Joshua Cullen

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Education

Texas A&M University, College Station, TX   August 2019
Ph.D. Wildlife & Fisheries Sciences

Clemson University, Clemson, SC   May 2013
B.S. Biological Sciences

Research Experience

Assistant Project Scientist: 2024 – present
Institute of Marine Science, University of California Santa Cruz
NOAA Southwest Fisheries Science Center

- Maintained 5 different operational tools that provide decision-support for fisheries within the California Current Ecosystem
- Modernizing workflows for ecological research that includes more efficient methods for data download, storage, analysis, prediction, and product automation

ORISE Postdoctoral Fellow: 2023 – 2024
Eastern Ecological Science Center, US Geological Survey

- Investigated spatiotemporal overlap of GPS tagged mallards (*Anas platyrhynchos*) with confirmed outbreaks of highly pathogenic avian influenza (HPAI) H5N1 in poultry farms
- Fit a Bayesian hierarchical occupancy model via Stan in R to estimate the impact of mallard overlap and farm type on H5N1 outbreak probability at poultry farms while accounting for imperfect outbreak reporting
- Developed reproducible documents and dashboards in Quarto for sharing results

NSF Postdoctoral Research Fellow: 2021 – 2023
Dept. of Earth, Ocean, and Atmospheric Science, Florida State University

- Applied statistical and machine learning methods (e.g., GLM, GAM, BRT, Gaussian Process) to fit transferable habitat selection models using green sea turtles (*Chelonia mydas*) as a focal species
- Downloaded environmental raster data (as NetCDF files) from NOAA's ERDDAP server, which I subsequently wrangled and extracted for habitat selection modeling
- Developed webpage summarizing project results via Quarto, including an embedded Shiny app for exploring turtle movements related to environmental covariates as well as interactive maps of model predictions via scheduled deployment using GitHub Actions
- Conducted parallel processing and used performant R code for geospatial analyses and statistical modeling of large datasets

Postdoctoral Research Associate: 2019 – 2021
School of Forest, Fisheries, and Geomatics Sciences, University of Florida

- Developed novel Bayesian statistical models to identify behavioral states from animal movement data and created {bayesmove} R package to apply these methods
- Analyzed the spatiotemporal patterns of threatened giant armadillos (*Priodontes maximus*) in relation to land use/land cover in collaboration with partners at a Brazilian NGO (Wild Animal Conservation Institute)
- Performed geoprocessing of remote sensing imagery (Landsat 8, Sentinel-2) via Google Earth Engine and processed vector layers of animal tracks and land use/land cover in R
- Conducted population viability analysis of endangered snail kite (*Rostrhamus sociabilis plumbeus*) across Florida to project future changes in population size with respect to climate change projections

Dissertation Research: 2013 – 2019
Department of Wildlife & Fisheries Sciences, Texas A&M University
- 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)
- The allometric scaling of bite force was measured over ontogeny and related to dietary shifts (via $\delta^{13}C$ and $\delta^{15}N$ stable isotopes)
- Quantified 45 organic pollutants (PAHs/PCBs) in shark liver and muscle tissue, and these burdens were related to feeding ecology (via stable isotopes)
- Shark tooth shape was characterized using elliptic Fourier analysis to evaluate heterodonty over ontogeny and among tooth positions of a given species
- Applied frequentist and Bayesian GLMs, hierarchical models, multivariate ordinations, and clustering to address study objectives

Qatar Field and Ecological Modeling Experience: 2014 – 2018
Department of Wildlife & Fisheries Sciences, Texas A&M University
- 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 species distribution models (via GAMMs)
- Downloaded and extracted HYCOM ocean model data from different layers of the water column for use in the species distribution model
- Calculated seasonal utilization distributions, and biophysical variables were used to determine drivers of latent states (i.e., transit and area restricted search)

Technical Skills

Programming languages: R (*10 yrs*), JAGS (*9 yrs*), Stan (*5 yrs*)
Software: QGIS (*10 yrs*), ArcGIS (*3 yrs*), Google Earth Engine (*4 yrs*)
Other: Git/GitHub (*5 yrs*), Shiny web apps (*5 yrs*), Rmarkdown (*8 yrs*), Quarto (*2 yrs*)

Participant in Leadership Academy and Network for Diversity and Inclusion in the Geosciences
(LANDInG) Program hosted by the American Geophysical Union (AGU) 2022 – 2023

Recent Publications

Cullen JA, Santos AJB, White JW, Komoroske LM, Stahelin G, Fuentes MMPB. (in review). Method selection and temporal scale greatly impact ecological inferences on animal behavior and space use.

17) **Cullen JA**, Domit C, Lamont MM, Marshall CD, Santos AJB, Sasso CR, Al Ansi M, Fuentes MMPB. (2024). A comparative framework to develop transferable species distribution models for animal telemetry data. *Ecosphere*, 15:e70136. https://doi.org/10.1002/ecs2.70136.

16) **Cullen JA,** Marshall CD. (2024). Scaling of bite force corresponds with ontogenetic niche shifts in coastal elasmobranchs. *Frontiers in Marine Science*, 11:1452984. https://doi.org/10.3389/fmars.2024.1452984.

15) Valle D, Attias N, **Cullen JA**, Hooten MB, Giroux A, Oliveira-Santos LGR, Desbiez ALJ, Fletcher Jr RJ. (2024). Bridging the gap between movement data and connectivity analysis using the Time-Explicit Habitat Selection (TEHS) model. *Movement Ecology*, 12:19. https://doi.org/10.1186/s40462-024-00461-1.

14) Hardin EE, **Cullen JA**, Fuentes MMPB. (2024). Comparing acoustic and satellite telemetry: an analysis quantifying the space use of *Chelonia mydas* in Bimini, Bahamas. *Royal Society Open Science*, 11:231152. https://doi.org/10.1098/rsos.231152.

13) Weber S, **Cullen JA**, Fuentes MMPB. (2023). Isotopic niche overlap among foraging marine turtle species in the Gulf of Mexico. *Ecology and Evolution*, 13:e10741. https://doi.org/10.1002/ece3.10741.

12) Santos AJB, **Cullen J**, Vieira DHG, Lima EHSM, Quennessen V, Santos EAPd, Bellini C, Ramos R, Fuentes MMPB. (2023). Decoding the interesting movements of marine turtles using a fine-scale behavioral state approach. *Frontiers in Ecology and Evolution*, 11:1229144. https://doi.org/10.3389/fevo.2023.1229144.

11) **Cullen JA**, Attias N, Desbiez ALJ, Valle D. (2023). Biologging as an important tool to uncover behaviors of cryptic species: An analysis of giant armadillos (*Priodontes maximus*). *PeerJ*, 11:e14726 https://doi.org/10.7717/peerj.14726.

10) Cullen JA, Poli CL, Fletcher Jr RJ, Valle D. (2022). Identifying latent behavioral states in animal movement with non-parametric Bayesian methods. *Methods in Ecology and Evolution*, 13:432-446. https://doi.org/10.1111/2041-210X.13745.

9) Valle D, Jameel Y, Betancourt B, Azeria ET, Attias N, **Cullen J**. (2022). Automatic selection of the number of clusters using Bayesian clustering and sparsity-inducing priors. *Ecological Applications*, 32(3): e2524. https://doi.org/10.1002/eap.2524.

8) Lawson MC, **Cullen JA**, Nunnally CC, Rowe GT, Hala DN. (2021). PAH and PCB body-burdens in epibenthic deep-sea invertebrates from the northern Gulf of Mexico. *Marine Pollution Bulletin*, *162*: 111825. https://doi.org/10.1016/j.marpolbul.2020.111825.

7) Marshall CD, **Cullen, JA**, Al-Ansi M, Hamza S, Abdel-Moati MA. (2020). Environmental drivers of habitat use by hawksbill turtles (*Eretmochelys imbricata*) in the Arabian Gulf (Qatar). *Frontiers in Marine Science*, *7*: 961. https://doi.org/10.3389/fmars.2020.549575.

6) Bacosa HP, Kamalanathan M., **Cullen J**, Shi D, Xu C, Schwehr KA, Hala D, Wade TL, Knap AH, Santschi PH, Quigg A. (2020). Marine snow aggregates are enriched in polycyclic aromatic hydrocarbons (PAHs) in oil contaminated waters: Insights from a mesocosm study. *Journal of Marine Science and Engineering*, *8*(10): 781. https://doi.org/10.3390/jmse8100781.

5) 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. https://doi.org/10.1002/jmor.20975.

4) 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. https://doi.org/10.1016/j.scitotenv.2018.09.128.

3) 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. https://doi.org/10.1016/j.jtbi.2018.07.020.

2) 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. https://doi.org/10.1111/mms.12497.

1) 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. https://doi.org/10.1371/journal.pone.0053274.

Grants & Funding

NSF Ocean Sciences Postdoctoral Research Fellowship ($273,561)	2021
US Fish & Wildlife Service Snail Kite Population Viability Analysis ($12,551)	2021
Texas A&M University at Galveston – Department of Marine Biology Mini-Grants ($2500)	2014 – 2018
Erma Lee and Luke Mooney Graduate Student Travel Grant ($1000)	2015, 2017
Texas Sea Grant, Grants-In-Aid of Graduate Research ($1000)	2014

Fellowships and Awards

ORISE Postdoctoral Fellowship (USGS, Eastern Ecological Science Center)	2023
NSF Ocean Sciences Postdoctoral Research Fellowship (Florida State University)	2021
University of Florida Informatics Institute Postdoctoral Fellowship	2019
Texas A&M University at Galveston Graduate Boost Fellowship	2017
Texas A&M University Doctoral Merit Fellowship	2013
College of Agriculture and Life Sciences Excellence Fellowship (Texas A&M University)	2013
College of Agriculture, Forestry and Life Sciences Senior Award (Clemson University)	2013

Organized Workshops

"Intro to Shiny" workshop – Climate and Ecosystems Group, NOAA SWFSC/UC Santa Cruz	
"Space-use and behavioral state estimation" workshop – Fuentes Lab, Florida State University	2022
Co-organized "Southeast Invasive Species Expert Elicitation" workshop – SECASC grant	2022
Co-organized "Interactive Web-based Visualizations and Decision Support Tools in Shiny/R Workshop" – Northeast Fish and Wildlife Conference	2022

"Using Git and GitHub with RStudio" workshop – Fuentes Lab, Florida State University   2022
Co-organized "Expanding the scope of connectivity" workshop – IALE Conference   2021

Service

Co-organized "Statistical Methods Seminar Series" webinar – Ecological Forecasting Initiative/
   Statistical Ecology section of ESA   2021 – 2022
Co-organized "Taking your R Shiny apps to the next level" webinar – Ecological Forecasting Initiative   2021
Secretary, ESA Statistical Ecology Section   2020 – 2022

Reviewer for: *Ecology*, *Journal of Anatomy, Journal of Applied Ecology, Journal of Experimental Marine Biology and Ecology, Remote Sensing*, *Science of the Total Environment, Scientific Reports*, *Sustainability, USGS Internal Review*

Conference Presentations

Cullen J, Gonnerman M, Sullivan J, Prosser D. October 2024. A Joint Bayesian Survival-Multifate Model to Estimate Nest Success of Common Terns. The Wildlife Society Meeting, Baltimore, MD, USA.

Santos AJB, **Cullen J**, Vieira DHG, Lima EHSM, Quennessen V, Santos EAPd, Bellini C, Ramos R, Fuentes MMPB. March 2024. Decoding the internesting movements of marine turtles using a fine-scale behavioral state approach. International Sea Turtle Symposium, Pattaya, Thailand.

Blob RW, Diamond KM, Sepa EB, **Cullen J**, Maie T, Schoenfuss HL. January 2024. Grazing kinematics and the evolution of waterfall-climbing in goby fishes. Society for Integrative and Comparative Biology, Seattle, WA, USA.

Blob RW, Diamond KM, **Cullen J**, Maie T, Schoenfuss HL. July 2023. Feeding kinematics of algal grazing in the gobiid fish *Sicydium punctatum*: A missing link in the evolution of goby climbing mechanics? International Congress of Vertebrate Morphology, Cairns, Queensland, Australia.

Cullen JA, Fletcher Jr RJ, Jeffrey B. April 2023. Population Viability of the Everglade Snail Kite Under Future Climate Change Scenarios. Greater Everglades Ecosystem Restoration Meeting, Coral Springs, FL, USA.

Cullen JA, Lamont M, Marshall C, Domit C, Sasso C, Fuentes MMPB. March 2023. A transferable modeling approach to predict habitat selection of green turtles (*Chelonia mydas*). Southeast Regional Sea Turtle Meeting, Orange Beach, AL, USA.

Cullen, JA, Attias N, Poli CL, Santos A, Desbiez ALJ, Fletcher Jr RJ, Fuentes MMPB, Valle D. November 2022. Identifying latent behavioral states in animal movement data. The Wildlife Society Meeting, Spokane, WA, USA.

Hardin EE, Fuentes MMPB, **Cullen JA**. March 2022. Comparison of acoustic and satellite telemetry as methods for quantifying space use of marine turtles within foraging grounds. International Sea Turtle Symposium, Perth, Australia.

Cullen, JA, Attias N, Desbiez ALJ, Valle D. August 2021. Uncovering behaviors of cryptic species: latent behavioral states, activity budgets, and habitat associations of giant armadillos (*Priodontes maximus*) in the Brazilian Pantanal. Ecological Society of America Meeting, virtual.

Cullen, JA, Poli CL, Fletcher Jr RJ, Valle D. August 2020. Non-parametric Bayesian methods for the identification of latent behavioral states from animal movement. Ecological Society of America Meeting, virtual.

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.

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.