Alexis C. Billings

UNIVERSITY OF CALIFORNIA, BERKELEY
Post-Doctoral Fellow/Assistant Specialist
Environmental, Science, Policy and Management
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PROFILE

Ecologist/Sensory Biologist offering research experience focused on the ecology and evolution of signaling systems and species interactions, the genetic basis of behavior and signals, and the physiological mechanisms that promote diversification and local adaptation. Researcher with success teaching and mentoring undergraduate and graduate students, securing internal and external funding and conducting laboratory and in-field research. Conservationist with unique blend of research and teaching in higher education, K-12 classroom, natural history center, hands-on science center, community nonprofits, wildlife research unit and a Hawaiian national park, at a conservancy and internationally.

Research Interests: Signal Processing & Evolution, Multimodal Signaling, Predator-Prey Interactions, Animal Behavior, Alarm Responses, Bioacoustics, Communication Networks, Chemical Signaling, Anti-Predator Responses, Behavioral Ecology, Sensory Ecology, Evolutionary Biology, Sexual Selection, Integrated Pest Management, and Entomology.

Teaching Areas: Ornithology, Ecology, Behavioral Ecology, Bioacoustics, Behavior and Evolution, Biological Diversity, Living Systems, General Biology, General Psychology; Student Mentoring and Advising.

Skills: Behavioral Assays, Biological Surveys (Bird Nesting, Insect Sampling, Vegetation, Plant, Wildlife), In-Field Biological Monitoring, Acoustic Recording/Analysis, Public Outreach & Education, MATLAB (XBAT), R Programming, Basic Linux, Audacity, Raven Pro, Statistical Modeling, Cell Culture, Molecular techniques (RNA and DNA Extraction; PCR; qPCR), Species Identification and Animal Handling and Population/Colony Maintenance.

EDUCATION

Post-Doctoral	**Postdoctoral Researcher** Advisor: Extension Specialist, Dr. Kent Daane Environmental, Science, Policy and Management, University of California, Berkeley	2019-Present
	Postdoctoral Researcher Advisor: Director School of Life Sciences, Dr. Donald Price School of Life Sciences, University of Nevada-Las Vegas	2017–2019
Doctorate	**Ph.D. in Organismal Biology, Ecology and Evolution** Advisor: Professor, Dr. Erick Greene Division of Biological Sciences, University of Montana, Missoula *Dissertation: The ecology and evolution of avian alarm call signaling systems*	2017
Undergraduate	**B.A. in Psychology** Psychology and Neuroscience Department, University of Colorado, Boulder *Magna cum laude* and Distinction	2006

RESEARCH EXPERIENCE

UNIVERSITY OF CALIFORNIA, BERKELEY

Postdoctoral Fellow/Assistant Specialist May 2019–Present

Laboratory of Dr. Kent Daane

Environmental, Science, Policy and Management, University of California, Berkeley

- Investigating grapevine red blotch virus (GRBV) insect vectors in working vineyards in Napa and Sonoma Counties, CA: involves passive and active insect sampling, insect identification, and vegetation sampling to understand the spread of a *Geminiviridae* virus.
- Investigating the transmission efficiency of candidate leafhopper insects (*Scaphytopius* spp. and *Sprissistilus festinus*) in the field and greenhouse through transmission studies exposing insects to infected vines followed by clean vines to measure the successful transmission of the virus as well as its efficiency of transmission.
- Designing and conducting PCR and qPCR assays to test plant and insect samples for red blotch virus.
- Conducting a follow-up investigation into the efficiency of the PCR and qPCR protocols to ensure correct identification of the virus and its titre level in both plant and insect material.
- Investigating the role of *Ganapsis brasiliensis*, a parasitoid from SE Asia, as a possible biocontrol for the invasive fruit fly, *Drosophila suzukii*, through choice, no-choice behavioral experiments.
- *Drosophila* species (*D. suzukii* and *D. melanogaster*) care including colony maintenance, mating/crosses, bumping, aspirating, and larval feeding.
- Parasitoid (*G. brasiliensis* populations) rearing and colony maintenance in USDA-certified Quarantine Facility including adult collections, aspirating, mating/crosses, bumping and population organization all while adhering to USDA Quarantine protocols.
- Accountable for lab maintenance; ordering and training; scheduling, managing, mentoring, advising and organizing six undergraduate research students.
- Design experiments, develop protocols, collect/analyze field data; conduct DNA extractions and PCR and qPCR analyses; organize and analyze data using R; parse data and construct figures using R and Adobe Illustrator

UNIVERSITY OF NEVADA, LAS VEGAS

Postdoctoral Fellow September 2017–April 2019

Laboratory of Dr. Donald Price

School of Life Sciences, University of Nevada–Las Vegas, Las Vegas, Nevada

- Investigating genetic underpinnings (gene expression) of complex courtship and male-male competition signaling behaviors in numerous picture-wing Hawaiian *Drosophila* species.
- Investigating chemical signal processing and use: involves behavioral experiments and microsurgery to understand behavioral and physiological underpinnings of chemical signal use and signal processing through gene expression.
- Investigating plasticity in female choice across allopatric populations of *Drosophila mojavensis* through temperature treatments and how they influence on female fecundity and offspring fitness.
- Conducted controlled crosses of selected lines of starvation-resistant *Drosophila melanogaster* and controls to test how starvation-resistance influences male courtship behaviors and female choice.
- Conducting a follow-up study to look for genetic regions associated with changes in male courtship behaviors and female choice in starvation-selected *Drosophila melanogaster* using ddRAD.
- Serve as Lab Manager accountable for lab maintenance; ordering and training; scheduling, managing, mentoring, advising and organizing 15 graduate and undergraduate research students.

- Design experiments, develop protocols, collect/analyze behavioral video data; conduct RNA extractions and gene expression analyses; organize and analyze data using R; parse data and construct figures using R and Adobe Illustrator; and conduct bioinformatic analyses (ddRAD and RNASeq data).
- *Drosophila* species (*D. melanogaster, D. mojavensis, D. grimshawi, D. paucipunta*) care including sexing, mating/crosses, bumping, aspirating, larval feeding, microsurgery, painting and body sizing.
- Prepare and edit manuscripts, write internally/externally funded grants/publications and present results at invited colloquiums and international conferences.

UNIVERSITY OF MONTANA

Graduate Research Assistant
Supervisor: Professor, Dr. Erick Greene August 2011–Jan 2017
Division of Biological Sciences, University of Montana, Missoula, Montana

- Gathered solo recording and microphone array unit acoustic data to study how bird species alter signals about predators in alarm calls, and how other species in a communication networks use signals to alert danger.
- Conducted phylogenetic comparative analysis (in R) using the threshold and other standard acoustic metrics.
- Used Audacity and Raven Pro to create acoustic stimuli, and manipulate and analyze acoustic recordings.
- Investigated internationally (Japan) how anthropogenic noise (road noise) influences receiver responses to alarm calls across bird species, testing if masking, distraction or both cause reduced response. (EAPSI 2017)
- Built cooperative laboratory relationships by supporting undergraduate and graduate students' educational pursuits and scientific discovery through teaching, supervision and mentorship of research and career goals.
- Integrated video and acoustic data in Australian birds (EAPSI 2014).
- Used XBAT in MATLAB to sync and analyze autonomous recording units in a microphone array to understand how a communication networks uses signals in the presence of predators.
- Helped with the Montana Osprey Project as ground support during nestling measurements and banding.
- Trained and organized volunteers and paid interns; mentored, managed and organized field personnel and undergraduate research assistants.
- Developed analyses protocols, quality control of analyses; organized and analyzed acoustic data using Raven Pro and R and parsed data and constructed figures using Excel, R and Adobe Illustrator.
- Prepared and edited manuscripts, K-12 interactive showcases, science camp curriculum, community presentations, workshops, seminar presentations in department colloquiums, invited seminars and international conferences, and grants using Microsoft Office Word and PowerPoint.

Research Technician June 2011–August 2011
Supervisor: Professor, Dr. Ragan Callaway
Division of Biological Sciences, University of Montana, Missoula, Montana

- Investigated invasive plant species' effects and direct interactions on natural plant communities and biodiversity in western Montana, such as competition for resources, allelopathy and facilitation, and indirect interactions mediated by herbivores, soil microbes (fungi) and other plants via common garden experiments.
- Conducted systematic vegetation surveys, plant identification/classification (spotted knapweed, leafy spurge, cheatgrass); collected, identified and sorted seeds of numerous local and invasive plants; planted, watered and assisted with experimental treatments and in greenhouse experiments.
- Performed vegetation surveys for ground cover of native forbes/grasses and non-native plant invaders, such as Spotted Knapweed (*Centaurea stoebe*) and Cheatgrass (*Bromus tectorum*).

Research, Field Assistant (part-time) May 2010–July 2010
Supervisor: Assistant Unit Leader/Senior Scientist, Dr. Tom Martin
Montana Cooperative Wildlife Research Unit, University of Montana, Missoula, Montana

— Explored breeding ecology and life history traits of Rocky Mountain birds, including clutch and egg sizes, renesting and developmental rates, adult survival and parental care behaviors, incubation, brooding and feeding young. Conducted nest searches and monitoring. Gathered egg and nestling measurements.
— Supported a master's thesis student with in-field bird surveys and research as part of a larger comparative study conducted across latitudes (other sites located in Arizona and Borneo, Indonesia).

Lab Manager/Research Assistant (part-time) December 2009–August 2010
Supervisor: Professor, Dr. Darrell Jackson
Center for Structural & Functional Neuroscience, University of Montana, Missoula
— In a research lab focused on understanding apoptosis in response to strokes, managed ordering and basic budgeting.
— Supported a doctoral student's research by conducting tissue growth and cell culture (human derived cell line SH-SY5Y) under sterile conditions; making needed solutions; running agarose gels for protein identification; conducting microscopy analysis on a confocal microscope of experiments looking at protein trafficking.
— Ran experiments looking at protein trafficking in rat hippocampi in response to different durations of ischemia (anoxia) and reperfusion. Dissected rat hippocampus, used microtome to section it, placed slices in treatments, fixed with antibodies to review different proteins associated with apoptosis, then fixed to slides.
— Analyzed marked protein movements to predict cell death in response to diverse treatments using a confocal microscope.

Research Assistant (part-time) September 2009–May 2010
Supervisor: Professor, Dr. John Maron
Wildlife Biology Program, University of Montana, Missoula, Montana
— Addressed how direct/indirect effects of species interactions across trophic levels influence distribution and abundance of species and organization of complex communities through large-scale, long-term field experiments.
— Helped with small and large-scale manipulative experiments, laboratory work and natural history information to determine when/where species interactions have strong or weak impacts on populations and communities.
— Supported a doctoral student's research on plant population and community ecology by exploring effects of Rocky Mountain elk on nutrient cycling and plant community structure.
— Assisted landscape tests collecting and weighting leaf litter bags (research suggests herbivore behavior influences plant nutrient cycling and therefore influences plant community biodiversity).
— Collected, organized and analyzed data; entered data into MS Excel.

BOISE STATE UNIVERSITY

Research /Team Leader, Technology Development June 2012–August 2012
Supervisor: Associate Professor, Dr. Jesse Barber
Department of Biological Sciences, Boise State University, Boise, Idaho
— Addressed behavioral, evolutionary and conservation-related questions by employing bioacoustics and videographic techniques to research and quantify how animals process sensory input and how this influences receiver behaviors.
— Conducted microphone array technology development to further research and understand how anthropogenic changes to the sensory environment alter animal behavior and community assembly.
— Constructed, tested and deployed microphone array technology at Lucky Peak, a migration corridor, to gather field observations and controlled experimental design with an emphasis on natural history.
— Helped with the Phantom Road, a large soundscape manipulation experience, which led to multiple publications.
— Supported research of the Intermountain Bird Observatory (IBO) Lucky Peak Project and of graduate students by helping with mist netting of songbirds, and trapping and banding of raptors and owls.
— Assisted with bird banding of hummingbirds with the Hummingbird Monitoring Network.

— Used Raven Pro 1.4 and Audacity to analyze acoustic data; synced autonomous recorders dispersed through a landscape to triangulate and localize individual vocalizations and understand how acoustic signals function in space and time in response to predators.

AUSTRALIAN NATIONAL UNIVERSITY

Research, Field Assistant March 2011
Supervisor: Dr. Lisa Schwanz
Research School of Biology, Australian National University & Department of Science and Technology, Canberra University, Canberra, ACT, Australia

- Supported long-term, grant-funded research on the physiology and sex allocation of mammalian reproductive strategies in Tammar wallabies (*Macropus eugenii*) that resulted in multiple publications.
- Conducted nocturnal bait trapping for female body condition on HMAS *Stirling* Royal Australian Navy base, Garden Island, Perth, WA, Australia, including body sizing, ear tagging, pouch and offspring measurements and fecal and blood samples.

Research, Field Assistant August 2010–December 2010
Supervisor: Dr. Robert Magrath
Research School of Biology, Australian National University, Canberra, ACT, Australia

— Supported doctoral students' grant-funded parent-offspring communications research: conducted nest searches, and bird and vegetation surveys.
— Conducted microphone array experiments and songbird surveys of different songbird species to investigate ways species a communication network or community respond near different predators and used MATLAB to localize vocalizations from synced recordings (2014 grant-funded work)
— Investigated the breeding ecology of White-browed Scrubwrens (*Sericornis frontalis*), including nest searching and monitoring, behavioral observations and nestling banding.
— Assisted with mist netting, handling, sexing and banding bird species with the Australian National Botanic Gardens.
— Studied avian social behavior, breeding biology, acoustic communications about danger (alarm calls, song, duetting, eavesdropping on other species), vocal mimicry and communication between parents and their young.

PACIFIC WHALE FOUNDATION

Naturalist / Public Outreach & Education November 2007–May 2008
Pacific Whale Foundation, Maui, Hawaii

— During whale watching/snorkeling tours, gave educational talks to people from around the globe on conservation of humpback whales, marine organisms and the oceans; issues influencing oceans and organisms within; bioacoustics (dropped hydrophones into the ocean to listen to whales sing). Volunteered in Haleakela National Park to conduct Nene surveys (endemic endangered, non-migratory bird) to obtain a headcount for management use.

TEACHING EXPERIENCE

University of Nevada – Las Vegas

Lead Instructor

BIOL 433 Ornithology, Summer 2018 (Term 1)
Course creation, design and planning, lecturer, lab and field course design, assessment creation, grading

University of Montana – Missoula

Lead Instructor

BIOB 490 Independent Research in Bioacoustics, Fall 2015; Spring 2016
Course planning, lecturer, assessment creation, grading

Teaching Assistant

BIOE 409 Behavior and Evolution, Fall 2015
Lab leader, lecturer, office hours, grading

BIOE 371 General Ecology, Fall 2012; Fall 2014
Lab leader, lecturer, office hours, grading; research mentor (effects and disturbance of invasive species on plant communities

BIOO 470 Ornithology, Spring 2012; Spring 2014
Lab leader, lecturer, office hours, assessment creation, grading

BIOB 160 Principles of Living Systems, Spring 2013
Lab leader, lecturer, office hours, assessment creation, grading

BIO 171 Principles of Biological Diversity, Fall 2011
Lab leader, lecturer, office hours, assessment creation, grading

University of Colorado – Boulder

Teaching Assistant

PSYC 1001 General Psychology, Spring 2006
Discussion leader, lecturer, assignment creation, office hours, grading

GRANTS, AWARDS & SCHOLARSHIPS

NV-INBRE – IdeA Network of Biomedical Research Excellence Scientific Service Award	2019	$ 2,000
ISBE - International Society of Behavioral Ecology Travel Award	2018	$ 500
NSF - National Science Foundation East Asia & Pacific Summer Institute (EAPSI) Fellowship, Japan Fellow, Kyoto University, Host: Dr. Toshitaka Suzuki	2017	$10,000
Bertha Morton Scholarship, University of Montana, Missoula	2016	$ 3,000
Dan Pletscher Scholarship for Avian Science, University of Montana, Missoula	2016	$ 5,000
Drollinger-Dial Research Travel Grant, University of Montana, Missoula	2016	$ 2,000
Drollinger-Dial Research Travel Grant, University of Montana, Missoula	2015	$ 1,000
PEO - Philanthropic Educational Organization Scholar Grant *(Nominated)*	2015	———
Dan Pletscher Scholarship for Avian Science, University of Montana	2014	$ 5,000
NSF - National Science Foundation East Asia and Pacific Summer Institute (EAPSI) Fellowship, Australia Fellow, The Australian National University, Host: Dr. Robert Magrath	2014	$ 8,000
NSF - National Science Foundation Graduate Research Fellowship *(Honorable Mention)*	2012	———

PUBLICATIONS

**Indicates an undergraduate co-author; **Indicates a high school co-author*

Billings, A.C., E. Greene. and S. Jensen*. 2015. Are chickadees good listeners? Antipredator responses to raptor vocalizations. *Animal Behaviour* 110: 1-8. doi:10.1016/j.anbehav.2015.09.004

Billings, A.C., E. Greene and D. MacArthur-Waltz**. 2017. Steller's jays assess and communicate about predator risk using detection cues and identity. *Behavioral Ecology* 28(3), 776–783. doi:10.1093/beheco/arx035
Featured cover photo

Billings, A.C. 2018. The low frequency acoustic structure of mobbing calls differs across habitat types in three passerine families. *Animal Behaviour* 138: 39-49. https://doi.org/10.1016/j.anbehav.2018.02.001

Billings, A.C., K.E. Schultz*, E.A. Hernandez*, W.E. Jones and D.K. Price. 2018. Male courtship behaviors and female choice reduced during experimental starvation stress. *Behavioral Ecology*. https://doi.org/10.1093/beheco/ary144.

Billings, A.C. and D. Blumstein. 2018. Communication. *Encyclopedia of Animal Cognition and Behavior*. (T.K. Shackelford and J. Vonk, editors). Springer. https://doi:10.1007/978-3-319-47829-6_1665-1.

Billings, A.C. and D. Blumstein. A framework to understand interspecific multimodal signaling systems. *Animal Signals and Communication*. (T. Aubin and N. Mathevon, editors). Springer. *In Press.*

Odom, K.J., M. Araya-Salas, J.L. Morano, R.A. Ligon, G.M. Leighton, C.C. Taff, A.H. Dalziell, **A.C. Billings**, R.R. Germain, M. Pardo, L. Guimarães de Andrade, D. Hedwig, S.C. Keen Y. Shiu, R.A. Charif, M.S. Webster and A.N. Rice. Comparative bioacoustics: a roadmap for quantifying and comparing animal sounds across diverse taxa. *In Review*.

Moreno, J.L., **A.C. Billings**, E. Greene and C.W. Clark. Blue jays (*Cyanocitta cristata*) alarm response and behavior is different for predators of different sizes. *In Review*.

Wilson, H., B.N. Hogg, K.G. Blaisdell, J.C. Anderson, A.S. Yazdani, **A.C. Billings**, K.M. Ooi, R. Almeida, M. Cooper and K.M. Daane. Survey of vineyard insects and plants to identify novel vectors and non-crop reservoirs of grapevine red blotch virus. *In Preparation.*

SELECTED PRESENTATIONS

From sender to receiver: the evolution and ecology of animal signaling systems 2018
Cal Poly, San Luis Obispo, California
Biological Sciences Department, Invited by: Dr. Clinton Francis

Male courtship behaviors and female choice reduced during experimental starvation stress 2018
International Society for Behavioral Ecology, Minneapolis, Minnesota *(Poster)*

The low frequency acoustic structure of mobbing calls differs across habitat types in three passerine families 2018
International Society for Behavioural Ecology, Minneapolis, Minnesota

The low frequency acoustic structure of mobbing calls differs across habitat types in three passerine families 2018
Animal Behaviour Society, Milwaukee, Wisconsin

Complex communication signals and speciation 2018
University of Nevada–Las Vegas
Inspiration, Innovation, Impact: Celebrating Graduate Student Research
UNLV Today: https://www.unlv.edu/news/article/fruit-flies-robots-research-sheds-light-our-future

The ecology and evolution of avian alarm call signaling systems 2017
Kyoto University, Kyoto, Japan
Ethology Department Seminar Series, Invited by: Dr. Toshitaka Suzuki

Complex information about predation risk in acoustically simple alarm calls 2016
International Society for Behavioural Ecology, Exeter, UK

The ecology and evolution of avian alarm call signaling systems 2016
Montana Tech University–Butte
Biology Department Seminar Series, Invited by: Dr. Stella Capoccia

The ecology and evolution of avian alarm call signaling systems 2015
University of Texas-Austin, Austin, Texas
Department of Integrative Biology, Population Biology Seminar Series, Invited by: Dr. Michael Ryan

Not all information is created equal: How predator information alters behavior in Steller's jays 2015
Animal Behaviour Society Annual Conference, Anchorage, Alaska

How animals communicate about predators: Steller's jay communication 2014
North Cascades Basecamp Presentation Series, Mazama, WA Methow Valley News
http://methowvalleynews.com/2014/01/09/mazama-jan-8-2014/

Psst. Pass It On: How animals communicate about danger 2013
University of Montana - Missoula Celebrate Academics Event

The Behavioral Ecology of Avian Mobbing Calls 2013
Animal Behaviour Society Annual Conference, Boulder, Colorado

WORKSHOPS

Sound Recording Workshop, Cornell University Lab of Ornithology June 2011
Sierra Nevada Field Station, CA
- Completed a week-long workshop focused on advanced field audio recording techniques with a range of recorders and microphones, processing, bird identification and analysis of recordings using Raven Pro.

ConGen, University of Montana September 2018
Flathead Lake Biological Station, MT
- Completed a week-long workshop with lectures, hands-on activities and data analysis focused on next generation sequence (NGS) data analysis and interpretation from novel statistical approaches and software programs.

STUDENT MENTORSHIP

Katie Schultz; PhD student in Biology, School of Life Sciences, University of Nevada-Las Vegas 2017-2019
- Co-author: *Starvation-resistance in Drosophila melanogaster leads to reduced male courtship and relaxed female choice*.
- Examining acoustic and chemical courtship behavior in *Drosophila grimshawii*

Katrina Pinili; Undergraduate in Biology, School of Life Sciences, University of Nevada-Las Vegas 2017-2019
- Developed a funded project to explore how thermal tolerance influences courtship behavior and female choice in the desert species, *Drosophila mojavensis*.
- Funded by AANAPISI and LSAMP research experience program for Summer 2018 and Spring 2019.
- Poster presented at the 2018 AANAPISI Undergraduate Research Conference.

Krysthal Morales; Undergraduate in Biology, School of Life Sciences, University of Nevada-Las Vegas 2017-2019

- Developed a funded project to explore how thermal tolerance influences female fecundity and offspring development in fitness in the desert species, *Drosophila mojavensis*.
- Funded by AANAPISI and LASAMP research experience for Spring 2018 and Spring 2019.
- Poster presented at the 2018 AANAPISI Undergraduate Research Conference.

Jacob Luna; Post-baccalaureate in Biology, School of Life Sciences, University of Nevada-Las Vegas 2017-2019

- Developing physiological and behavioral experiments to test which sensory modalities are employed by receivers in response to a chemical signal in *Drosophila grimshawi*.

Eddy Hernandez; Undergraduate in Biology, School of Life Sciences, University of Nevada-Las Vegas 2017-2018

- Co-author*: Starvation-resistance in Drosophila melanogaster leads to reduced male courtship and relaxed female choice*.
- Examined how starvation-resistance in *Drosophila melanogaster* influences body size in males and females and egg-laying in females.
- Funded by AANAPISI and LASAMP research experience for Spring 2018.
- Poster presented at the 2018 AANAPISI Undergraduate Research Conference.

Rachel Hutchins; Undergraduate in Organismal Biology, Ecology and Evolution, University of Montana 2015-2016

- Bioacoustics: supervised independent research
- Contributor: *The low frequency acoustic structure of mobbing calls differs across habitat types in three passerine families*

Sarah Gaulke; Undergraduate in Wildlife Biology, University of Montana 2015-2016

- Bioacoustics: supervised independent research
- Contributor: *The low frequency acoustic structure of mobbing calls differs across habitat types in three passerine families*.

Dylan MacArthur-Waltz; Hellgate High School Senior, Missoula, Montana 2013-2015

- Poster presented at the 2015 Animal Behaviour Society Meeting
- Honors Thesis: Steller's Jays respond differently to seeing vs hearing predators
- Co-author: *Steller's Jays assess and communicate about predator risk using detection cues and identity*

Devin Landry; BS in Wildlife Biology, University of Montana 2013-2014

- MS in Wildlife Biology, University of Montana, 2016

Sophia Jensen; BS in Human Biology, University of Montana 2012-2013

- Best Poster Award: University of Montana Conference on Undergraduate Research
- Honors Thesis: Can birds detect threat level from predator vocalizations alone?
- Co-author: *Are chickadees good listeners? Antipredator responses to raptor vocalizations*

Maggie Raboin; BS in Wildlife Biology, University of Montana 2012-2013

- Honors Thesis: Hoo done it? Birds can distinguish raptors by their vocalizations
- Presented poster at University of Montana Conference on Undergraduate Research
- Current PhD student at University of California–Berkeley

Nora Carlson, Post-baccalaureate in Wildlife Biology, University of Montana 2012-2014

- Honors Thesis: How do red-breasted nuthatches encode information?
- Presented poster at University of Montana Conference on Undergraduate Research
- PhD in Biology, St. Andrew's University, Scotland, UK, 2016

COMMUNITY, STATE & INTERNATIONAL OUTREACH

Science Café, presenter, 2019

- Presented on animal signaling systems to the general public at the monthly, NSF-funded Science Café seminar series.

Science Trends, blog writer, 2018

- Wrote a general summary for publication, *"The low frequency acoustic structure of mobbing calls differs across habitat types in three passerine families."* Accessible at: https://sciencetrends.com/why-do-animal-vocalizations-sound-different-how-habitat-may-be-influencing-the-low-frequency-of-mobbing-calls-in-birds/

Women in Graduate School, forum participant, 2017

- Participated in a multidisciplinary forum for women in graduate school to discuss strategies to succeed and how to manage work-life balance

High School Biology, teacher trainer, 2017

- Presented ways to teach and incorporate evolution into grades 9-12 curriculum through the study of animal communication, and behavior in birds and other animals.

Expanding your Horizons, workshop presenter, 2016

- Designed and led a bioacoustics workshop to motivate and encourage young women (age 9-15) in STEM careers.

Methow Conservancy in Winthrop, Washington, adult education lecturer, 2016

- Lectured on Steller's jays for an adult education 6-week course on Corvids

We Are Montana in the Classroom–President's Tour, grades 9-12 mentor, 2015

Invited by University of Montana's President of to tour Montana's high schools over 5 days

- Information available at: http://www.uMontana.edu/big/we-are-MONTANA/

  Bozeman, Billings & Great Falls: I was one of two graduate students invited to interact and engage high school students as a role model, share my story and encourage college consideration. We reached 1100+ students.

  Kalispell & Blackfeet Indian Reservation: As the only graduate student invited to interact and engage with high school students, I served as a role model to share my background and encourage students that college is an option even with non-traditional backgrounds. We reached 700+ high schools.

  **Kalispell's Daily InterLake Newspaper: http://www.dailyinterlake.com/members/students-track-sounds-science/article_b52c408a-6e21-11e5-afcb-4bef660c6f08.html*

American Indian Heritage Day, hands-on instructor, 2015

- Created and led an interactive table about animal communication and behavior research sponsored by University of Montana's science discovery and outreach program, SpectrUM, which reaches 40,000+ Montanans annually via onsite and mobile science programs.

SciGirls Camp, teacher, 2015

- Designed and led activities about bioacoustics and behavioral ecology to engage and encourage 20+ girls in science (age 7-12). Camp was sponsored by SpectrUM.

National Public Radio (NPR), On-Point Radio Show, guest speaker, 2014

- Shared with listening audience *"The (Hidden) Natural Worlds of Winter"*
  Accessible at: http://onpoint.wbur.org/2014/12/04/winter-nature-cold-snow-wildlife-spring

Enashiva Nature Refuge - Thomson Safaris in Tanzania, Africa, curriculum designer, 2014

- Designed and conducted independent research during a *Field Ecology of East Africa* course to be translated into Swahali and Maa for use by local Maasai schoolchildren and visitors to Enashiva Nature Refuge "Mongoose-Hornbill Mutualism." Accessible at: https://www.youtube.com/watch?v=kVJa014G-l8

SpectrUM, science program teacher, 2013

- Designed and led 3 on-site science programs on ecology, animal behavior and animal communication that reached 100+ children (age 4-12).

SpectrUM – STEM Camp Program, instructor, 2012

- Designed and led a camp program about ecology that involved 30+ children (age 8-12)

Montana Natural History Center, lecturer, 2012

- Lecturer for Master Naturalist Certification class on *Non-human communication*

The Girls Way, role model and mentor, 2011

- Participated in "FabFem" program for girls (age 8-13). The nonprofit organization uses women in science as mentors and role models to encourage and mentor young girls. Reached 20 young girls interested in science.

CAMPUS, COMMUNITY & PROFESSIONAL SERVICE AND AFFILIATION

Peer Reviewer
Behavioral Ecology, PLOS ONE, Behavioral Ecology and Sociobiology, International Journal of Comparative Psychology, Ibis, Ecology and Evolution, Animal Behavior and Cognition

Grant reviewer
Animal Behaviour Society Graduate Student Grant reviewer (2019)

Professional Affiliations
Animal Behavior Society; International Society of Behavioral Ecology; American Genetic Association; Interdisciplinary Collaborative Network; Psi Chi National Honors Society

Postdoctoral Fellow Representative
Top Tier Postdoctoral Committee, University of Nevada–Las Vegas

Graduate Representative
Organismal Biology, Ecology and Evolution, University of Montana

Graduate Representative
Search Committee, Craighead Endowed Chair Faculty, University of Montana