Museum of Vertebrate Zoology Newsletter

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Spring 2024

Featured Publication

MVZ Postdoctoral Fellow Phred Benham, MVZ Professor and Curator of Birds Rauri Bowie

Saltwater-adapted Savannah sparrows are losing their genetic distinctiveness

A new genomic analysis of Savannah sparrows (*Passerculus sandwichensis*) from around the state shows that over the past 128 years, the Bay Area's sparrow's adaptation to salt water is being diminished by interbreeding with inland sparrows adapted to fresh water. The result is stable levels of genetic diversity among coastal Savannah sparrows in Northern and Central California, but a loss of the genetic variants that make them adapted to tidal marshes. This could affect the bird's ability to survive in tidal marshes, where it subsists on saltwater and salty crustaceans, something freshwater birds are ill-adapted to.

The surprise finding, published in the journal ***Global Change Biology***, can be explained in part by the steep state-wide decline in tidal marshes, which are wetlands subject to the tidal influx of salty ocean water. The Bay Area has seen a 90% decline in tidal marshland since the 1800s, which has reduced Savannah sparrow populations to the level that interbreeding with immigrants is affecting their unique saltwater adaptation. "There seem to be increasing levels of gene flow from eastern California into places like the Bay Area, potentially due to the local population becoming a sink where the local breeders can't really produce enough offspring to maintain a population," said Phred Benham, a postdoctoral fellow at UC Berkeley and leader of the study." So you get the influx of immigrants from another population. The migrants think it's a nice place to stay and try to set up a nest, and there's this opportunity for gene flow to occur into the residents."

Top: Photo of Phred Benham by Jackie Childers, Natural History Museum of Los Angeles County. Bottom: A Savannah sparrow photographed at Cesar Chavez Park in Berkeley in 2007. Photo by Steve Scholl.

Recent Publication by MVZ Researchers

MVZ Affiliated Graduate Student Erin P Westeen, Affiliated Researcher Brad Shaffer, Affiliated Faculty Professor Ian J. Wang

Ring-necked snake, *Diadophis punctatus*, in California

In a recent paper published in the ***Journal of Heredity*** Westeen, Shaffer and Wang released a new reference genome assembly for the San Diego ring-necked snake, *D. p. similis*, as part of the California Conservation Genomics Project. Given its continental distribution and high degree of variation in coloration, diet, feeding ecology, and behavior, the ring-necked snake is an excellent species for the study of genetic diversity and trait evolution. Within California, six subspecies form a continuously distributed "ring species" around the Central Valley, while a seventh, the regal ring-necked snake, *Diadophis punctatus regalis* is a disjunct outlier and Species of Special Concern in the state.

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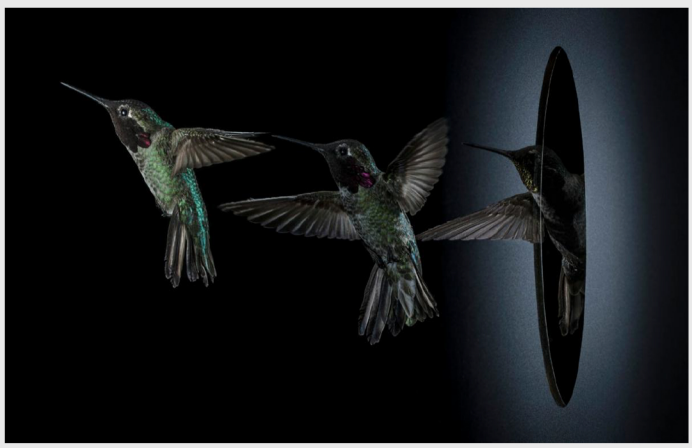
(B) An individual from California showing the characteristic ring-neck coloration, bright red ventral coloration, and tail curling behavior (*D. p. amabilis* or Western California Lineage). (C) Another individual lacking characteristic the ring-neck coloration, displaying some of the variation in ventral coloration present in *D. punctatus*, and exhibiting tail curling behavior (*D. p. regalis*).

MVZ Affiliated Professor Robert Dudley, MVZ Affiliated Student Ashley Smiley

High Speed Video Captures Hummingbirds Flying in Small Spaces

A study published in the ***Journal of Experimental Biology*** shows that hummingbirds have evolved their own unique strategies to fly through tight spaces. For slit-like gaps too narrow to accommodate their wingspan, they scooch sideways through the slit, flapping their wings continually so as not to lose height. For smaller holes — or if the birds are already familiar with what awaits them on the other side — they tuck their wings and coast through, resuming flapping once clear. MVZ Affiliated Professor Robert Dudley, and senior author of the paper, helped to design the experiment to capture the hummingbird's technique on video.



Dudley and Marc Badger, first author, who obtained his Ph.D from UC Berkeley in 2016, teamed up with UC Berkeley students Kathryn McClain, Ashley Smiley and Jessica Ye. "We set up a two-sided flight arena and wondered how to train birds to fly through a 16-square-centimeter gap in the partition separating the two sides," Badger said. "Then, Kathryn had the amazing idea to use alternating rewards." The team placed flower-shaped feeders containing a sip of sugar solution on both sides of the partition, but only remotely refilled the feeders after the bird had visited the opposite feeder. This encouraged the birds to continually flit between the two feeders through the aperture. Video captured at high speed and slowed down shows how hummingbirds navigate through apertures too small for their wingspan.

Top: An Anna's hummingbird (*Calypte anna*) navigating an aperture during experiments at UC Berkeley. Marc Badger.
Bottom: Sequential shots of an Anna's hummingbird (*Calypte anna*) navigating an aperture too small for its wingspan by sidling through while flapping its wings. Anand Varma

Banner Image by Daisy Horr, 2023.
Western toad (*Anaxyrus boreas*) found at Hastings Natural History Reservation.