NEWSLETTER

Southwestern Research Station

Portal, Arizona

Center for Biodiversity and Conservation
American Museum of Natural History

Number 24 **Year 2009**

FROM THE DIRECTOR

For the past several years, the winters at the SWRS have been relatively dry. Low winter snow levels in the mountains translate into rapid drying of our creeks in the spring months. These low water levels have had a negative affect on the abundance of plants and animals normally observed in spring. However, I am happy to announce that this winter we have had relatively high precipitation resulting in a snow covered mountain. We are optimistic that this coming season the creeks will fill and run late into the spring. So, if you have not visited the station recently, this year is a great time to come and enjoy the wonderful biodiversity that the Chiricahuas have to offer.

Each year I update you on the station's progress towards completing the goals as set forth in our master plan for growth and development at the station. In spring of 2009 construction of our new education building was completed and we hosted several workshops and classes in the spacious classroom. We also opened our new gift shop, which is now located near the entrance to the station. The revenue generated from our gift shop helps support the general operation of the station. A spacious porch attached to the gift shop will provide interpretive displays to visitors informing them about station research and workshop activities and educating them on the biodiversity of the area.

Ant Course in new classroom

Currently, our most pressing need at the station is to upgrade our aging housing accommodations. Next winter we plan to improve researcher, student, and visitor housing by adding new dormitories and renovating the older housing units. Our goal is to provide affordable, safe housing to users of the station and additional housing units that can accommodate families that use the station. The new dorms will include a large common area where people can get together to share ideas and socialize, a laundry facility, and kitchenette area. We currently have partial funding for these projects and are seeking the remainder of the funding from grants and donations.

This fall the station offered a new taxonomic training course, The Lepidopteran Course. This course bridges the gap between amateur observation and scientific research. In addition to observing and identifying various species of butterflies and moths, students in the course investigate changes in butterfly populations and their dynamics. Butterflies have been shown to be good indicators of climate change by tracking shifts in their emergence periods and latitudinal changes in their home ranges. We still have spaces available in our August 2010 course. If you are interested in signing up for this summer's course, go to http://research.amnh.org/swrs/education/lepidopteran-course for more information.

Dysschema howardi, largest N.A. tiger moth.

Other courses being developed for the future include taxonomic workshops on coleopterology (beetles) and herpetology (reptiles and amphibians).

Dawn S. Wilson

The Southwestern Research Station

The research station is a non-profit organization under the direction of the Center for Biodiversity and Conservation at the American Museum of Natural History (AMNH) in New York.

The SWRS enhances AMNH's diversity and strengths by providing scientists and educators from the museum and other institutions and around the world the opportunity to participate in research, workshops, and classes in one of the most biologically rich environments in the United States.

Staff:
Dawn S. Wilson, Director
P.D. Hulce, Office Manager/Volunteer Coordinator
Barbara Roth, Bookkeeper/Reservations
Geoff Bender, Operations Manager/Budget Officer
Steve Christensen, Chief Maintenance
Jodi Kessler, Kitchen Manager/Cook
Chris Pope, Seasonal Cook
Juvy McEwan, Kitchen Assistant
Leesa Bunts, Housekeeper
Lorraine Titus, Gift Shop Clerk
Tresa Glore, Gift Shop Clerk

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RESEARCH

Dawn S. Wilson, Director

SAVE THE FROGS! - UPDATE

Last year I told you about our new project to partner with the Arizona Game and Fish Dept. (AGFD) and the U.S. Fish and Wildlife Service (USFWS) to reestablish Chiricahua Leopard frogs (*Lithobates chiricahuensis*) back into the eastern half of the Chiricahua Mountains. This past year, we set up a head-starting facility at the station. So far, we have received 19 tadpoles from USFWS and currently are raising them to adult frog size. We plan to expand the facility by building two outdoor enclosures this spring. These enclosures will be used to grow newly metamorphosed frogs into adult frogs. Our goal is to begin releasing adult frogs into our natural pond by fall of 2010.

2009 RESEARCHERS

A wide diversity of projects was undertaken in 2009 by senior and student researchers covering a multitude of species. We hope to see many of you again this 2010 year!

Agard, Christopher. Howard Univ., Washington, DC. *Sceloporus* Tales: an inquiry into the effect of caudal autotomy on survivorship on spiny lizards.

Axen, Heather. Univ. Vermont, Burlington. Intra and interspecific variation: delimiting species in a taxonomically difficult and economically important species group within *Solenopsis* (Hymenoptera).

Balbag, Brittany. Univ. Puget Sound, Tacoma, WA. The effects of size and color of the female reproductive ornament on male courtship in *Sceloporus virgatus*.

Boersma, Kate. Oregon State Univ., Corvallis. Drought season community dynamics in Madrean Sky Island streams.

Bogan, Michael. Oregon State Univ., Corvallis. Drought, dispersal, and community dynamics in arid land streams.

Brown, Chris. Tennessee Tech Univ., Cookeville. Assessment of predation risk by the use of chemical cues in the riparian wolf spider *Pardosa valens*.

Bucheli, Sibyl Rae. Sam Houston State Univ., Huntsville, TX. Diversity of Gelechioidea (Lepidoptera).

Cahan, Sara. Univ. Vermont, Burlington. Genetic architecture and evolution of reproductive caste determintation in harvester ants.

Cooper, Bill. Indiana Univ./Purdue Univ., Fort Wayne. Antipredatory behavior and foraging by *Sceleporus virgatus* and other lizards.

Corcoran, Aaron. Wake Forest Univ., Winston-Salem, NC. Effectiveness of a sonar-jamming defense against a community of free-flying bats in S.E. Arizona.

Downer, Jim and **John Menge.** Univ. California. Fungi of the Chiricahua Mountains; biodiversity and ecology.

Doyle, Sumit. Univ. North Carolina, Chapel Hill. Sexual selection in age-structured populations of *Drosophila pseudoobscura*.

Dubin, Matt. Univ. Puget Sound, Tacoma, WA. The effect of female ornamentation on aggressive male-male interactions in the striped plateau lizard (*Sceleporus virgatus*).

Dyer, Lee. Univ. Reno, NV. Climate change and multi-trophic interactions.

Gordon, Deborah. Stanford Univ., CA. Behavioral ecology of harvester ants.

Greene, Michael. Univ. Colorado, Denver. Chemical interactions and work in harvester ants.

Hespenheide, Henry. Univ. California, Los Angeles. The robberflies (Diptera: Asilidae) of Cave Creek Canyon, Chiricahua Mountains, AZ .

Jablonski, Piotr. Polish Acad. Sciences, Poland. Ecology of the Mexican Jay.

Kang, Changku. Seoul National Univ., South Korea. How does aposematic coloration of prey affect escape behavior – experiments with moths.

Kureck, Ilka. LMU Munich, Germany. Intracolonial conflicts in an ant with alternative reproductive tactics.

Lazarus, Adam. Marine Biol. Lab., Woods Hole, MA. Population genetics and genome sequencing of *Blochmannia*, obligate bacterial mutualist of ants.

Leichty, Aaron. Univ. North Carolina, Chapel Hill, Genetic basis of adaptation in spadefoot toad tadpoles.

Lewis, Randy. Univ. Oklahoma, Norman. Sex or the lack thereof. – a test of the frozen niche-variation hypothesis.

Longhair, Rob. Univ. Calgary. Diversity of solitary vespid wasps.

Loveless, Marilyn. College of Wooster, Ohio. Plant-animal interactions in *Erythrina flabelliformis* – pollination, defense, and herbivory.

Martin, Ryan. Univ. North Carolina, Chapel Hill. Investigating trophic plasticity as a target of disruptive selection.

Middendorf, George. Howard Univ., Washington, DC. Behavioral ecology of *Sceleporus jarrovii* and other sympatric lizards.

Nelson, Gordon. Univ. Waterloo, ON, Canada. Land use history, landscape change and planning.

Olenic, Sandra. Univ. Puget Sound, Tacoma, WA. The effect of corticosterone exposure on the top speed and vertical escape response of adult and hatchling tree lizards (*Urosaurus ornatus*).

Paull, Jeff. Univ. North Carolina, Chapel Hill. Resource use in spadefoot toads.

Pfennig, David. Univ. North Carolina, Chapel Hill. Character displacement in spadefoot toads.

Pfennig, Karin. Univ. North Carolina, Chapel Hill. Hybridization and behavior in spadefoot toads.

Roskens, Violet. Univ. Vermont, Burlington. The illustration of the evolutionary relationship within Vespinae using genetic, morphological, and behavioral data.

Scales, Jeffrey. Univ. Hawaii, Manoa, Honolulu. The evolution of the locomotor system in phrynosomatid lizards.

Sherbrooke, Wade. American Museum of Natural History, NY. Horned lizard predator-prey interactions.

Shin, Hongsup. Seoul National Univ., South Korea. Foraging strategy of Northern Mockingbird: Exploring escape behavior in prey elicited by wing flash and usual stimuli from different directions.

Smith, Adrian. Arizona State Univ., Tempe. Worker reproduction in the ant *Aphaenogaster cockerelli*.

Soule, Jacob. Univ. Texas at Austin. QTL mapping of a life history polymorphism in *Ipomopsis longiflora*.

Steffenson, Matt. Tennessee Tech Univ., Cookeville. Comparative life histories of sky island populations of the scorpion genus *Vaejovis*.

Sturgis, Shelby. Stanford Univ., CA. The role of cuticular hydrocarbons in the midden of *Pogonomyrmex barbatus* colonies.

Unckless, Robert. Univ. Rochester, NY. Temporal dynamics of endosymbiont infections of mycophagus *Drosophila* species.

Weiss, Stacey. Univ. Puget Sound, Tacoma, WA. Effect of age on female striped plateau lizard ornamentation.

Williams, Kevin. Utah State Univ., Logan. Transectional survey of Mutillidae (Hymenoptera) across the Deming plain.

Wilson, Joseph. Utah State Univ., Logan. Biodiversity and endemism in velvet ants (Hymenoptera: Mutillidae) of the Madrean Sky Islands.

Willyard, Ann. Univ. South Dakota, Vermillion. Developing ponderosa pine as an early detector of forest responses to climate change.

Wisdom, Laura. Univ. Puget Sound, Tacoma, WA. The effect of ultraviolet light on detection of female chemical cues by the male striped plateau lizard (*Sceleporus virgatus*).

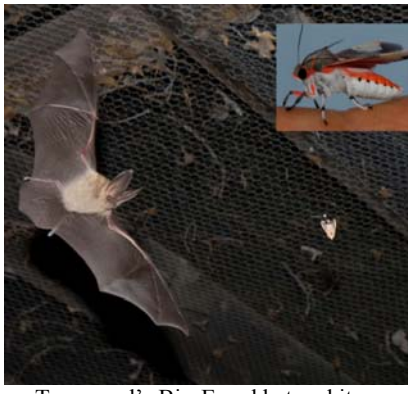
2009 FEATURED SCIENTIST:

AARON J. CORCORAN

WAKE FOREST UNIVERSITY

Photo illustration by Ken Bennett

Every night above our heads an ancient battle rages. The attackers – bats – search out their prey using biological sonar, or echolocation, with pinpoint accuracy. On defense are moths, whose sonar-detection devices, or ears, raise alarm whenever a bat approaches. For many moths their only choice is to flee, and they do so with an astounding variety of maneuvers. Others, the tiger moths, use another trick; they blast the bats with a cacophony of ultrasonic clicks. Our work, conducted at the Southwestern Research Station and in the Department of Biology at Wake Forest University, found that the tiger moth *Bertholdia trigona* uses the sound to jam the sonar of bats, just as a fighter jet might try to jam the missile radar of an enemy. This is the only known example of such a defense being used in nature.



Townsend's Big-Eared bat and its tiger moth prey

Demonstrating jamming required a team effort. In the summer of 2008, Jesse Barber, one of my collaborators, patiently collected moths night after night at SWRS with the help of two interns, Jeff Paull, and Frank Insana. *B. trigona* adults are only active for about three weeks each year after the local monsoons, leaving us a narrow time window for the study. Next, Jesse, Jeff, and Frank shipped the live moths overnight to our facility at Wake Forest University in Winston Salem, North Carolina. There, my Ph.D. advisor, Dr. William Conner, and I had been training baby Big Brown bats (*Eptesicus fuscus*) to fly and catch insects off a fishing line in an indoor flight room. The timing was perfect, as it needed to be. The bats were ready for the experiment as the moths arrived. Just as predicted, the bats rarely caught the moths when they clicked, but caught them every time when we mechanically removed their sound-producing organs. The bats' sonar was clearly disrupted by the moth clicks, as evidenced by our ultrasonic recordings. We also ruled out other possibilities such as that the clicks simply surprised the bats. We published our work in *Science* (Vol. 325, pgs. 325-327).

Now, I'm curious about how the interaction plays out under natural conditions, and if any bats can overcome the defense. I suspect if any can, it would be the Townsend's Big-Eared Bat. In order to avoid being heard by their prey, these bats "whisper" or echolocate very quietly. This may allow the bats to sneak up on a jammer moth without the moth ever knowing it was under attack. This strategy could be an evolutionary countermeasure by the bats to one-up their prey. To study this, I am returning to the SWRS, which is the only location in the United States where we can reliably find *B. trigona*. We are deeply indebted to the staff, interns, and conservation legacy of the station; without you this work would not be possible. We also thank the National Science Foundation for funding this research.

EDUCATIONAL FEATURE: THE BEE COURSE

Bee Course Instructors (left to right): Terry Griswold, Stephen Buckmann, Robin Thorp, James Cane, John Ascher, Lawrence Packer, and Jerry Rozen.

Origin: It all began when students and colleagues, mentored by Dr. Jerry Rozen during his regular visits to the SWRS, wished there was some way a broader audience could come together to learn about bee taxonomy and life history. So, in 1995 Jerry and Dr. Ron McGinley of the Smithsonian sat on a porch at the research station and granted that wish with the creation of The Bee Course. The course has been taught by them and several of their colleagues each year since 1999, and the bee community has shown unflagging interest. Jerry's tireless work on the course ranges from year-round fundraising to advance scouting of optimal collecting sites, and, of course, the selection of appropriate beverages for happy hour.

Location: Nestled in the foothills of the great "sky island" mountain wilderness at the southern extreme of the Rocky Mountains, the SWRS with its significant diversity of plants and animals is a biodiversity hotspot. Because of a broad diversity of vegetation types ranging from semi-desert grasslands and Chihuahuan desert scrub to montane mixed conifer forest, the SWRS is situated among the richest bee fauna in all of North America and thus is an ideal location for the workshop.

Participants: Attending students to date have come from 26 countries around the world. While many of them are graduate students, others are professors, museum curators, state and federal government employees, and anyone who needs to know more about bees for professional reasons. One testimonial from a former student sums up how participants feel when they leave the course – "…Attending the course has been a highlight of my career as a biologist. It was a wonderful experience to learn from many of North America's finest bee researchers and to spend 10 days with so many people with shared ideals and interests. Every aspect of the course was excellent, magical, and inspirational." Participants in course return to their home countries and institutions with an impressive array of identified bee specimens, a passion for investigating bee life history, and a knowledge of the latest developments in bee research.


Participants in the lab and in the field

Why take the Course: The enthusiasm for the course in part stems from the growing realization of the importance of native bees as the major animal pollinator in our terrestrial environment and of our crops and other commercially important plants. In part it also derives from the fact that the course is blessed with a roster of 7 to 9 instructors who are among the leading, world-class researchers on bee systematics, behavior, and pollination ecology.

Each year by the time students complete the workshop, they are able to identify some 60 genera of bees, have acquired an understanding of bee nesting and floral biologies, and have come away with the new-found skills for finding, collecting, mounting, and labeling adult specimens and preserving their immature stages. Annually, undescribed bee species are uncovered and new floral associations of oligolectic species (specialist pollinators) are identified. In addition to directly training an impressive cohort of bee biologists, Jerry and Ron's work on the Bee Course pays further dividends on a global scale as the Bee Course continues to serve as a model for training courses on bees and many other taxa and as collaborations forged or enhanced during the course continue to bear fruit.

BIRD AND NATURALIST TOURS AT THE SWRS


Montezuma Quail Female (left) and Male (right)

This spring will be the station's fifth year offering Bird and Naturalist Tours. Our experienced guide, P.D. Hulce, gets excellent reviews each year from tour participants. Our 6 day/5 night Bird and Nature Tours include: Airport pickup in Tucson, double-occupancy cabin housing, three meals/day, hearty and sumptuous sack lunches, bottled water for trips, and a gift bag full of coupons and more. Check out our website at http://research.amnh.org/swrs/visitor/package-tours

STUDENT INTERN AND VOLUNTEER POSITIONS

Approximately 30 positions are available for the 2010 season.

1. *Research Season*: March – Oct. The student intern program offers students in biological sciences outstanding opportunities to observe and work with scientists conducting field research. Food and lodging are provided in exchange for 24 hours per week of routine chores, with remaining time available for research activities.

2. *Naturalist Season*: Sept. – May, individuals interested in birding, hiking, and other nature adventures: The volunteer program offers individuals the opportunity to enjoy all the wonders of the Chiricahua Mountains. Just a few minutes walk from the station are hiking trails, creeks, and birding areas. Food and lodging are provided in exchange for 24 hours per week of routine chores.

For applications, please visit our website or contact: P.D. Hulce, SWRS, P.O. Box 16553, Portal, AZ 85632 USA; 520-558-2396; dhulce@amnh.org

2009 INTERNS AND VOLUNTEERS

Twenty-eight volunteers and interns came to the Southwestern Research Station in 2009. We thank each of them for their participation and hard work and wish them well in their future endeavors.

Canada: Denise McDonald, Chris Hamilton, **Germany:** Ellen Koth, **Korea:** Minyoung Chun, **Mexico:** Ruth Percino-Daniel, **Great Britain:** Victoria Prichard, Rebecca Hyde, **United States:** Chris Agard, Joseph Ahumada, Nicole Ahumada, Alex Binford-Walsh, Allison Blansfield, Kate Boersma, Christopher Brachna, Edward Chu, Bryant DeRoy, Stephen Ferguson, Jeff Gicklhorn, Rachel Grey, Meg Harries, Seth Heald, Carol Maun, Christina Ripplinger, Krista Schmidt, Leslie Shenkin, Bob Weaver, William Webb, Bonnie Woods.

A BIG THANKS TO THE FRIENDS OF THE SOUTHWESTERN RESEARCH STATION

Donations to the Southwestern Research Station provide funding for special projects and also provide support to student researchers. We are very grateful to the following people who donated funds in 2009:

Sharon & Buzz Aagaard, Stu Abraham, Dan Ahern, Emily & John Alexander, AST Foundation, Doris Nagel Baker, Ray Barkhaus, Keith and Carolyn Becker, Karen Becker, Judith M. Boyce, Susan Buchan, Shane Burchfield, Jack & Martha Carter, George & Kathryn Cawman, Judith Cohn, Charles Cole, Rock Comstock, Nancy Dickson & Justin Congdon, William Cooper, Joanne Cormier, Mary Cormier, Heidi Dobson, Maryann Danielson, Lloyd Davis, R.L. Duncan, Greg Dwyer, Elizabeth Fabry, Kevin Frey, Arnold D. Gooder, Billie & David Hardy, Van Alan & Debra Hargraves, James & Diane Hays, Catherine Gorman & Philip Hedrick, Henry Hespenheide III, Jan and Roy Hiatt, Alan & Lucy Hinman, Don Hollister, Tom Jackson, Rudolf & Ursula Jander, Paula Jenkins, Ron Kaczor, Kathy Kiseda, Larry Barello & Leigh Krueger, Nancy Lauver, John & Nancy LeGates, Kurt Leuschner, Lyn Loveless, Jack & Katherine Marietta, Mr. & Mrs. Rick McGarrey, Bruce McIntosh, Joy & Ray Mendez, Hal & Pat Michael, Barbara Miller, Guy Miller, Laura & Bill Mullen, Robin Andrews & Brent Opell, Farion Pearce, Mr. & Mrs. Daniel Peshka, Martha Pippit, Helen & Edgar Roca, Barbara Roth, Jerry Rozen, Ruth & Marvin Schilling, Steve Schoenig, Eleanor Sterling, Kristine J. Stone, Paul & Marie Stone, Ned Therrien, Carol Simon & Howard Topoff, Stacey Weiss, Vicki Wilhite, Mary Willy, Robert Winston, James & Andrea Wygle, James & Linda Young.

BECOME A FRIEND OF THE SOUTHWESTERN RESEARCH STATION!

The SWRS provides scientists, educators, and students from across the country and around the world the opportunity to participate in research, workshops, and classes in one of the most biologically rich environments in the United States.

Your generous support plays a vital role in enabling us to maintain our programs and facilities. With your help, we have recently: installed an underground irrigation system using recycled water from our constructed wetland; refurbished our reservoir, a major source of water for bats and animals of the area; and develop new courses and programs, such as the new Lepidopteran Course.

Your tax-deductible contribution to the SWRS [a 501(c)(3)] will ensure that the station remains in peak condition, allowing us to fulfill our mission of fostering science that focuses on the abundant biodiversity of the Chiricahua Mountains.

Your gift will also allow us to advance both our research and educational objectives by enhancing our technology infrastructure, becoming a "green" model for the surrounding community, and providing students the opportunity to gain valuable research experience.

*** Please contact Dawn Wilson (520-558-2396; dwilson@amnh.org) for more information about contributing to the New Dormitory Building Challenge or about naming opportunities for future "Green" Buildings ***

Thank you for supporting the Southwestern Research Station!

Please accept my tax-deductible gift in the amount of:
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Southwestern Research Station Newsletter
Funding Opportunities Available For Student Researchers

The SWRS has funds available for undergraduate, graduate and post-doctoral students conducting independent research projects at the SWRS. Students must have a researcher application on file at the SWRS before applying. Students listed as assistants on their advisor's project are not eligible for SWRS support.

The amount of support available ranges from 10-50% of room and board fees. Only students residing at the station while conducting their research qualify for the subsidy. Travel and research supplies are not covered.

SWRS students at Fourth of July parade
Save the Frog!

For research applications and subsidy instructions, please go to http://research.amnh.org/swrs/ and click on the "Researchers" tab. Please follow instructions carefully – applications will not be considered if instructions are not followed.

Bobcat photographed from porch of housing unit at the research station.