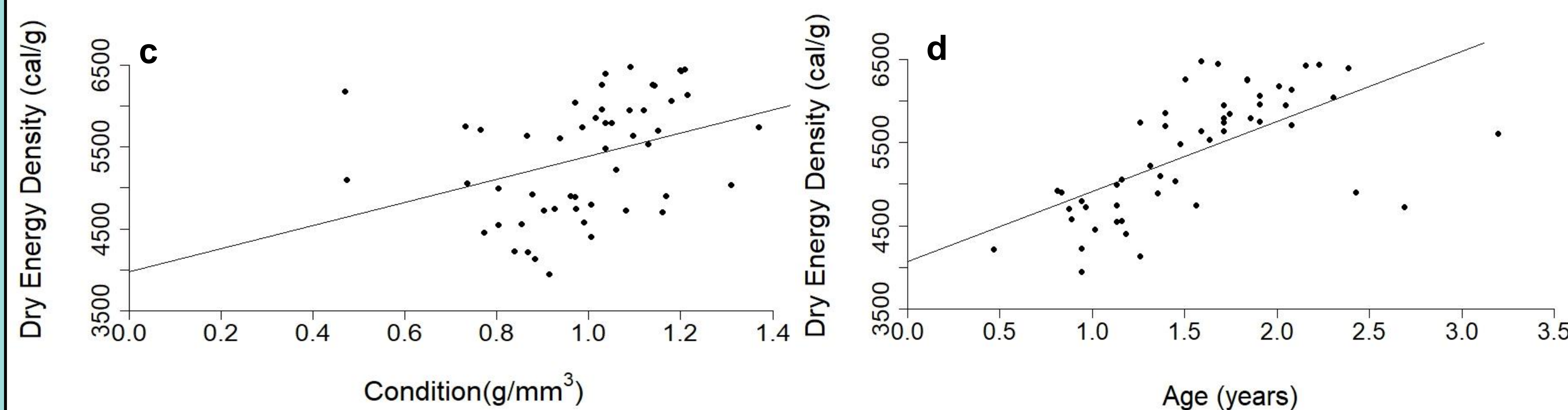


## Results



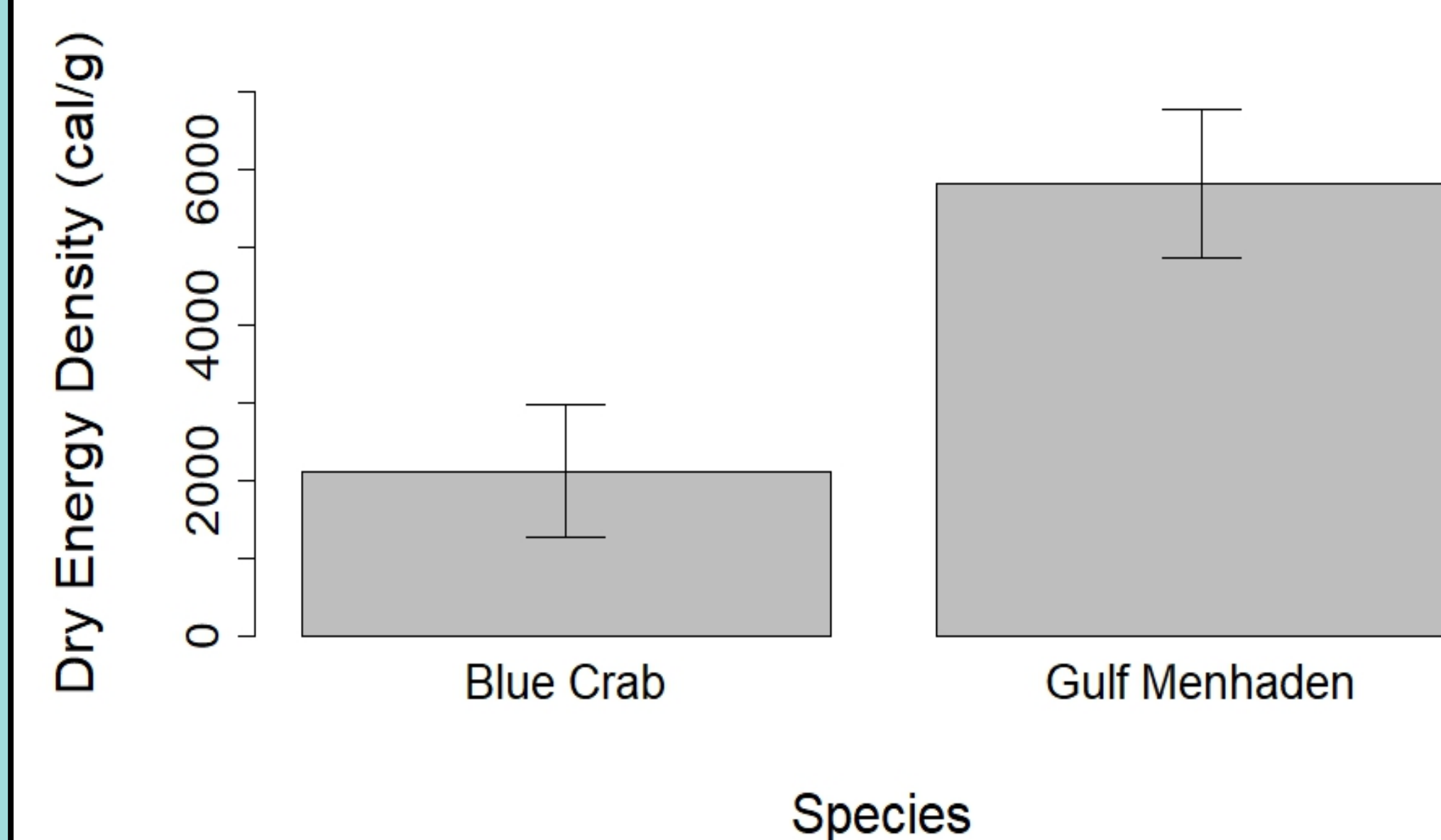
Fork length (FL) and dry energy density had a significantly positive, linear relationship in Gulf Menhaden ( $\text{Cal g}^{-1} = 27.2\text{FL} + 1,243.9$ ;  $p < 0.05$ ) (**Figure 1a**).

Wet weight (W) and dry energy density had a significantly positive, linear relationship in Gulf Menhaden ( $\text{Cal g}^{-1} = 20.0\text{W} + 4,070.3$ ;  $p < 0.05$ ) (**Figure 1b**).



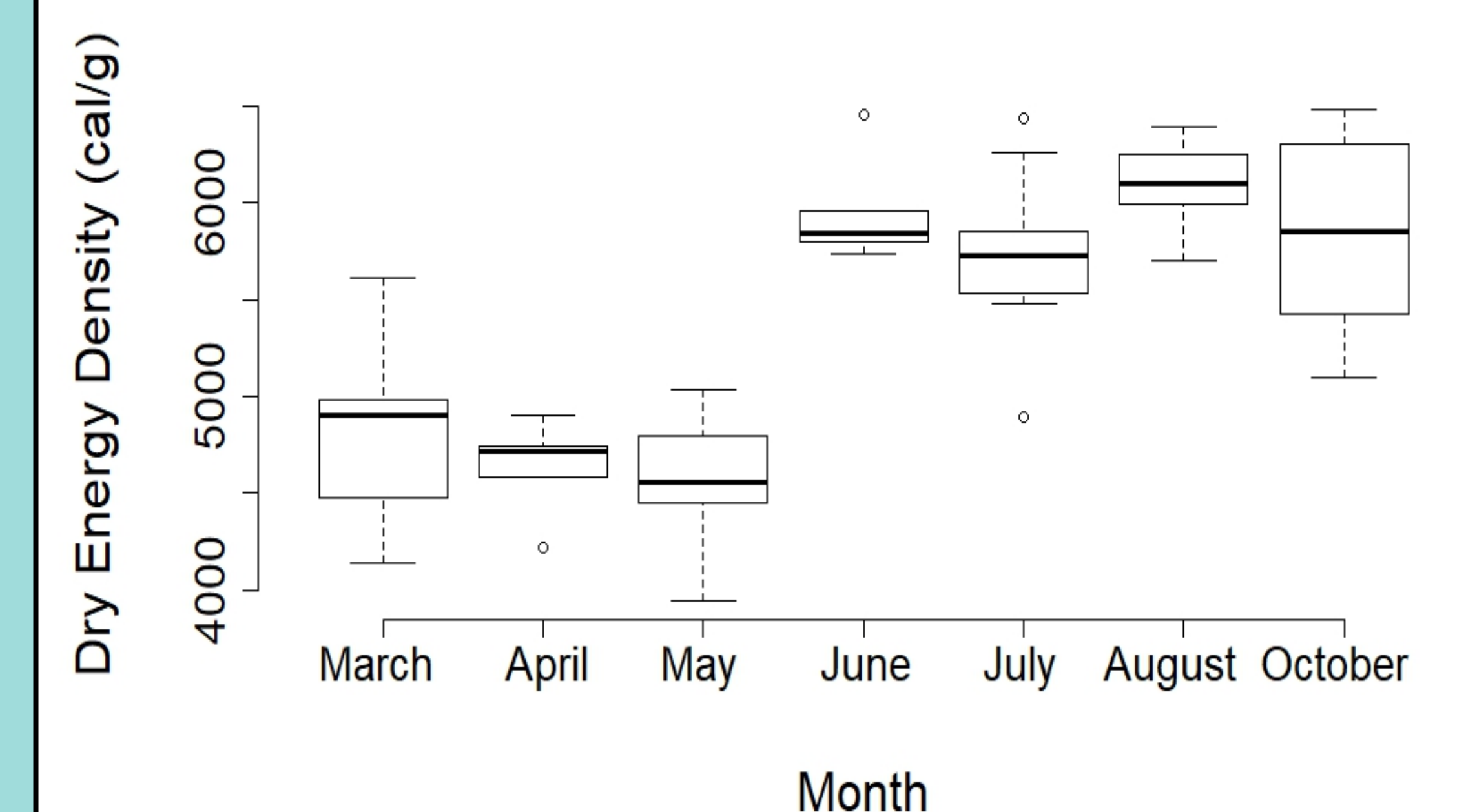
Condition (K) and dry energy density had a significant positive, linear relationship in Gulf Menhaden ( $\text{Cal g}^{-1} = 1,416.2\text{K} + 3,973.9$ ;  $p < 0.05$ ) (**Figure 1c**).

Age (T) and dry energy density had a significant positive, linear relationship in Gulf Menhaden ( $\text{Cal g}^{-1} = 840.4\text{T} + 4,074.6$ ;  $p < 0.05$ ) (**Figure 1d**).



**Figure 2.** There was a significant difference between dry energy density of June and July Gulf Menhaden and June and July blue crab ( $p < 0.05$ ).

## Results



**Figure 3.** There was a significant difference between dry energy density and month for Gulf Menhaden, with dry energy density increasing through spring and reaching a peak during summer.

## Conclusions

- Wet weight, fork length, and condition are significant predictors of dry energy density for Gulf Menhaden, so rough estimates of dry energy density could be made in-field by weighing and/or measuring the length or carapace width of individuals.
- Gulf Menhaden exhibit a seasonal dry energy density trend that increases through spring and peaks in summer. This could be because Gulf Menhaden spawn and overwinter from late fall to early spring.
- Blue crab dry energy density is lower than that of Gulf Menhaden.
- Gulf Menhaden caloric density is approximately three times that of blue crab.
- This contrast in caloric density indicates that Gulf Menhaden may be a preferred prey item for generalist predators that can feed on both.

## Acknowledgments

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