University of California Riverside

Department of Evolution, Ecology, and Organismal Biology

Fall 2023

In this newsletter, you'll find department announcements, recent awards and publications, and a review of second-year Ph.D. student research. Thank you for taking the time to read UCR EEOB's fall newsletter!

A light autumn rain falls on the Carrizo Plain National Monument, revealing a rainbow over the Temblor Range. Photo Credit: Sam Louden

Awards and Grants

UC NRS Field Science Fellowship:

- **Danielle Marcelin-Stone**

49th Annual Southern California Botanists Symposium, Poster Competition Winners:

- **Georgina Thomas** and **Gabrielle Shen** – *Botanical Jeopardy: Investigating California's Threatened and Endangered Species*

Shipley-Skinner Conservation Science Award (CCB, CNAS):

- **Ria Ghosh**

Geographer's Scholarship for Global Change Science and Sustainability:

- **Ria Ghosh**

2023 Doctoral Dissertation Advisor/Mentoring Award (UCR Graduate Division):

- **Ted Garland**

Hellman Fellow

- **Kate Ostevik**

Collaborative of Native Nations for Climate Transformation and Stewardship (CNNCTS, UC Climate Action Program):

- **Helen Regan**, **Kimberly Hammond**, and **Joshua Gonzalez** (Native American Students Program)
- Goal: To establish a community-based, kincentric approach to creating a model of Indigenous-led land stewardship.

Awards and Grants (continued)

UCOP Advancing Faculty Diversity Grant:

- **EEOB Department**, PIs: **Natalie Holt**, **Kieran Samuk**, and **Lucy Delaney**
- Goal: To hire diversity-invested faculty to the department over the next 2 years.

USDA-NIFA McIntire Stennis fund:

- **Marko Spasojevic** - *Examining forest dynamics across scales to more effectively manage Southern California forests* (4-year grant)

UCR – OASIS:

- **Marko Spasojevic** and **Lou Santiago** – *Scaling climate solutions from tree neighborhoods to whole forests with real-time tree health data*

Congratulations to everyone!

Announcements

Congratulations to all of our newest Ph.Ds.!

Summer 2023:

- **Jared Anderson-Huxley**
- **Peggy Brady**
- **Nicole Schwartz**
- **Yuwei Cui**

Fall 2023:

- **Elijah Hall**
- **Jason Randall**
- **Ryan Conway**
- **Annika Rose-Person**
- **Catherine Nguyen**
- **William Ota**

Welcome to our newest faculty members!

- **Dr. Elisa Cabrera-Guzman**
- **Dr. Daniel Moen**
- **Dr. Shana Welles**

Welcome to the 2023 graduate student cohort!

- **Mia Ashby**
- **Juliana Base**
- **Audrey Burr**
- **Sivaraj Gangothri**
- **Nicolas Graver**
- **Joseph Guenther**
- **Chenkun Jiang**
- **Emma Knoles**
- **Brittney Nguyen**
- **Mikhail Plaza**
- **Dirk Plunkett**
- **Mary Tucker**
- **Joseph Wu**

Look forward to a more thorough introduction to our department's newest members in a future edition.

Upcoming Events:

- Ted Garland and members of his lab will be presenting at the Society for Integrative and Comparative Biology (SICB) meeting in Seattle, WA during the first week of January 2024. More information can be found here.
- Kurt Anderson is helping to organize the Third Santa Ana River Science and Conservation Symposium, which will be held on 15-16 February 2024. The symposium aims to connect researchers and managers who work and are interested in southern California's largest watershed. More information can be found here.
- Joel Sachs will be hosting the 12th Annual Yosemite Symbiosis Workshop, which will be held at the Sierra Nevada Research Institute (in Yosemite National Park) on 19-21 April 2024. More details coming soon!

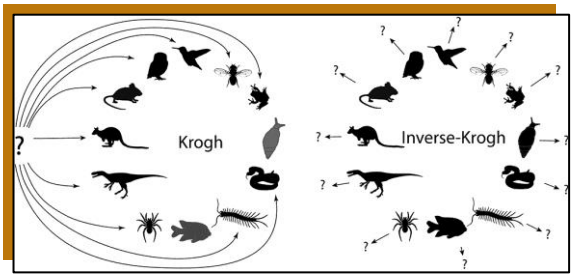
Recent Publications

Albuquerque, R. L., P. A. Zani, and T. Garland, Jr. 2023. *Lower-level predictors and behavioral correlates of maximal aerobic capacity and sprint speed among individual lizards.* Journal of Experimental Biology

Anaya-Rojas, J. M., R. D. Bassar, B. Matthews, J. F. Goldberg, L. King, D. Reznick, and J. Travis. 2023. *Does the evolution of ontogenetic niche shifts favour species coexistence? An empirical test in Trinidadian streams.* Journal of Animal Ecology

Backus, G.A., M. B. Rose, S. J. E. Velazco, J. Franklin, A. D. Syphard, and H. M. Regan. 2023. *Modeling the effects of spatially explicit patterns of climate and fire on future populations of a fire-dependent plant*. Frontiers in Ecology and Evolution

Cassady, A., K. E. Anderson, K. A. Schwabe, and H. M. Regan. 2023. *The intersection of wastewater treatment plants and threatened and endangered species in California, USA watersheds.* Water Resources Research



Clark, Hutchinson, and Garland 2023 – Figure 1

Clark, C. J., J. R. Hutchinson, and T. Garland, Jr. 2023. *The Inverse-Krogh Principle: all organisms are worthy of study.* Physiological and Biochemical Zoology

Collins, C.G., M. J. Spasojevic, N. Pombubpa, and J. M. Diez. 2023. *Legacy effects post removal of a range-expanding shrub influence soil fungal communities and create negative plant-soil feedbacks for conspecific seedlings.* Plant and Soil

Flud, G., J. Angle, M. N. Simon, and D. S. Moen. 2023. *Functional frogs: using swimming performance as a model to understand natural selection and adaptations.* American Biology Teacher

Fronk, D.C., and J. L. Sachs. 2022. *Symbiotic organs: the nexus of host-microbe evolution.* Trends in Ecology & Evolution

Goebl, A. M., N. C. Kane, D. F. Doak, L. H. Rieseberg, L.H., and K. L. Ostevik. 2022. *Adaptation to distinct habitats is maintained by contrasting selection at different life stages in sunflower ecotypes.* Molecular Ecology

Grabowski, M., J. Pienaar, K. L. Voje, S. Andersson, J. Fuentes-González, B. T. Kopperud, D. S. Moen, M. Tsuboi, J. C. Uyeda, and T. F. Hansen. 2023. *A cautionary note on "A cautionary note on the use of Ornstein Uhlenbeck models in macroevolutionary studies".* Systematic Biology

Green, M. D., K. E. Anderson, D. B. Herbst, and M. J. Spasojevic. 2022. *Rethinking biodiversity patterns and processes in stream ecosystems.* Ecological Monographs

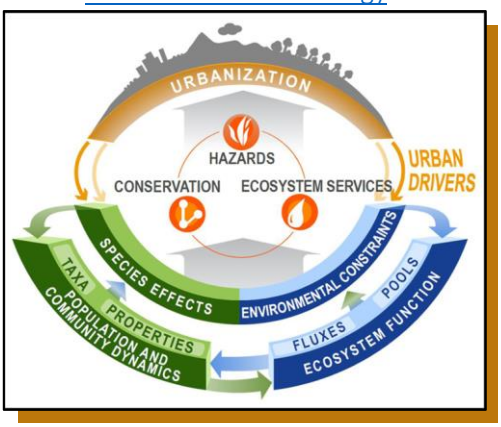
***Green, M. D., *C. A. Woodie, M. Whitesell, and K. E. Anderson.** 2023. *Long transients and dendritic network structure affect spatial predator–prey dynamics in experimental microcosms.* Journal of Animal Ecology

* = co-first authors

Hayes, S. M., and K. E. Anderson. 2023. *Persistence in spatial multi-species food webs: The conflicting influences of isolated food web feasibility and spatial asynchrony.* Communications in Nonlinear Science and Numerical Simulation

Hillis, D. A., and T. Garland, Jr. 2023. *Multiple solutions at the genomic level in response to selective breeding for high locomotor activity.* Genetics

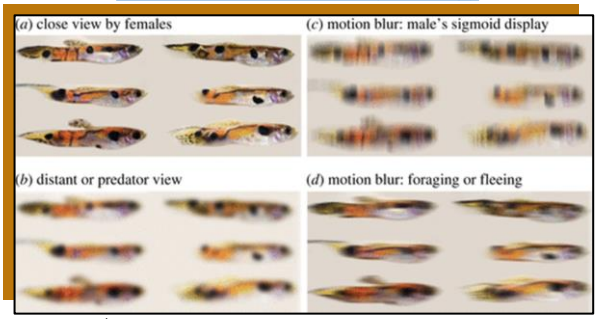
Jenerette, G. D., K. E. Anderson, M. L. Cadenasso, M. Fenn, J. Franklin, M. L. Goulden, L. Larios, S. Pincetl, H. M. Regan, S. J. Rey, L. S. Santiago, and A. D. Syphard. 2022. *An expanded framework for wildland–urban interfaces and their management.* Frontiers in Ecology and the Environment



Jenerette *et al.* 2023 – Figure 1

Recent Publications (cont.)

Juarez, B. H., D. S. Moen, and D. C. Adams. 2023. *Ecology, sexual dimorphism, and jumping evolution in anurans.* Journal of Evolutionary Biology **Cover article



Kemp *et al*. 2023 – Figure 2

Kemp, D. J., D. N. Reznick, J. Arendt, C. van den Berg, and J. A. Endler. 2023. *How to generate and test hypotheses about colour: insights from half a century of guppy research.* Proceedings of the Royal Society B

Krichels, A. H., A. C. Greene, G. D. Jenerette, M. J. Spasojevic, S. I. Glassman, and P. M. Homyak. 2023. *Precipitation legacies amplify ecosystem nitrogen losses from nitric oxide emissions in a Pinyon-Juniper dryland.* Ecology

Latchney, S. E., M. D. Cadney, A. Hopkins, and T. Garland, Jr. 2023. *Maternal upbringing and selective breeding for voluntary exercise behavior modify patterns of DNA methylation and expression of genes in the mouse brain.* Genes, Brain and Behavior

Leszczynski, E. C., N. E. Schwartz, A. C. McPeek, K. D. Currie, D. P. Ferguson, and T. Garland, Jr. 2023. *Selectively breeding for high voluntary physical activity in female mice does not bestow inherent characteristics that resemble eccentric remodeling of the heart, but the mini-muscle phenotype does.* Sports Medicine and Health Science

Madsen-Hepp, T. R., J. Franklin, S. McFaul, L. Schauer, and M. J. Spasojevic. 2023. *Plant functional traits predict heterogenous distributional shifts in response to climate change.* Functional Ecology

Manci, M., O. G. Mercado, R. X. Camantigue, T. Nguyen, J. Rothschild, F. Khairi, S. Neal, W. F. Farsamin, M. T. Lampe, I. A. Perez, T. H. Le, G. S. Ortiz-Barbosa, L. Torres-Martinez, and J. L. Sachs. 2023. *Live soil inocula, not host population or domestication status, is the predominant driver of growth benefits to cowpea.* Plant and Soil

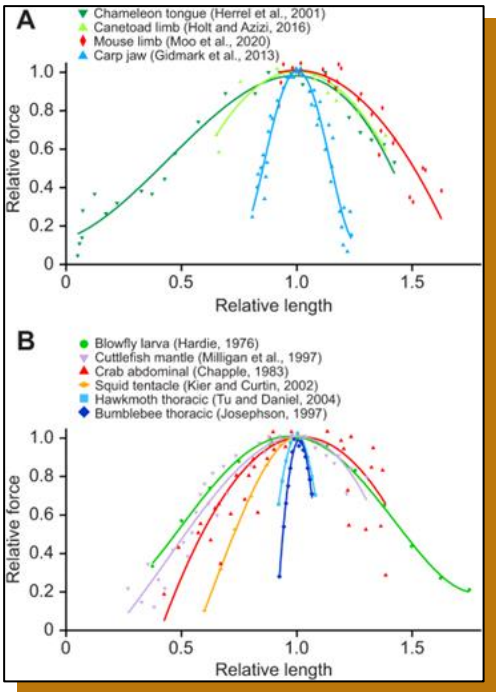
Mendoza, E., D. S. Moen, and N. C. Holt. 2023. *The importance of comparative physiology: mechanisms, diversity, and adaptation in skeletal muscle physiology and mechanics.* Journal of Experimental Biology **In special issue: "JEB100: 100 years of Journal of Experimental Biology".

Morinaga, G., J. J. Wiens, and D. S. Moen. 2023. *The radiation continuum and the evolution of frog diversity.* Nature Communications

Ortiz-Barbosa, G.S., L. T. Torres-Martinez, J. Rothschild, and J. L. Sachs. 2022. Lotus japonicus *regulates root nodulation and nitrogen fixation dependent on the molecular form of nitrogen fertilizer.* Plant and Soil

Ortiz-Barbosa, G., L. Torres-Martinez, A. Manci, S. Neal, T. Soubra, F. Khairi, J. Trinh, P. Cardenas, and J. L. Sachs. 2022. *No disruption of rhizobial symbiosis during the early stages of cowpea domestication.* Evolution

Parra-Vargas, M., S. G. Bouret, J. C. Bruning, E. G. de Moura, T. Garland, Jr., P. C. Lisboa, S. E. Ozanne, M.-E. Patti, A. Plagemann, J. R. Speakman, M. Tena-Sempere, C. Vergely, L. M. Zeltser, and J. C. Jiménez-Chillarón. 2023. *The long-lasting shadow of litter size in rodents: litter size is an underreported variable that strongly determines adult physiology.* Molecular Metabolism



Mendoza, Moen, and Holt 2023– Figure 1

Recent Publications (cont.)

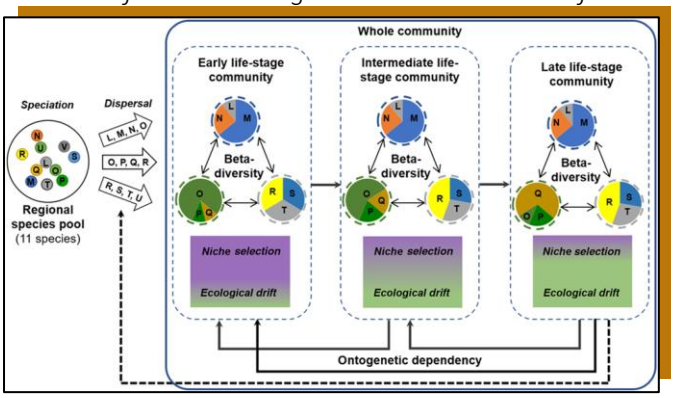
Portik, D., J. W. Streicher, D. C. Blackburn, D. S. Moen, C. R. Hutter, and J. J. Wiens. 2023. *Redefining possible: combining phylogenomic and supersparse data in frogs*. Molecular Biology and Evolution

Potter, T., J. Arendt, R. D. Bassar, B. Watson, P. Bentzen, J. Travis, and D. N. Reznick. 2023. *Female preference for rare males is maintained by indirect selection in Trinidadian guppies.* Science

Qin G., K. Anderson, A. Cassady, L. Rodriguez, E. Syed, and H. M. Regan. In press. *An analysis of threats to endangered animal taxa in California's freshwater systems.* Aquatic Conservation.

Rahman, A., M. Manci, C. Nadon, I. A. Perez, W. F. Farsamin, M. T. Lampe, T. E. Le, L. T. Torres-Martinez, A. J. Weisberg, J. H. Chang, and J. L. Sachs. 2023. *Competitive interference among rhizobia reduces benefit to hosts.* Current Biology

Ramachandran, A., J. D. Huxley, S. McFaul, L. Schauer, J. Diez, R. Boone, T. Madsen-Hepp, E. McCann, J. Franklin, D. Logan, M. B. Rose, and M. J. Spasojevic. 2023. *Integrating ontogeny and ontogenetic dependency into community assembly.* Journal of Ecology

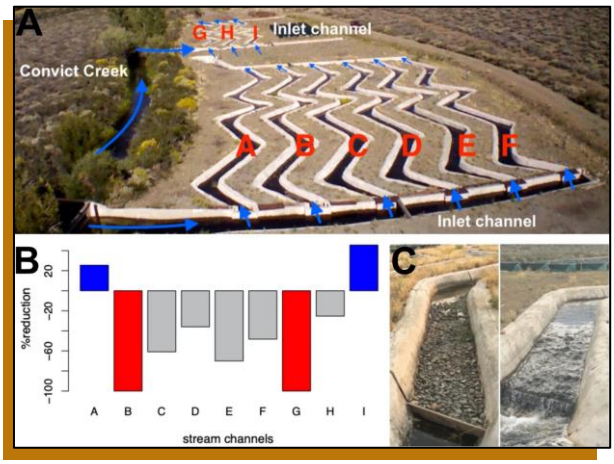


Ramachandran *et al*. 2023 – Figure 1

Rose, M. B., S. J. E. Velazco, H. M. Regan, and J. Franklin. 2023. *Rarity, geography, and plant exposure to global change in the California Floristic Province.* Global Ecology and Biogeography

Saffarinia, P., K. E. Anderson, & D.B. Herbst. 2022. *Effects of experimental multi-season drought on abundance, richness, and beta diversity patterns in perennially flowing stream insect communities.* Hydrobiologia

Saffarinia, P., K. E. Anderson, and K. T. Palenscar. 2022. *Effects of urban spatial and temporal heterogeneity on benthic macroinvertebrate and diatom communities.* Fundamental and Applied Limnology



Saffarinia, Anderson, and Herbst 2023 – Figure 1

Safian, D., M. Ahmed, H. Van Kruistum, A. I. Furness, D. N. Reznick, G. F. Wiegertjes, and B. J. A. Pollux. 2023. *Repeated independent origins of the placenta reveal convergent and divergent organ evolution within a single fish family (Poeciliidae).* Science Advances

Schmill, M. P., Z. Thompson, D. Lee, L. Haddadin, S. Mitra, R. Ezzat, S. Shelton, P. Levin, S. Benham, K. J. Huffman, and T. Garland, Jr. 2023. *Hippocampal, whole midbrain, red nucleus, and ventral tegmental area volumes are increased by selective breeding for high voluntary wheel-running behavior.* Brain, Behavior, and Evolution

Schönbeck, L., M. Arteaga, H. Mirza, M. Coleman, D. Mitchell, X. Huang, H. Ortiz, and L. S. Santiago. *Plant physiological indicators for optimizing conservation outcomes.* Conservation Physiology

Schwab, S. T., K. W. Quides, C.E. Wendlandt, J. Trinh, M. Sung, P. Cardenas, M. Torres, L. S. Santiago, L. Larios, and J. L. Sachs. *Effective rhizobia enhance legume growth during subsequent drought despite water costs associated with nitrogen fixation*. Plant and Soil

Schwartz, N. E., M. P. McNamara, J. M. Orozco, J. O. Rashid, A. P. Thai, and T. Garland, Jr. 2023. *Selective breeding for high voluntary exercise in mice increases maximal (VO2,max) but not basal metabolic rate.* Journal of Experimental Biology

Recent Publications (cont.)

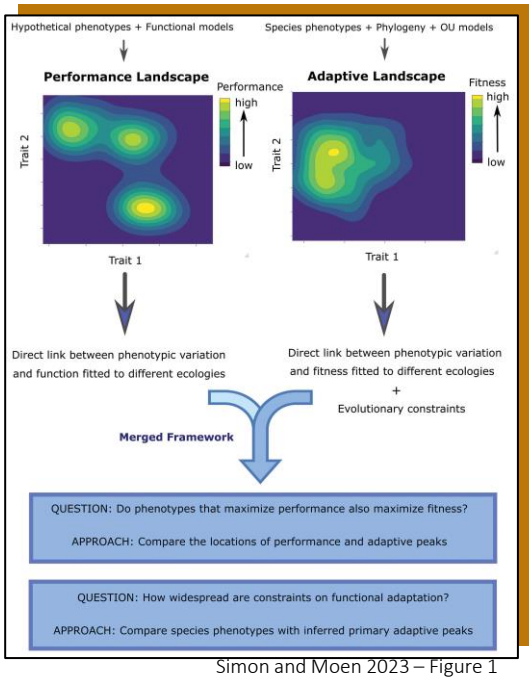
Simon, M. N., and D. S. Moen. 2023. *Bridging performance and adaptive landscapes to understand long-term functional evolution.* Physiological and Biochemical Zoology

Tingle, J. L., B. M. Sherman, and T. Garland. 2022. *Scaling and relations of morphology with locomotor kinematics in the sidewinder rattlesnake* Crotalus cerastes. Journal of Experimental Biology

Travis, J., R. D. Bassar, T. Coulson, A. Lopez-Sepulcre, and D. Reznick. 2023. *Population regulation and density-dependent demography in the Trinidadian guppy.* The American Naturalist

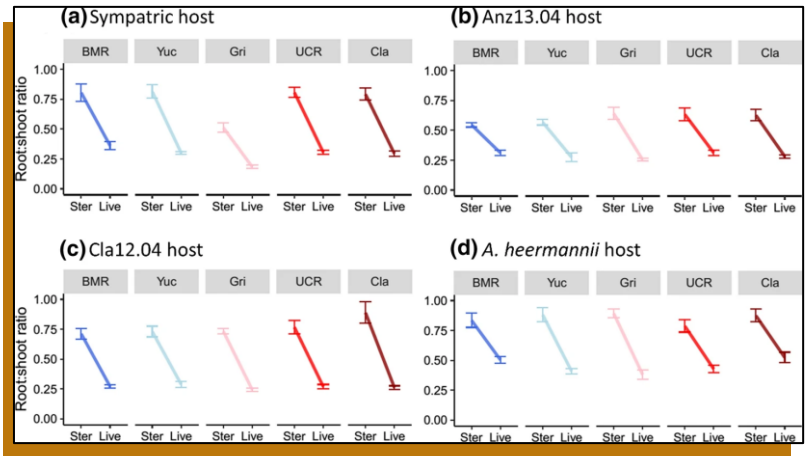
Velazco S. J. E., M. B. Rose, P. de Marco Jr., H. M. Regan, and J. Franklin. 2023. *How far can I extrapolate my species distribution model? Exploring shape, a novel method.* Ecography

Wang, Z., A. and 217 more authors. 2022. *Genome-wide association analyses of physical activity and sedentary behavior provide insights into underlying mechanisms and roles in disease prevention.* Nature Genetics



Simon and Moen 2023 – Figure 1

Weisberg, A.J., A. Rahman, D. Backus, P. Tyavanagimatt, J. H. Chang, and J. L. Sachs. 2022. *Pangenome evolution reconciles robustness and instability of rhizobial symbiosis.* mBIO



Wendlandt *et al.* 2023 – Figure 2

Weisberg, A.J., J. L. Sachs, and J. H. Chang. 2022. *Dynamic interactions between mega symbiosis ICEs and bacterial chromosomes maintain genome architecture.* Genome Biology & Evolution

Wendlandt, C.E., K. A. Gano-Cohen, P. J. N. Stokes, B. N. R. Jonnala, A. J. Zomorrodian, K. Al-Moussawi, and J. L. Sachs. 2022. *Wild legumes maintain beneficial soil rhizobia populations despite decades of nitrogen deposition.* Oecologia

Resources

Do you want to learn how to promote student success and build strong mentor-mentee relationships? Do you enjoy listening to podcasts? If the answer to these questions is "Yes!", then here is some recommended listening:

- **Teaching for Student Success**: "For faculty & staff in higher education who may be pressed for time, to learn about evidence-based teaching practices that improve student success, equity, and inclusivity." Website / Episode 31: Grades Do Harm! / Episode 20: The Benefits of Diverse Role Models
- **The Science of Effective Mentoring in STEMM**: "Mentorship is essential to the development of anyone in science, technology, engineering, mathematics, or medicine, but did you know mentorship is a set of skills that can be learned, practiced, and optimized?" Website

Meet the second-years!

Although they have been around for over a year now, last year's cohort of graduate students has not yet received an official newsletter introduction. As they have just wrapped up their first-year research presentations, now is an ideal time to check in and read about their current and future work.

Brennan R. Silva – Ph.D. Student in Kate Ostevik's Lab

"Hello! My name is Brennan Silva. I'm a 2nd-year EEOB graduate student in the Ostevik lab. I'm interested in learning more about chromosome evolution and how chromosomal differences contribute to reproductive barriers and the formation of new species. I pursue this work in *Clarkia*, a flower plant genus in the Northwest United States. I am interested in mapping chromosomal rearrangements between species, discerning how these karyotypic differences are distributed across populations and space, and assessing how these chromosomal rearrangements impact gene flow between species. Currently, I am growing populations of several *Clarkia* species to perform interspecific crosses and conduct whole genome sequencing, which will inform us of the degree of reproductive isolation between species and allow us to visualize chromosomal differences. "

Rajesh Neupane - Ph.D. Student in Kate Ostevik's Lab

"Greetings! I'm Rajesh, a second-year PhD student from Nepal. My research focuses on the adaptation of wild sunflowers in arid and nutrient-poor soil conditions. My approach involves collecting wild populations, primarily along the roadsides of Californian highways, performing common garden experiments to genotype and phenotype individual plants, and exploring relevant environmental variables. The goal is to pinpoint specific regions of the genome that underlie the adaptive responses of wild sunflowers to drought conditions. Besides addressing questions about speciation through adaptation studies, I also aim to contribute to the climate resiliency of cultivated sunflowers. Beyond sunflowers and science, I enjoy cooking, playing soccer, and going on hikes on the weekend!"

Ria Ghosh – Ph.D. Student in Kurt Anderson's Lab

"The Santa Ana River stands as Southern California's most extensive watershed, traversing three counties. Unfortunately, the river's ecosystem faces significant challenges, greatly influenced by urbanization. My research focus is examining the impact of human activities on this river. I aim to understand how alterations in river parameters (biotic and abiotic) due to anthropogenic influences affect communities across various trophic levels. I investigate the differences in composition and structure among these communities, analyzing diversity, and interactions across different spatial and temporal scales."

Gina Lucas – Ph.D. Student in Kieran Samuk's Lab

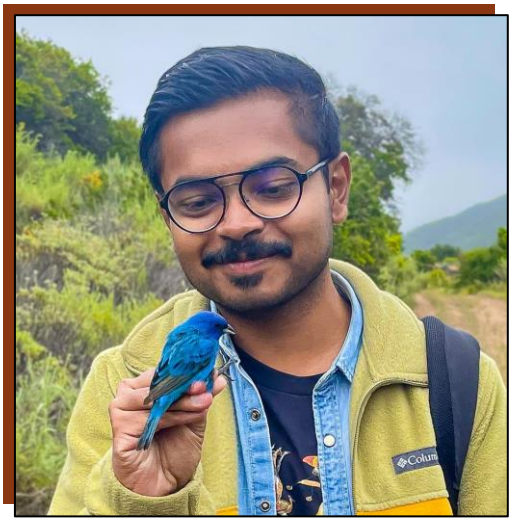
"I am interested in studying the causes of variation in recombination rate as well as its potential adaptive function. Currently, I am using gene editing technology to experimentally assess the role of maladaptive gene flow and recombination suppression in the evolution of chromosomal inversions. I am also studying the effects of gene flow on recombination rate in natural populations of Three-spined stickleback."

Sam Louden – Ph.D. Student in Loralee Larios' Lab

"I am a community ecologist generally interested in the processes and mechanisms that affect how local communities assemble from regional species pools. Specifically, I seek to better define how generalist seed predators (e.g., the endangered giant kangaroo rat) fit into established community assembly frameworks, especially in arid and semi-arid ecosystems. I plan to approach this research from the dual perspectives of plant functional traits and animal-mediated seed dispersal. My excitement at finding a hillside teeming with desert candle (and a sea of goldfields in the background, for good measure) is pictured here; my study sites are located in the valley farther behind me."

Jenny Wong – Ph.D. Student in Chris Clark's Lab

"As part of my dissertation work, I aim to explore the mate choice of bee hummingbirds (tribe: Mellisugini). The noticeable sexual dimorphism in Mellisugini, characterized by a myriad of secondary sexual traits in males, hints at a potential impact on mate selection. Surprisingly, the landscape of female mate choice in Mellisugini remains unexplored. Questions linger in my thoughts throughout the day, from sunrise to sunset. Whom do females choose as their mates? What specific traits in males capture their preference? And how might female mate choice contribute to the rapid diversification of Mellisugini?"

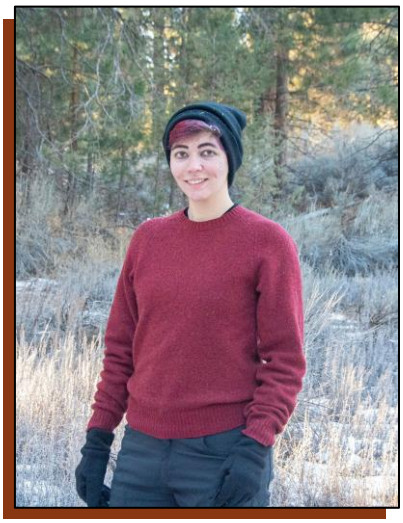


Soumyadeep Chatterjee – Ph.D. Student in Chris Clark's Lab

"For my first-year project, I looked at opsin1 gene sequences across different species of hummingbirds. When unable to find the sequences of interest by BLAST alone, I did PCR on DNA samples collected from 3 hummingbird species which amplified my region of interest and then compared those sequences. I also approached the spectral tuning question from a behavioral perspective where I studied color discrimination abilities across different species, sexes, ages of hummingbirds through an operant conditioning experiment. My future research will investigate: if male nuptial color matches spectral tuning in a species; if females are better than males at discriminating between two shades of color; if adults are better than juveniles at discriminating between two shades of color; and if breeding adults have better color perception than non-breeding adults."

Zul Alam – Ph.D. Student in Alan Brelsford's Lab

"I'm interested in the applicability of sex chromosome theory to the evolution of autosomal supergenes. Theory predicts that recombination can be suppressed in sex chromosomes through either the spread of genetic modifiers or through structural rearrangements. I plan to examine this with the newly discovered queen miniaturization supergene on chromosome 9 in Formica ants. My work will begin to distinguish the relative importance of structural variants and selfish genetic elements in maintaining regions of suppressed recombination, which will provide a broader picture of the mechanisms underlying genomic architectural evolution. Pictured here, a majestic mountain towers over me, this quaint alpine village, and one of my field sites."



William Lampman – Ph.D. Student in Ted Garland's Lab

"For my first-year project, I researched the personality syndrome of the High Runner mice selectively bred for voluntary wheel running! This was done by conducting different behavioral tests (marble-burying, open field, elevated plus-maze, and forced-swim), by providing enrichment, and conducting visual observations of behavior. In the future, I intend to compile a meta-analysis of behavioral research previously conducted on the High Runner mice, as well as repeat my behavioral tests while manipulating the hormones of the High Runner mice."

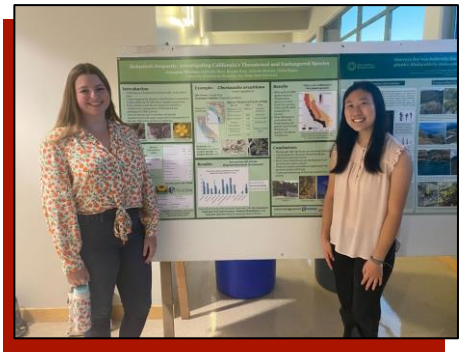
Erik Axlid - Ph.D. Student in Timothy Higham's Lab

"My primary areas of interest are fish functional morphology and biomechanics, and I am particularly interested in linking the form and function of fishes to their environment. I am currently working on two projects; the first aims to shed light on the effects of flow on predator-prey interactions, which could have applications in conservation and wildlife management, while the second seeks to investigate the kinematics of aerial feeding in largemouth bass."

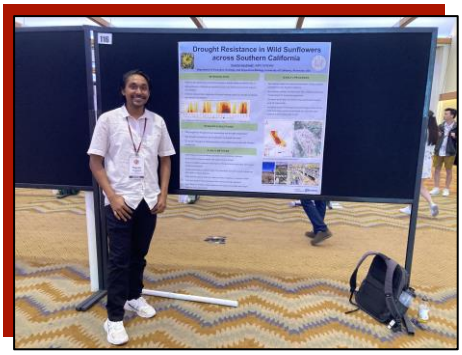
And the rest, with the titles of their first-year talks:

- **Alex Sumarli** (Samuk Lab): "Exploring genomic divergence between two sympatric stickleback ecotypes."
- **Elena Kaminskaia** (Rafferty Lab): "Effects of reduced solar radiation and warming on plant-pollinator interactions."
- **Tao Hernandez Arellano** (Reznick Lab): "Artificial insemination and female cryptic choice."
- **Tyler Whiteacre** (Holt Lab): "Effect of inertia on muscle force-velocity properties: submaximal recruitment as a window to scale."

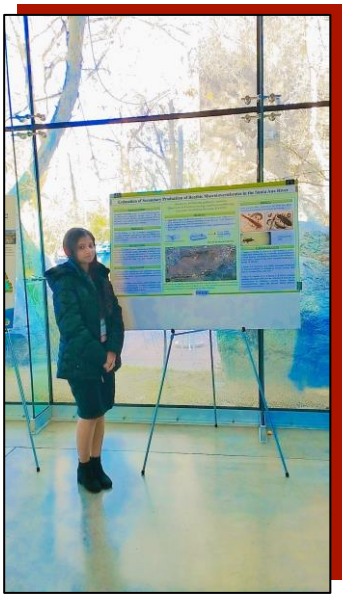
EEOB, Out and About



Georgina and Gabrielle (Regan Lab) with their competition-winning poster at the 49th Annual Southern California Botanists Symposium.



Rajesh (Ostevik lab) with his poster at the 2023 Evolution meetings in Albuquerque, NM.



Ria (Anderson lab) presenting her poster at the Second Annual Santa Ana River Science and Conservation Symposium.

Rhiena, Linlin, and Joshua (Ostevik lab) at a RISE/MSRIP party.

Aurora and Alondra (Ostevik lab) at the UCR Box Springs Reserve looking for *Penstemon* tags.

Call for submissions – Spring 2024

Do you have announcements to share with the department?
Upcoming events, resources, new publications, grants, awards, stories, photos, etc.?
Please send them to me to be included in the next newsletter!

sloud003@ucr.edu
Sam Louden, Ph.D. Student, UCR EEOB

Have a great winter, EEOB!