

# KAYCEE MORRA

Postdoctoral Scholar, 2018-2021, [kayceem@ucr.edu](mailto:kayceem@ucr.edu), 248-935-5650  
Department of Earth and Planetary Sciences, University of California, Riverside  
5846 Elmwood Road, San Bernardino, CA 92404

## EDUCATION

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- 2013-2018 Ph.D. in Zoology, Michigan State University, GPA: 4.0, Dissertation title: Seasonal and decadal-scale foraging habits of three Hawaiian seabirds
- 2009-2012 Bachelor of Science with Honors in Zoology, Specialization: Animal behavior and neurobiology, Honors College, Michigan State University, completed in 3 years

## REFERENCES

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- Marilyn Fogel—Postdoc advisor, Distinguished Professor Emerita of Geo-Ecology and Director of the Environmental Dynamics and GeoEcology Institute at the University of California, Riverside, [marilyn.fogel@ucr.edu](mailto:marilyn.fogel@ucr.edu)
- Peggy Ostrom—PhD advisor, Professor Emerita of Integrative Biology at Michigan State University [ostrom@msu.edu](mailto:ostrom@msu.edu)
- Seth Newsome—Collaborator, Associate Professor in the Department of Biology and Associate Director of the Center for Stable Isotopes at the University of New Mexico, [newsome@unm.edu](mailto:newsome@unm.edu)
- Anne Wiley—PhD committee member and collaborator, Associate Professor in the Department of Natural Sciences at Bowie State University, [wileyanne@gmail.com](mailto:wileyanne@gmail.com)
- Helen James—Collaborator, Curator-in-Charge, Division of Birds, National Museum of Natural History, [jamesh@si.edu](mailto:jamesh@si.edu)
- Gary Graves—Collaborator, Curator, Division of Birds, National Museum of Natural History, [ozark.smoketree@gmail.com](mailto:ozark.smoketree@gmail.com)

## RESEARCH INTERESTS & EXPERIENCE

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My interests are to develop and harness a suite of compound- and position-specific multi-isotopic tools to address ecological, physiological, and biogeochemical questions, particularly with a spatiotemporal perspective and within the context of the Anthropocene. Recent interests include microbial ecology and human health and diet.

- Undergraduate
  - Evolved ecology lab group project into first publication, of which I am first author, about soil pollution near the on-campus recycling facility.
  - Kay Holekamp's lab: volunteer → Research Assistant → presentation at University Undergraduate Research and Arts Forum—how anthropogenic disturbances (e.g., pastoralism) affect spotted hyena behavior in the Masai Mara National Reserve, Kenya.
- Ph.D.
  - Pioneered amino acid-specific  $\delta^{15}\text{N}$  analysis in the Ostrom lab.
  - Generated novel isotope chronologies to study long-term and seasonal foraging habits of highly mobile seabirds, including endangered species and those often killed as bycatch.
  - Identified trophic declines and changes in foraging location within the past century, potentially in response to the onset of industrial fishing or climate change.
- Postdoctoral

- Expanded study of seabird foraging ecology by incorporating amino acid-specific  $\delta^{13}\text{C}$  and  $\delta^2\text{H}$ ; a controlled feeding study; additional species, age classes, and tissue types; and analysis of prey samples to further investigate fishery reliance and anthropogenically driven changes to diet quality, dietary routing, and foraging location.
- Collected bulk tissue and amino acid-specific  $\delta^{13}\text{C}$  and  $\delta^2\text{H}$  data from a primary producer and multiple insect tissues (caterpillar, butterfly body and wing) to discover evidence of a gut microbiome, substantial isotopic effects associated with metamorphosis, and extensive intra- and inter-individual variation—all in the absence of geospatial variation; in addition to drinking water and diet, physiology drives  $\delta^2\text{H}$  values in animal tissues.
- Developed method for position-specific  $\delta^{13}\text{C}$  measurements of  $^{13}\text{C}$ -labeled amino acids using a GC-TSQ-IRMS with the aim of assessing the degree to which the gut microbiome contributes to the protein metabolism of its host so we can better quantify animal diets, trophic positions, and resource use, as well as apply this method to microbial ecology. Through exhaustive testing, determined that this method can distinguish between labeled and unlabeled amino acids at extremely low detection threshold (<2% label) and identify label position within molecule.
- Generated amino acid-specific  $\delta^{13}\text{C}$  dataset from hairs of women living in a food desert to explore applications to the study of human health, diet, and movement through dietary reconstruction and development of biomarkers for consumption of specific foods (e.g., red meat, sugar, alcohol).

## ADDITIONAL QUALIFICATIONS

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- Uniquely proficient at amino acid- and position-specific analyses and a triple isotope approach
- Experienced with preparation and analysis of numerous sample types (e.g., serum, bone, leaf, feces, modern and historical, aquatic and terrestrial)
- Strong analytical background with years' experience running, maintaining, and repairing mass spectrometry instrumentation
- Extensive lab leadership experience including daily operations and personnel coordination

## PUBLICATIONS

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- Morra, K., Newsome, S., Graves, G. and Fogel, M. (in review). Physiology drives reworking of amino acid  $\delta^2\text{H}$  and  $\delta^{13}\text{C}$  in butterfly tissues. *Frontiers in Ecology and Evolution*.
- Morra, K., Chikaraishi, Y., James, H., Rossman, S., Wiley, A. and Ostrom, P. (2020). Seasonality of decadal-scale trophic declines and nutrient regime shifts in the Laysan albatross and Newell's shearwater. *Marine Ecology Progress Series* 654.
- Morra, K., Chikaraishi, Y., Gandhi, H., James, H., Rossman, S., Wiley, A., Raine, A., Beck, J. and Ostrom, P. (2019). Trophic declines and decadal-scale foraging segregation in three pelagic seabirds. *Oecologia* 189(2).
- Morra, K., Ostrom, P., Wiley, A. and James, H. (2018). Influence of feather selection and sampling protocol on interpretations of Hawaiian petrel (*Pterodroma sandwichensis*) nonbreeding season foraging habits from stable isotope analysis. *Waterbirds* 41(1).
- Morra, K., Wolski, B., Mohr, C. and Reh-Gingerich, A. (2014). Soil pollution from recycling centers: case study analysis from the campus of Michigan State University. *Student Pulse* 6(03).

## PUBLICATIONS IN PREP

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- Ash, J., Morra, K., Fogel, M. (in prep). Effects of rate, substrate and metabolism on multiply-substituted isotopologues of methane. *Geochimica et Cosmochimica Acta*.

- Morra, K., Newsome, S. and Fogel, M. (in prep). Position-specific  $\delta^{13}\text{C}$  analyses on a triple quadrupole mass spectrometer: implications for using labeled amino acids as tracers. *Rapid Communications in Mass Spectrometry*.
- Gharibi, H., Chernobrovkin, A., Eriksson, G., Saei, A. A., Morra, K., Timmons, Z., Kitchener, A. C., ...et al. (in prep). Abnormal deuterium content in bone collagen (hydroxy)prolines redefines hydrogen chemical mass. *Science*.
- Morra, K., Wiley, A., James, H. and Fogel, M. (in prep). Amino acid-specific  $\delta^2\text{H}$  informs diet and physiology of marine predators. *Frontiers in Marine Science*.
- Jacobs, M., Morra, K., Wiley, A. and Fogel, M. (in prep). Amino acid  $\delta^2\text{H}$  values in Brown booby chick blood vary with dietary lipid content. *Oecologia*
- Morra, K., Jacobs, M., Wiley, A. and Fogel, M. (in prep). A triple isotope amino acid-specific approach to studying temporal shifts in marine food webs. *Marine Ecology*.

## INVITED TALKS

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- Morra, K. (2020). Find the Label! Intramolecular isotopic fingerprints of amino acids. University of New Mexico, Center for Stable Isotopes, seminar, Albuquerque, NM.
- Morra, K., Chikaraishi, Y., James, H., Wiley, A., Ostrom, P. and Fogel, M. (2020). Three-dimensional isotopic approach with amino acids and intramolecular isotopic fingerprints. University of New Mexico, Department of Biology, seminar, Albuquerque, NM.
- Morra, K., Chikaraishi, Y., James, H., Rossman, S., Wiley, Ostrom, P. and Fogel, M. (2019). Decadal- and centennial-scale foraging ecology of endangered Hawaiian seabirds: amino acid  $\delta^{15}\text{N}$ ,  $\delta^{13}\text{C}$ ,  $\delta^2\text{H}$ . University of California, Riverside, Environmental Dynamics and Geo-Ecology Institute Spring Symposium, Riverside, CA.
- Morra, K. (2018). Seasonal and decadal-scale foraging habits of three Hawaiian seabirds. University of California, Riverside, Department of Earth Sciences, Hewett Club seminar, Riverside, CA.
- Morra, K. (2017). Investigating anthropogenic alterations to oceanic food webs. Michigan State University, Zoological Students Association, research experience and professional advice talk for undergraduates, East Lansing, MI.
- Morra, K., Ostrom, P. and Wiley, A. (2016). Forward thinking. Isotope workshop in honor of Marilyn Fogel, Isotopes: Past, Present, and Future "Marilyn Madness", Carnegie Institution for Science, Washington, D.C. (3<sup>rd</sup> place award).
- Morra, K., Ostrom, P., Wiley, A., James, H. and Gandhi, H. (2015). Reconstructing ecosystem change in the North Pacific Ocean. International Workshop in Isotope Biogeochemistry, East Lansing, MI.

## CONFERENCE PRESENTATIONS

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- Morra, K., Newsome, S., Graves, G. and Fogel, M. (2021). Variation in amino acid  $\delta^2\text{H}$  and  $\delta^{13}\text{C}$  values in butterfly tissues at a single geographical site: implications for using  $\delta^2\text{H}$  as a tracer of animal movement. IsoEcol, virtual.
- Morra, K., Fogel, M., and Newsome, S. (2020). Trust your gut microbiome: intramolecular isotopic fingerprints of amino acids in mouse tissues. American Geophysical Union Fall Meeting, virtual.
- Morra, K., Newsome, S., Graves, G. and Fogel, M. (2019). Chasing butterflies: a three-dimensional isotopic approach with amino acids. American Geophysical Union Fall Meeting, San Francisco, CA.
- Morra, K., Chikaraishi, Y., James, H., Rossman, S., Wiley, Ostrom, P. and Fogel, M. (2019) Decadal- and millennial-scale foraging habits of three Hawaiian seabirds: insights from stable isotope analyses. University of California, Riverside Postdoc Symposium, Riverside, CA.
- Morra, K., Chikaraishi, Y., James, H., Rossman, S., Wiley, Ostrom, P. and Fogel, M. (2019) Decadal- and centennial-scale foraging habits of three Hawaiian seabirds: amino acid  $\delta^{15}\text{N}$ ,  $\delta^{13}\text{C}$ , and  $\delta^2\text{H}$  analyses. Pacific Seabird Group Annual Meeting, Kaua'i, HI.

- Morra, K., Chikaraishi, Y., Gandhi, H., James, H., Rossman, S., Wiley, A., Raine, A., Beck, J. and Ostrom, P. (2018) Seasonal and decadal-scale foraging habits of three Hawaiian seabirds: insights from amino acid-specific nitrogen isotope analysis. *IsoEcol*, Viña del Mar, Chile.
- Rossman, S., Morra, K., Ostrom, P., Garver, A. and Yochem, P. (2017). Advancing stable isotope diet models for cetacean species: a controlled feeding trial of SeaWorld killer whales. *Society for Marine Mammalogy*, Halifax, Nova Scotia, Canada.
- Greenberg, J., Laubach, Z., Carvey, S., Morra, K., Smale, L. and Holekamp, K. (2017). Social and anthropogenic influences on maternal behavior in a free-living carnivore (*Crocuta crocuta*). *Animal Behavior Society*, University of Toronto Scarborough Campus, Canada.
- Morra, K., Chikaraishi, Y., James, H., Ostrom, P., Rossman, S., Wiley, A. and Zipkin, E. (2017). *Invited presentation*. Pelagic seabird species partition the North Pacific Ocean. *American Ornithological Society and Society of Canadian Ornithologists*, East Lansing, MI.
- Morra, K., Chikaraishi, Y., James, H., Ostrom, P., Rossman, S., Wiley, A. and Zipkin, E. (2017). Persistent foraging segregation between closely-spaced seabird populations. *Association for the Sciences of Limnology and Oceanography*, Honolulu, HI.
- Morra, K., Chikaraishi, Y., James, H., Ostrom, P., Rossman, S. and Zipkin, E. (2016). *Invited presentation*. Temporal and population level variation in amino acid  $\delta^{15}\text{N}$  values: Implications for entomology. *XXV International Congress of Entomology*, Orlando, FL.
- Morra, K., Ostrom, P., Wiley, A., James, H. and Stricker, C. (2014) Analysis of inter- and intra-individual variation in foraging habits of the endangered Hawaiian Petrel using stable isotopes. *American Geophysical Union Fall Meeting*, San Francisco, CA.
- Morra, K. and Wagner, K. (2012) Rank-related stress in a fission-fusion society. *University Undergraduate Research and Arts Forum*, East Lansing, MI.

## GRADUATE HONORS AND AWARDS (TOTAL AWARDS \$121,005)

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2017 (Summer)	College of Natural Science Dissertation Completion Fellowship: \$6,000
2017 (Spring)	MSU Environmental Science and Policy Program Conference Travel Award Grant: \$500
2016 (Fall)	Carnegie Institution for Science Workshop: Isotopes: Past, Present, and Future Talk: 3 <sup>rd</sup> place
2016 (Summer)	College of Natural Science Continuation Fellowship: \$6,000
2016 (Spring)	John R. Shaver Research Fellowship in Integrative Biology: \$1,125
2015 (Fall)	Dr. Marvin Hensley Endowed Scholarship in Zoology: \$9,600
2015 (Summer)	College of Natural Science Continuation Fellowship: \$6,000
2015 (Spring)	College of Natural Science Start Up Fellowship: \$1,575
2014 (Spring)	National Science Foundation Graduate Research Fellowship: <i>Honorable Mention</i>
2013 (Fall)	MSU Rasmussen Fellowship Award: \$4,000
2013 (Summer)	College of Natural Science Early Start Fellowship: \$6,000
2013-2014	College of Natural Science Recruiting Fellowship: \$68,000

## ADDITIONAL PROFESSIONAL EXPERIENCE

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Spring 2021	<b>Member of URGE (Unlearning Racism in Geoscience)</b> —a community-wide journal-reading and policy-design curriculum.
Spring 2021	<b>Volunteer Judge for the Riverside County Science &amp; Engineering Fair</b> —Junior and Senior Divisions.
Summer 2020	<b>Hosted virtual workshop</b> with participants from the Universities of California, Riverside and Santa Cruz, the University of New Mexico, and others—advances in the development of triple quadrupole mass spectrometric methods for position-specific isotopic analysis.

*Spring 2020* **Demo for Visiting Scientists** from the University of California, Santa Cruz—introduction to position-specific isotopic analysis using triple quadrupole mass spectrometry.

*Fall 2019* **Training of Visiting Scientist** from the University of Akron—sample preparation and amino acid-specific stable isotope analysis.

*Fall 2017-Spring 2018* **Mentoring of Undergraduates**—advised and assisted two students in lab.

*Summer 2017* **Visiting Scientist**, Purdue University with Helen Atkinson of Sercon. Host Tim Filley, Professor, Department of Earth, Atmospheric, and Planetary Sciences.

*Spring 2017* **Compound Specific Isotope Workshop**, Association for the Sciences of Limnology and Oceanography, Honolulu, Hawaii.

*Fall 2016* **Carnegie Institution for Science Workshop**, Carnegie Institution for Science, Washington D.C.

*Summer 2016* **Visiting Scientist**, Bernice Pauahi Bishop Museum, Honolulu, Hawaii. Host Molly Hagemann, Vertebrate Zoology Collections Manager.

*Spring 2016* **Visiting Scientist**, University of California, Merced. Host Marilyn Fogel, Professor, School of Natural Sciences.

*Spring 2015* **Training of Visiting Scientists** from the Universities of Wisconsin-Madison and Akron—sample preparation and analysis.

*Fall 2014* **Visiting Scientist**, University of Wisconsin-Madison—discussion of compound specific isotope approaches and collaboration. Host Shawn Steffan, Assistant Professor, Department of Entomology.

*Fall 2014 & Spring 2015* **Visiting Scientist**, Smithsonian Institution, National Museum of Natural History, Washington D.C.—sample acquisition and specimen curation. Host Helen James, Curator in Charge, Division of Birds.

*Summer 2014* **Conference Facilitator**, Grand Challenges in Water Research in the Great Lakes Region, MSU—organization and registry.

*Summer 2013* **Visiting Scientist**, Hawaii Department of Land and Natural Resources, Lana'i, Hawai'i—geolocation tag recovery, reproductive success evaluation and tissue sample acquisition. Host Fern Duvall, Manager of the Maui Nui Seabird Recovery Project.

*Spring 2012* **Undergraduate Research Assistant**, Spotted Hyena Lab of Kay Holekamp, Department of Zoology, MSU—enhancement of data extraction protocol and data extraction—maternal behavior analysis.

*Spring 2011-Spring 2012* **Undergraduate Research Volunteer**, Spotted Hyena Lab of Kay Holekamp, Department of Zoology, MSU—refinement of behavioral ethograms and data extraction—aggressive behavior analysis.

## TEACHING EXPERIENCE

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*Spring 2016, 2017 & 2018* **Graduate Teaching Assistant**, Ecology (IBIO 355), Department of Integrative Biology—designed and led honors option, collaborated on new lecture material, developed online resources, evaluated assignments and moderated student conferences, debriefed class on assignments.

*Fall 2014, 2015 & 2017 & Spring 2015* **Graduate Teaching Assistant**, Applications in Biological Science Laboratory (ISB 208L)—twelve classes over four terms as sole instructor, helped develop curriculum and prepare labs, evaluated assignments and moderated student conferences.

*Spring 2012*

**Undergraduate Grading Assistant, Ecology (IBIO 355),** Department of Integrative Biology—evaluated assignments and moderated student conferences.