

Joshua Cullen

Postdoctoral Research Associate
School of Forest Resources and Conservation
University of Florida
136 Newins-Ziegler Hall • Gainesville, FL 32611
E-mail: joshcullen@ufl.edu
Phone: (609) 649-0070

Education

Texas A&M University, College Station, TX
Ph.D. Wildlife & Fisheries Sciences

August 2019

Clemson University, Clemson, SC
B.S. Biological Sciences (*Magna Cum Laude*)

May 2013

Research Interests

I am broadly interested in the study of comparative biomechanics, trophic ecology, ecotoxicology, and movement ecology. By using an integrative approach to understand how organisms function within the scope of their environment, associations of physical performance can be used to assess ecological roles and resource use. Species distribution models can evaluate the impact of environmental drivers on spatiotemporal patterns of short-term movements and long-term ranges of a species. These analyses can then be used to inform conservation and management of species from an integrative perspective. I am particularly interested in using quantitative methods (hierarchical state space models, mixed effects models, multivariate ordinations and clustering) to answer questions regarding an organism's ecology.

Publications

Cullen JA, Marshall CD. (2019). Do sharks exhibit heterodonty by tooth position and over ontogeny?: A comparison using elliptic Fourier analysis. *Journal of Morphology* 280: 687-700.

Cullen JA, Marshall CD, Hala D. (2019). Integration of multi-tissue PAH and PCB burdens with biomarker activity in three coastal shark species from the northwestern Gulf of Mexico. *Science of the Total Environment* 650: 1158-1172.

Hala D, Cullen JA, Hernout B, Ivanov I. (2018). *In silico* predicted transcriptional regulatory control of steroidogenesis in spawning female fathead minnows (*Pimephales promelas*). *Journal of Theoretical Biology* 455: 179-190.

Marshall CD, Al Ansi M, Dupont J, Warren C, Al Shaikh I, Cullen J. (2018). Large dugong (*Dugong dugon*) aggregations persist in coastal Qatar. *Marine Mammal Science* 34(4): 1154-1163.

Cullen JA, Maie T, Schoenfuss HL, Blob RW. (2013). Evolutionary Novelty versus Exaptation: Oral Kinematics in Feeding versus Climbing in the Waterfall-Climbing Hawaiian Goby *Sicyopterus stimpsoni*. PLoS ONE 8(1): e53274. doi:10.1371/journal.pone.0053274.

Manuscripts in Preparation

Cullen, JA, Marshall, CD. Scaling of bite force and its relationship with trophic ecology in bull (*Carcharhinus leucas*), blacktip (*Carcharhinus limbatus*), and bonnethead sharks (*Sphyrna tiburo*).

Marshall, CD, **Cullen, JA**, Al Ansi, MA. Hawksbill sea turtle (*Eretmochelys imbricata*) spatial movement in an extreme environment: The Arabian Gulf as a living laboratory for investigating organismal response to climate change.

Research Experience

Postdoctoral Research:

2019 – Present

School of Forest Resources and Conservation, University of Florida

(Research Advisors: Dr. Denis Valle and Dr. Robert Fletcher)

- Development of novel Bayesian methods for the classification of latent behavioral states of animal movement from GPS tracking data
- Geospatial analyses conducted on endangered snail kites (*Rostrhamus sociabilis plumbeus*) in the Florida Everglades to assist decision-making related to conservation and management

Dissertation Research:

2013 – 2019

Department of Wildlife & Fisheries Sciences, Texas A&M University

(Research Advisor: Dr. Christopher Marshall)

- Integrative study of sharks and their roles in coastal ecosystems over ontogeny by measuring bite force, trophic ecology, and conducting a risk assessment of major organic pollutants (PAHs and PCBs)
- Bayesian regression models were used to measure the scaling of bite force over ontogeny and metrics of trophic ecology (via stable isotopes) using R
- Multivariate statistics were implemented to analyze datasets of pollutants in shark liver and muscle tissue and to correspond these burdens with trophic ecology (via stable isotopes)
- Outlines of shark teeth were fit using elliptic Fourier analysis and analyzed by multivariate statistics to evaluate heterodonty over ontogeny and among tooth positions of a given species using R
- Outreach efforts were conducted to explain this ongoing research to local fishermen and undergraduate students

Water Quality Research Assistant:

Spring 2018

Galveston Bay Foundation, Houston, TX

- Analysis of long-term (2011 – 2017) citizen science water quality data from Galveston Bay, TX to determine the effects of Hurricane Harvey as well as locations in need of remediation
- Evaluated relationships among water quality variables, conducted time-series analyses, and estimated spatiotemporal patterns with geographic information systems (GIS) in R
- Analyses included generalized linear mixed effects models (GLMMs), generalized additive models (GAMs), and autoregressive moving average (ARMA) models using R
- These findings were presented at Galveston Bay Foundation to employees and volunteers with a range of scientific backgrounds

Qatar Field and Ecological Modeling Experience:

2014 – 2018

Department of Wildlife & Fisheries Sciences, Texas A&M University

(Research Advisor: Dr. Christopher Marshall)

- The movement ecology of hawksbill (*Eretmochelys imbricata*) and green sea turtles (*Chelonia mydas*) was studied in relation to biophysical variables in the Arabian Gulf using Bayesian state space models and mixed effects models (GAMMs) in R
- Remote sensing data were downloaded and extracted for each of the static and dynamic environmental variables included in the species distribution models, which were mapped using ArcGIS and R
- Seasonal utilization distributions were calculated and biophysical variables were used to determine drivers of latent transit and area restricted search behaviors

One Health Summer Research Exchange:
 Center for Environmental & Human Toxicology, University of Florida
 (Research Advisor: Dr. Nancy Denslow)

Summer 2015

- Lab study of sheepshead minnow (*Cyprinodon variegatus*) exposure to Macondo crude oil and dispersant using real-time quantitative polymerase chain reaction (RT-qPCR)
- Measured expression of stress-related genes (superoxide dismutase, catalase) from brain tissue

Undergraduate Research:
 Department of Biological Sciences, Clemson University
 (Research Advisor: Dr. Richard Blob)

2010 – 2013

- Kinematic analysis of a Hawaiian climbing goby (*Sicyopterus stimpsoni*) comparing cranial movements during feeding and climbing behaviors
- Analyzed kinematic profiles of multiple variables to determine potential evolutionary relationship between superficially similar behaviors
- This research resulted in an oral presentation at a national conference and a publication

Teaching Experience

Teaching Assistant, Natural History of Vertebrates (MARB 315)
 Texas A&M University at Galveston, Galveston, TX

2014 – Present

Undergraduate Teaching Assistant, Vertebrate Biology (BioSci 307)
 Clemson University, Clemson, SC

2012

Fellowships and Awards

University of Florida Informatics Institute Postdoctoral Fellowship
 Texas A&M University at Galveston Graduate Boost Fellowship
 Texas A&M University Doctoral Merit Fellowship
 College of Agriculture and Life Sciences Excellence Fellowship (Texas A&M University)
 College of Agriculture, Forestry and Life Sciences Senior Award (Clemson University)
 NSF Research Experience for Undergraduates (Clemson University)
 NSF Research Experience for Undergraduates (Rutgers University)

2019
 2017
 2013
 2013
 2013
 2012
 2011

Grants & Funding

Texas A&M University at Galveston – Department of Marine Biology Mini-Grants (\$2500)
 Erma Lee and Luke Mooney Graduate Student Travel Grant (\$1000)
 Texas Sea Grant, Grants-In-Aid of Graduate Research (\$1000)

2014 – 2018
 2015, 2017
 2014

Professional Societies

Society for Integrative and Comparative Biology
 American Fisheries Society

Conference Presentations

- Cullen, JA**, Hala, D, Marshall, CD. January 2019. How does feeding ecology impact the accumulation of PAHs and PCBs in sympatric shark species? Southern Division of the American Fisheries Society Meeting, Galveston, TX, USA.
- Marshall, CD, **Cullen, JA**, Al-Ansi, M. January 2019. Spatiotemporal Movement Patterns of Hawksbill Sea Turtles (*Eretmochelys imbricata*) in an Extreme Environment: The Arabian Gulf as a Living Laboratory for Investigating Organismal Response to Climate Change. Society for Integrative and Comparative Biology Meeting, Tampa, FL, USA.
- Cullen, JA**, Hala, D, Marshall, CD. January 2019. Influence of Feeding Ecology on Accumulation of PAHs and PCBs in Three Sympatric Shark Species. Society for Integrative and Comparative Biology Meeting, Tampa, FL, USA.
- Burroughs, L, Faulkner, P, **Cullen, J**, Marshall, C, Hala, D. November 2017. Hepatic *in vitro* biotransformation of selected pharmaceuticals in two species of Gulf of Mexico sharks. Society of Environmental Toxicology and Chemistry Meeting, Minneapolis, MN, USA.
- Cullen, JA**, Marshall, CD, Hala, D. November 2017. Comparative Analysis of Exposure and Physiological Response to PAHs and PCBs in Three Coastal Sharks. Society of Environmental Toxicology and Chemistry Meeting, Minneapolis, MN, USA.
- Marshall, CD, **Cullen, JA**, Al-Ansi, MA. July 2017. Hawksbill Sea Turtle (*Eretmochelys imbricata*) Spatial Movement in an Extreme Environment: The Arabian Gulf as a Living Laboratory for Investigating Organismal Response to Climate Change. Joint Meeting of Ichthyologists and Herpetologists, Austin, TX, USA.
- Cullen, JA**, Marshall, CD. July 2017. Morphological Changes in Shark Teeth May Facilitate Ontogenetic Dietary Shifts. Joint Meeting of Ichthyologists and Herpetologists, Austin, TX, USA.
- Merrill, ML, **Cullen, JA**, Marshall, CD. April 2016. Tooth Morphology of Three Texas Coastal Sharks. Texas A&M University at Galveston Undergraduate Research Symposium. Galveston, TX, USA.
- Cullen, JA**, TinHan, T, Plumlee, J, Wells, RJD, Marshall, CD. January 2016. Impact of Allometry and Feeding Biomechanics on Ontogenetic Dietary Shifts in Three Coastal Sharks. Society for Integrative and Comparative Biology Meeting, Portland, OR, USA.
- Cullen, JA**, Marshall, CD. May 2015. Ontogenetic Scaling of Bite Performance in Three Sympatric Sharks. Canadian Society of Zoologists Meeting, Calgary, AB, CA.
- Marshall, CD, **Cullen, JA**, Al-Ansi, MA, Dupont, J. January 2015. Iconic Marine Vertebrates of the Qatari Arabian Gulf: Preliminary Data on Sea Turtle and Dugong Morphometrics, Movement, and Strandings. Society for Integrative and Comparative Biology Meeting, West Palm Beach, FL, USA.
- Cullen, JA**, Marshall, CD. January 2015. A Preliminary Analysis of Ontogenetic Scaling of Bite Performance Within Three Species of Texas Sharks. Society for Integrative and Comparative Biology Meeting, West Palm Beach, FL, USA.
- Cullen, JA**, Maie, T, Schoenfuss, HL, Blob, RW. January 2013. Can exaptation facilitate terrestrial invasion? Oral kinematics of climbing and feeding in a waterfall-climbing gobiid fish. Society for Integrative and Comparative Biology Meeting, San Francisco, CA, USA.