7-1-2017

2016 Annual Report

Joseph A. Cook

Museum of Southwestern Biology
2016 Annual Report

Joseph A. Cook, Director
29 June 2017

The University of New Mexico's Museum of Southwestern Biology in 2016

The Museum of Southwestern Biology (MSB) enjoyed another banner year in 2016 by providing key infrastructure to the Department of Biology at the University of New Mexico and to a worldwide community of scientists, educators, public health workers, and natural resource managers that need samples and information on diverse aspects of biodiversity. Our collections and web-accessible databases, managed by a set of dedicated Collection Managers, constitute an informatics resource that contributes to understanding the complexity of planetary life and related ecosystem function on local, regional, and global scales. High research activity at MSB demonstrates the increasing use of collections (both samples and data) in environmental and biomedical research. Our **collections now support a tremendous number of peer-reviewed publications (nearly 200 in 2016)** and attract significant grant dollars (> $6.4M in force at UNM in 2016). The museum is an unparalleled informatics resource contributing to applied efforts in conservation as well as theoretical advancements in biology across time and across local, regional, and global scales. MSB faculty curators with active research and graduate programs and their staff build the collections and then exploit the wealth of specimens and data, as they create **a permanent and shared resource for the greater scientific community**.

	2012	2013	2014	2015	2016	5-Year Average
1. Collection growth (Specimens Cataloged)	25,446	34,772	103,947	129,245	66,334	71,949
2. Loans Out	99	145	241	176	208	174
3. Professional Visitors to the Collections	307	344	248	945	392	447
4. Collection Database Web Site Hits	396,362	**	233,079	585,913	454,998	417,588
6. Outside Pubs Citing MSB Specimens	76	167	147	189	90	134
7. Peer-Reviewed Publications by Staff	77	54	104	80	59	75
8. Graduate Students	42	42	41	27	56	42
9. Graduate Theses/Dissertations Completed	9	7	11	11	11	10
10. Undergraduate Students	76	66	63	57	73	67
11. Grants/Contracts in Force	76	61	61	82	51	66
12. Grants In Force Total Costs	N/A	N/A	N/A	$2,662,014	$6,354,047	$4,508,030
13. Estimated F&A return	$528,950	$410,871	$436,680	379,129	$211,182	$ 393,362

* 1 UNM, 2 outside, NR – not reported

We focus on hands-on training of UNM students who gain experience in natural history specimen curation, field expeditions, informatics, and laboratory research. MSB faculty and staff are heavily involved in instructional efforts, including the new Museum Studies Program and through collaborative efforts with other departments and colleges on campus. MSB staff members (8 collection managers and 7 curators) teach

courses, provide specimens and offer many opportunities for high quality experiential or inquiry-based educational experiences. As one of the most active university-based natural history museums worldwide, UNM students are afforded world-class opportunities in biodiversity informatics, comparative biology, and cutting-edge genomics that extend their university experiences far beyond those available at other universities in the Southwest.

MSB has a long history of leading UNM in training students. Many of our students fill jobs with natural resource agencies, the private sector, or in academia in the state and elsewhere. We also lead in mentoring international students, especially those from Latin America, with many returning to leadership positions in their respective countries. MSB-affiliated undergraduate and graduate students have taken leadership positions in biology in the US. Many graduate students work in collections-related activities during their graduate tenure at UNM. Our unit regularly leads the Biology Department in the number of students receiving doctorate or master's degrees.

MSB is a major contributor at UNM to public service and outreach efforts, especially activities related to evidence-based management of natural resources such as water and riparian environments in the Southwest. We are thoroughly engaged with municipal, county, state and federal agencies through funded projects ranging from South America to New Mexico to Alaska. Many of our outreach efforts are related to developing effective management plans for state and federal resource agencies. International organizations also rely on our specimens, data and expertise to help them design and implement public health initiatives. MSB has built a strong tradition in the public health arena in efforts related to identifying zoonotic pathogens (e.g., hantavirus) and understanding the ecology of zoonotic diseases and wildlife diseases in the western US, but also in a number of international settings including Peru, Mongolia and elsewhere.

Because of the vast spatial and temporal biodiversity data served, MSB is now a key player in national and international efforts in bioinformatics, both environmental and genomic. This activity is recorded in the number of hits (and downloads) from our databases, number of loans and number of publications based on these materials and data. MSB faculty and staff been heavily engaged with faculty in other departments and in other colleges---perhaps more so than other units on campus. We have established and long-term collaborative efforts with the School of Medicine and with the Arts and Ecology Program (College of Fine Arts), and Anthropology, Geography, History, and other disciplines. We have MOUs in place that are active and productive including one with New Mexico Museum of Natural History and Science. Our staff serves on national boards including the Board of Directors of American Society of Mammalogists, Flora of North America, Society of Ichthyologists and Herpetologists, Entomological Society of America, and the Natural Science Collections Alliance, the primary advocacy group of administrators and curators who oversee research-oriented museums of natural history in Washington, DC. MSB staff also serve on Steering Committees for several national initiatives, including VertNet, Aim-Up!, and the National Integrated Biocollections Alliance, a new NSF sponsored Research Coordinating Network (BCoN) focused on translating the vast digital resources of natural history museums into a catalyst for greater research productivity and educational transformation in the US.

Across the primary missions of UNM in research, teaching, and public service, MSB's metrics attest to the fact that MSB is among the most productive and international units on campus. Follow us on FaceBook or at www.msb.unm.edu.

A few examples of the Breadth of MSB Activities in 2016 (more details in Division Reports).

MONTH	AWARD OR EVENT

January 2016

MSB Mammals and Birds received 149 museum cases (2 semi-trucks worth) donated this week to the MSB by the Denver Museum of Nature and Science. Thank you John Demboski (former Cook Lab doctoral student)! Nearly everyone got in on unloading all the equipment.

Once again, the Museum of Southwestern Biology is partnering with the UNM Wilderness Alliance to bring the Telluride Mountain Film Festival to campus. Mountainfilm on Tour brings inspiration and education through documentary films that explore cultures, preserve environments and promote adventure.

February

J Tomasz Giermakowski, Senior Collections Manager, Amphibians and Reptiles delivered a talk entitled "*Of museums, specimens, and maps: How collections help conservation in a time of extinction*" to a public audience at the NM Museum of Natural History and Science. There are many other examples of public talks by MSB personnel throughout the year including 5 lectures in the Bernalillo County Open Space *Naturalist Series*. Among these, the Division of Fishes presented *Chihuahua Desert Pupfishes and Conservation.*

March

The UNM Daily Lobo focused on MSB in mid-March with a feature story on our "hidden" collections. Take a look at those caribou tapeworms!
http://www.dailylobo.com/gal…/museum-of-southwestern-biology

April

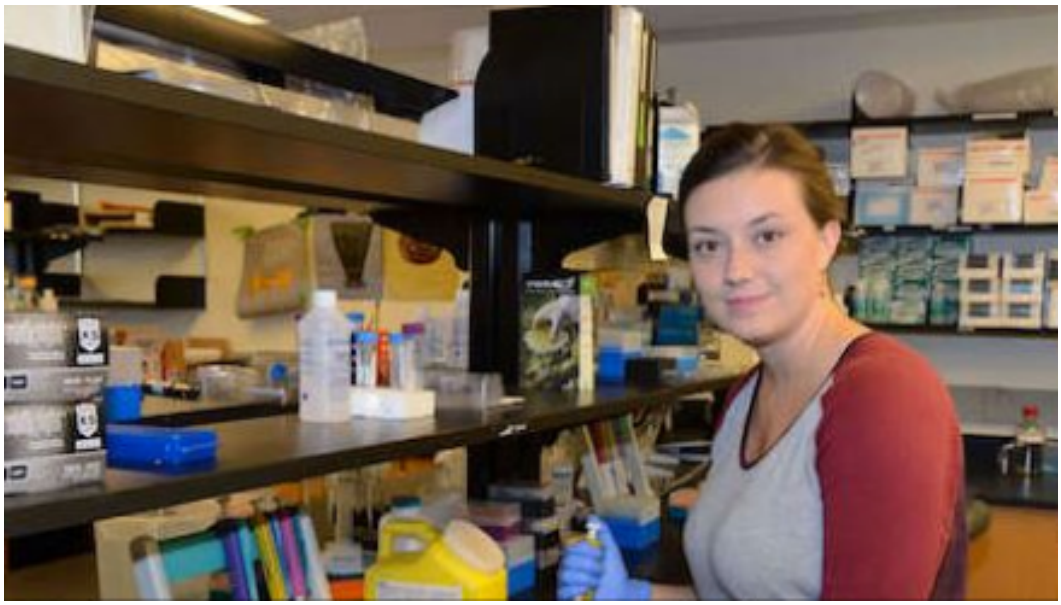
MSB held an Open House for the Biology Department's Annual Research Day. Bigger and better than ever this year, all divisions participated.

May

Lex Synder, Senior Collection Manager Fishes, received $100,000 from Region 6, Federal Emergency Management Administration (FEMA) for additional "earthquake" shelving ledges to stabilize jars during seismic events causing side-to-side movement of shelves.

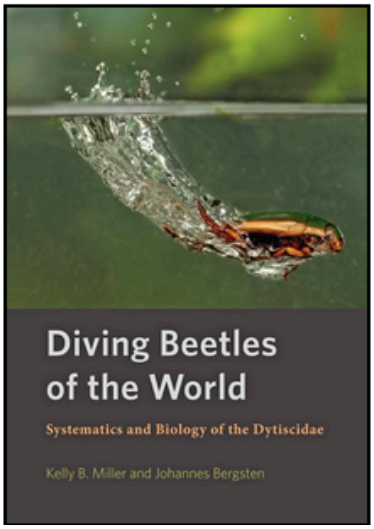
Kelly Speer, former MSB undergraduate student has just completed her MS at University of Florida and will be beginning a doctoral program at the AMNH in New York this fall. She hails from Corrales NM and the local newspaper wrote about her accomplishments.

http://www.corralescomment.com/…/3450-speer-wins-post-at-am…



June

Dr. Kelly Miller, Curator of Arthropods, has just completed a major monograph on the "Diving Beetles of the World" which will be published by Johns Hopkins Press in September 2016. Congratulations Kelly!



American Society of Mammalogists (ASM) 2016 annual meeting in Minneapolis. Bryan McLean was award the ASM Fellowship, the top ASM award for graduate students. Joseph Cook won the 2016 Joseph Grinnell Award for outstanding and sustained contributions to education in Mammalogy.

July

MSB Mammal crews are in eastern Mongolia on a six-week expedition to collect mammals and their associated parasites in collaboration with Batsaikhan Nayamsuren and his students at the National University of Mongolia. Another crew headed north to Canada to recover >1000 carnivore specimens from research freezers.

August

Tom Giermakowski attended the Summer Supercomputing Institute at the Texas Advanced Computing Center (TACC). The week-long series of workshops focused on using TACC resources to explore concepts ranging from data management to data visualization and data query and analyses on distributed systems. TACC resources provide an amazing array of options for different purposes and Tom's hopes to take advantage of TACC's connections to (hosting) the MSB database ARCTOS to further enhance use of MSB big data (e.g., through visualization).

September	In the Fall semester, the Division of Arthropods had 3 undergraduates, with funding from the US Geological Survey, help clear out a backlog of samples from Bandelier National Monument and the Valles Caldera National Preserve. The samples are for ecological monitoring of ground-dwelling arthropods to study the effects of climate change (Bandelier), or the effects of the 2011 Las Conchas fire (Valles Caldera).
October	Dr. Chris Witt stars in Nature program on hummingbirds! http://www.pbs.org/…/nature/super-hummingbirds-about/14472/…  Super Hummingbirds | About | Nature | PBS
November	Howard Snell, MSB Curator of Herps, designed a new course, Wilderness Biology, where students develop expertise, confidence, and independence associated with wilderness travels and observations. Students just returned from a five-day, 50 river mile trip into the Rio Grande del Norte National Monument and Rio Grande Gorge. Day hikes at Punche & Costilla Creeks, Pinion Hills and Ute Mountain provided opportunities for viewing habitats and wildlife away from the river corridor. 
December	Dr. Stephen Greiman (MSB Postdoctoral Associate) received the American Society of Parasitologists (ASP) 2016 Ashton Cuckler New Investigator Award, given to the most outstanding North American early career parasitologist of the year. The honor is competitive, and is based on the recipient's research over the course of graduate studies. He is leaving MSB in January to start a tenure-track position at Georgia Southern University.

MSB Division Reports
Division of Amphibians & Reptiles

DIVISION HIGHLIGHTS

During 2016 the collection increased to 98,002 specimens. Students, staff, and collaborators of the division collected the majority of the 1,411 specimens that were added last year. In addition, we hosted several research visitors in the collection and responded to nearly 170 data requests in person. Our outreach activities, in addition to general tours of the collection to over 200 visitors, included a variety of presentations and consultations. We presented on the role of museums in conservation of amphibians and reptiles at New Mexico Museum of Natural History and Science as well as to the City of Albuquerque and Bernalillo County Open Space Division programs. In addition, staff and students gave presentations on ongoing research projects at regional and national meetings as well as gave invited lectures internally (at UNM).

TABLE OF COLLECTION USE

2016	
1. Collection: growth & current size (New Specimens Cataloged/total specimens)	1,411 / 98,002
2. Loans Out	8
3. Professional Visitors to the Collections	5
4. Collection Database Web Site Hits	1,078
6. Outside Publications Citing MSB Specimens	10
7. Peer-Reviewed Publications by Staff	12
8. Graduate Students (using or working in collections)	5
9. Graduate Theses/Dissertations Completed (UNM/Other*)	3/0
10. Undergraduate Students (using or working in collections)	7/6

* List Other Institutions

COURSES USING THE COLLECTIONS

BIOL 204, Animal Form and Function, spring and fall semesters, 310 students
BIOL 386, General Vertebrate Zoology, spring and fall semesters, 83 students

COURSES TAUGHT BY MSB PERSONNEL

A. Faculty/Collection Managers

INSTRUCTOR(S)	SEM	COURSE	TITLE	ENROLLMENT
SNELL, HOWARD	Spring	BIOL 402 U 022	T: Conservation Biology	15
SNELL, HOWARD; GIERMAKOWSKI, JACEK	Spring	BIOL 402 U 026	T: Herpetology Collection Research	9
SNELL, HOWARD	Spring	BIOL 499 U 027	Undergraduate Problems	2
SNELL, HOWARD	Fall	BIOL 379 U 001	Conservation Biology	41
SNELL, HOWARD	Fall	BIOL 402 U 011	T: Conservation Biology	12
SNELL, HOWARD	Fall	BIOL 409 U 001	T: Wilderness Biology	8
POE, STEVEN	Fall	BIOL 551 M 004	Research Problems	3
POE, STEVEN	Fall	BIOL 699 P 024	Dissertation	9

POE, STEVEN	Spring	BIOL 551 M 024	Research Problems	2
POE, STEVEN	Spring	BIOL 699 P 024	Dissertation	14

COLLECTION MANAGEMENT

By the end of 2016, the collection has increased to 98,002 specimens. Students, staff, and collaborators of the division collected the majority of the 1,411 specimens that were added last year. The division's website was viewed 1,873 times. The collection manager handled 169 data requests in person and hosted several research visitors in the collection. Our outreach activities, in addition to general tours of the collection to over 200 visitors, included a variety of presentations and consultations. We presented on amphibians and reptiles at New Mexico Museum of Natural History and Science as well as to the City of Albuquerque and Bernalillo County Open Space Division programs. In addition, we gave presentations on ongoing research projects at regional and national meetings as well as gave invited lectures internally (at UNM).

AWARDS, GRANTS, AND CONTRACTS (TO MSB CURATOR OR STAFF)

Poe, S; RAC grant received "Empirical test of the native-nonnative distinction, $10,000

Snell, HL; UNM Teaching Allocation Grant: "Wilderness Biology" $5,000

Snell, HL, Giermakowski, JT, and MJ Ryan: "2016 Surveys of the Arizona Toad throughout its range in New Mexico", New Mexico Department of Game and Fish. $33,500

McCollough and **J.T. Giermakowski**. "Information Development for Species of Greatest Conservation Need". New Mexico Department of Game and Fish. $153,163.

PUBLICATIONS (BY MSB CURATOR, CM OR OTHER PAID STAFF)=

Journal Articles (ONLY THOSE PUBLISHED IN 2016, NOT IN PRESS)

Clause, A. G., C. J. Pavón-Vázquez, P. A. Scott, C. M. Murphy, E. W. Schaad, and L.N. **Gray**. 2016. Identification uncertainty and proposed best-practices for documenting herpetofaunal geographic distributions, with applied examples from southern Mexico. Mesoamerican Herpetology 3:976–1000.

Gratwicke B, et al. (**Ryan** 17th author). 2016. Evaluating the probability of avoiding disease-related extinctions of Panamanian amphibians through captive-breeding programs. Animal Conservation, 19:324–336.

Giermakowski, J.T., and S. Bauernfeind. 2016. Geographic distribution. *Tantilla nigriceps* (Plains Black-headed Snake). Herpetological Review 47:429.

Giermakowski, J.T., and L.J.S. Pierce. 2016. Geographic distribution. *Pseudemys gorzugi* (Rio Grande Cooter). Herpetological Review 47:626.

Gray, L. N., R. Meza-Lázaro, S. **Poe**, and A. Nieto-Montes de Oca. 2016. A new species of semiaquatic *Anolis* (Squamata: Dactyloidae) from Oaxaca and Veracruz, Mexico. Herpetological Journal 26:253–262.

Latella IM, TK Kennedy, & MJ **Ryan**. *Lampropeltis alterna* (Graybanded Kingsnake). Range Extension. Herpetological Review, 47:426–427.

Marshall M, MJ **Ryan**, & JD Camper. *Eleutherodactylus planirostris* (Greenhouse Frog), Range Extension. Herpetological Review, 47:247.

Poe, S. 2016. Review of The Anoles (Reptilia: Squamata: Dactyloidae: Anolis: *Norops*) of Honduras. The Quarterly Review of Biology 91(2):227-228.

Ryan, MJ, IM **Latella**, JT **Giermakowski**, HL **Snell**, S **Poe**, R Pangle, N Gehres, W Pockman, WN Mcdowell. 2016. Too dry for lizards: short-term rainfall influence on lizard microhabitat use in an experimental rainfall manipulation within a piñon-juniper woodland. Functional Ecology 30:964–973.

Ryan, M. J., I. M. **Latella**, G. Gustafson, J. T. **Giermakowski**, and H. L. **Snell**. 2016. *Anaxyrus microscaphus* (Arizona Toad). Natural History Note (diet). Herpetological Review 47:436.

Willows-Munro, S., Dowler, R. C., Jarcho, M. R., Phillips, R. B., **Snell**, H. L., Wilbert, T. R. and Edwards, C. W. (2016), Cryptic diversity in Black rats *Rattus rattus* of the Galápagos Islands, Ecuador. Ecology and Evolution, 6: 3721–3733. doi: 10.1002/ece3.2033

Books

Gentile, G., C. Marquez, H. L. **Snell**, W. Tapia, and A. Izurieta. 2016. Conservation of a New Flagship Species: The Galápagos Pink Land Iguana (*Conolophus marthae* Gentile and Snell, 2009). Pages 315–336*in* F. M. Angelici, editor.Problematic Wildlife. Springer International Publishing, Cham.

Technical Reports

Hatten, J. R., J. T. **Giermakowski**, J. A. Holmes, E. M. Nowak, M. J. Johnson, K. E. Ironside, M. Peters, C. Truettner, and K. L. Cole. 2016. Identifying bird and reptile vulnerabilities to climate change in the southwestern United States. US Geological Survey.

Giermakowski, J. T., J. R. Hatten, M. J. Johnson, J. A. Holmes, and E. M. Nowak. 2016. Effects of Changing Climate and Water Availability on Four Riparian Species in the Southwestern United States.

Ryan MJ, IM **Latella**, TJ **Giermakowski**, & H **Snell**. Effects of El Niño on breeding behavior of the Arizona Toad (*Anaxyrus microscaphus*) in New Mexico. New Mexico Department of Game & Fish, Interim Report, 12 pp.

Ryan, MJ. Comments on the species status of the Gray Checkered Whiptail in New Mexico and implications for continued protection in New Mexico. Official Comments to New Mexico Department of Game and Fish.

Publications Based on MSB Specimens/Data
(OTHER THAN THOSE REPORTED ABOVE)

Arteaga, A., R. A. Pyron, N. Peñafiel, P. Romero-Barreto, J. Culebras, L. Bustamante, M. H. Yánez-Muñoz, and J. M. Guayasamin. 2016. Comparative Phylogeography Reveals Cryptic Diversity and Repeated Patterns of Cladogenesis for Amphibians and Reptiles in Northwestern Ecuador. PLOS ONE 11:e0151746.

Cunningham, H. R., L. J. Rissler, L. B. Buckley, and M. C. Urban. 2016. Abiotic and biotic constraints across reptile and amphibian ranges. Ecography 39:1–8.

Goldberg, S. R. 2016. Reproduction in the Plains Black-headed Snake, *Tantilla nigriceps* (Serpentes, Colubridae) from New Mexico. Sonoran Herpetologist 29:49–50.

López-Alcaide, S., M. Nakamura, E. N. Smith, and E. Martínez-Meyer. 2016. Would behavioral thermoregulation enables pregnant viviparous tropical lizards to cope with a warmer world? Integrative Zoology:1–47.

Parra-Olea, G., S. M. Rovito, M. García-París, J. A. Maisano, D. B. Wake, and J. Hanken. 2016. Biology of tiny animals: three new species of minute salamanders (Plethodontidae: *Thorius*) from Oaxaca, Mexico. PeerJ 4:e2694.

Pelletier, T. A., and B. C. Carstens. 2016. Comparing range evolution in two western Plethodon salamanders: glacial refugia, competition, ecological niches, and spatial sorting. Journal of Biogeography 43:2237–2249.

Quintero-Díaz, G. E., A. Cardona-Arceo, and R. A. Carbajal-Márquez. 2016. The Great Plains Ratsnake, *Pantherophis emoryi* Baird & Girard, 1853, (Squamata: Colubridae), a new state record from Aguascalientes, México. Check List 12:1903.

Stratmann, T. S. M., K. Barrett, and T. M. Floyd. 2016. Locating suitable habitat for a rare species: Evaluation of a species distribution model for bog turtles (*Glyptemys muhlenbergii*) in the southeastern United States. Herpetological Conservation and Biology 11:199–213.

Troia, M. J., and R. A. McManamay. 2016. Filling in the GAPS: evaluating completeness and coverage of open-access biodiversity databases in the United States. Ecology and Evolution 6:4654–4669.

Wright, A. N., M. W. Schwartz, R. J. Hijmans, and H. Bradley Shaffer. 2016. Advances in climate models from CMIP3 to CMIP5 do not change predictions of future habitat suitability for California reptiles and amphibians. Climatic Change 134:579–591.

ACTIVITIES IN LEARNED SOCIETIES

Invited Talks

Ryan
Spring 2016, Tropical Biology – Tropical Amphibian Ecology & Conservation, Lecture

Giermakowski
Fall 2016, Global Change Biology – Species Distribution Modeling and Climate Change, Lecture

Contributed Talks/Posters (*presenter)

Giermakowski, JT*, EM Nowak, JR Hatten, MJ Johnson JA Holmes, M Peters. Current and future landscape-level suitability models for two species of gartersnakes from Arizona and New Mexico and their implications for management. Joint Annual Meeting of the AZ and NM Chapters of The Wildlife Society, Flagstaff, Arizona. February.

Giermakowski, JT*, JR Hatten, MJ Johnson, JA Holmes, EM Nowak. Effects of Changing Climate and Water Availability on Four Riparian Species in the Southwestern United States. Resource Modelling Association World Conference, Flagstaff, Arizona. June.

Ryan, MJ*. Too dry for lizards: rainfall influence on lizard microhabitat use in an experimental rainfall manipulation within a piñon-juniper. Joint Annual Meeting of the AZ and NM Chapters of The Wildlife Society, Flagstaff, AZ.

Ryan, MJ*. Population status and threats to the Boreal Chorus frog in New Mexico. Chiricahua Leopard Annual Meeting, Truth or Consequences, NM.

Ryan, MJ*. Impacts of climate change on arid adapted lizards. University of Nevada, Reno Ecology and Evolution Group, Reno, NV.

Attendance at Professional Meetings

Giermakowski, JT. World Conference on Natural Resource Modelling, Flagstaff, AZ, June.
Giermakowski, JT. Joint Annual Meeting of the AZ and NM Chapters of The Wildlife Society, Flagstaff, AZ.
Ryan, MJ. Joint Annual Meeting of the AZ and NM Chapters of The Wildlife Society, Flagstaff, AZ.

Service as Editor or on Editorial Board of a Journal

S. Poe. Phyllomedusa (Associate Editor)

OTHER PROFESSIONAL ACTIVITIES

Presentation to General Audience in a Scholarly Capacity

J.T. Giermakowski

Frogs and Toads of the Rio Grande Valley. Presentation to the Bernalillo Open Space Program, Albuquerque, New Mexico. March.

Frogs and Toads of the Rio Grande Valley. Presentation to the Valle del Oro National Wildlife Refuge, New Mexico. August.

Scholarly Service as a Member of a Local/State/Regional/National Committee, Panel, etc.

H.L. Snell.
Member of IUCN SSC Iguana Specialist Group 2013-2016.

Member of New Mexico Department of Game and Fish Species Recovery Team for Boreal Toads and Gila Monsters. New Mexico Department of Game & Fish.

Elected Board Member, Tierra Grande Improvement Association (organization that administers 15,000 acres of protected areas in southern Manzano Mountains, Valencia County).

J.T. Giermakowski.
Webmaster of the Southwestern Partners in Amphibian and Reptile Conservation Steering Committee.

Member of Collections Committee for the American Society of Ichthyologists and Herpetologists.

Member of New Mexico Department of Game & Fish Species Recovery Board.

Appointed to University of New Mexico Institutional Animal Care and Use Committee. 2016-2018.

Journal Referee

Ryan
Canadian Journal of Fisheries and Aquatic Sciences
Evolutionary Ecology
Integrative Zoology
Herpetological Conservation and Biology (2x)
Mesoamerican Herpetology (2x)
United States Geological Survey Publications

10. SERVICE

NAME	COMMITTEE/SERVICE	CHAIR (Y/N)
SNELL	Associate Chair	
SNELL	Curator, Division of Herpetology, MSB	

SNELL	Coordinator, Conservation Biology Concentration	
SNELL	Annual Faculty Review	Y
SNELL	Lecturer Promotion	Y
SNELL	Tenure & Promotion	Y
SNELL	MSB Publications Committee	Y
SNELL	MSB Executive Committee	N
SNELL	Adhoc Task Force - Means of Replacing Retired University Secretary	N

CURRENT STAFF

Faculty/Staff

H.L. Snell, Curator
W.H. Degenhardt, Curator Emeritus
Poe, S., Associate Professor and Associate Curator

J.T. Giermakowski, Collection Manager

Loughran, C.L. Graduate Assistant (Spring and Fall)

Graduate students

Gray, L.N., Ph.D. /Poe
Latella, I.M., Ph.D./Poe
Loughran, C.L., Ph.D/Wolf

Undergraduate Student Workers and Volunteers

Castillo, Shelby, Student employee.
Cruz, Paxton. Student employee.
Isom, Kaylee. Student employee.
McMenomy, Charlie. Student employee.
White, Brittney. Student employee.

MUSEUM ASSOCIATES

A. Curatorial Associates

Pierce, L.J.S., New Mexico Dept. of Game & Fish
Stuart, J.N., New Mexico Dept. of Game & Fish

Research Associates
Fitzgerald, L., Texas A&M University
Fritts, T.H., retired

Division of Arthropods

TABLE OF COLLECTION USE

2016
1. Collection: growth & current size (New Specimens Cataloged/total specimens) 7877 added to SCAN
2. Loans Out 3
3. Professional Visitors to the Collections 1
4. Collection Database Web Site Hits 32,043
6. Outside Publications Citing MSB Specimens 0
7. Peer-Reviewed Publications by Staff 9
8. Graduate Students (using or working in collections) 3
9. Graduate Theses/Dissertations Completed (UNM/Other*) 1
10. Undergraduate Students (using or working in collections) 3

* List Other Institutions

COURSES USING THE COLLECTIONS

NTSC 262 (College of Education), Life Sciences, one visit to museum (Jon & Sandy), 26 students
BIOL/419/519 Natural History Collections Curatorial Techniques (Sandy, Dave), 18 students

COURSES TAUGHT BY MSB PERSONNEL

Faculty/Collection Managers

CURATOR

BIOL 203	Animal Sexual Strategies	171

COLLECTION MANAGERS

BIOL 419/519	Natural History Collections Curatorial Techniques	18

COLLECTION MANAGEMENT

New collection: We received almost all of the crustaceans/mollusks from the NM Dept. of Game and Fish; the field notebooks and a few specimens will be transferred in early 2017. This collection fills most of the remaining space in the arthropod alcohol collection; once specimens are curated and moved to smaller containers, some space will be recovered.

SCAN database: TCN funding covered NAU undergraduate Caitlin Chapman's work to complete specimen georeferencing; Mark Ward added many specimens to the Bandelier pinned collection and Sandy added all the pinned specimens to SCAN (2823 records); Rachael labeled and databased many of the spiders collected from Nicaragua; Sandy edited and uploaded 3660 specimen records from White Sands/Cuatro Cienegas to SCAN; MSBA records are now being sent to GBIF in addition to the iDigBio portal; TCN funding ended June 30.

Other collection activity: Darren Pollock and Lisa Reichert kindly identified 258 MSBA asilid specimens to genus or species level; GA Rachael Alfaro shifted the spider collection to match the current phylogeny of the order, as it will be in the new *Spiders of North America Identification Manual* (due Spring 2017); intern Jaylen Quintana inventoried and labeled the legacy Bandelier collection of Warren Pippin (1980s); during the Fall semester three undergraduate students worked with us to sort backlogged samples from Bandelier and the Valles Caldera.

AWARDS, GRANTS, AND CONTRACTS (TO MSB CURATOR OR STAFF)

Department of Agriculture (K.B. Miller, PI). Promoting undergraduate research in systematics: Insects as a template for training. ($60,000), 2016-2021.

NSF Systematic Biology and Biodiversity Inventories Grant #DEB–1353426 (K.B. Miller, PI). The Phylogeny of Diving Beetles and Extreme Diversification of Sexual Strategies ($520,000), 2014-2016. ($15,000 REU supplement).

NSF Emerging Frontiers Grant #EF-1207371, (N. Cobb, PI: K.B. Miller, Co–PI). Digitization TCN: Collaborative Research: Southwest Collections of Arthropods Network (SCAN): A Model for Collections Digitization to Promote Taxonomic and Ecological Research ($366,333), 2012-2015; no-cost extension through June 30, 2016.

Valles Caldera National Preserve (NPS) Cooperative Agreement P16AC00421 (K.B. Miller, P.I., M.A. Ward, Senior Scientist, S.L. Brantley, Collection Manager). Successional changes in arthropod assemblages during watershed restoration and fire management in the Jemez Mountains, New Mexico ($106,000) 2016-2017.

2016 Alvin R. and Caroline G. Grove Summer Research Scholarship ($2250), Rachael Alfaro, to cover costs of travel for SEM imaging of spiders at California Academy of Sciences and to continue maintaining the Nicaraguan spider colony within the lab

2016 Spring GRAC Research Grant ($400), Rachael Alfaro, to cover costs associated with specimen preparation for SEM imaging of spiders at California Academy of Sciences

2016 Spring GRAC Travel Grant ($150), Rachael Alfaro, to cover travel to the 25th International Arachnology Congress

PUBLICATIONS (BY MSB CURATOR, CM OR OTHER PAID STAFF)

A. Journal Articles (ONLY THOSE PUBLISHED IN 2016, NOT IN PRESS)

Brantley, S.L., C.A. Chapman, and N.S. Cobb. Influence of habitat and region on spider communities along two elevation gradients in the southwestern U.S. Chapter G, pages 59-69 in Ralston, B.E., ed. Proceedings of the 12th biennial conference of research on the Colorado Plateau. U.S. Geological Survey Scientific Investigations Report 2015-5180. http://dx.doi.org/10.3133/sir20155180.

Miller, K.B. 2016. Revision of the Neotropical diving beetle genus *Hydrodessus* J. Balfour-Browne, 1953 (Coleoptera, Dytiscidae, Hydroporinae, Bidessini). *ZooKeys*, 580: 45–124.

Gustafson, G., A.E.Z. Short, and **K.B. Miller.** 2016. New species of diving beetles of the *Platynectes* Régimbart, 1897 *sensu stricto* (Dytiscidae: Agabinae: Hydrotrupini) from the Guiana Shield. *Zookeys*. In press.

Miller, K.B. 2016. *Novadessus viracocha*, a new genus and species of Bidessini Sharp from Peru (Coleoptera, Adephaga, Dytiscidae, Hydroporinae). *ZooKeys*, 623: 125-130.

Miller, K.B. 2016. New species of *Bidessonotus* Régimbart, 1895 with a review of the South American species (Coleoptera, Adephaga, Dytiscidae, Hydroporinae, Bidessini). *ZooKeys*, 622: 95-127.

Leister, M, and **K.B. Miller.** 2016. First description of the male *Hoedillus sexpunctatus* Simon, 1898; a redescription of the female, and transfer of *Hoedillus* to Zoropsidae Bertkau, 1882 (Araneae). *Zootaxa*, 4107: 447-450.

Kanda, K., Gomez, R.A., Van Driesche, R., **Miller, K.B.,** Maddison, D.R. 2016. Phylogenetic placement of the Pacific Northwest subterranean endemic diving beetle *Stygoporus oregonensis* Larson & LaBonte (Dytiscidae, Hydroporinae). *ZooKeys*, 632: 75-91.

Gustafson G.T. and **K.B. Miller**. 2016. Revision of the southeast Asian whirligig beetle genus *Porrorhynchus* Laporte, 1835 (Coleoptera: Gyrinidae: Gyrininae: Dineutini). *The Coleopterists Bulletin*, 70: 675-714.

Books

Miller, K.B. and J. Bergsten. 2016. *The Diving Beetles of the World: Systematics and Biology of the Dytiscidae*. Johns-Hopkins University Press, Baltimore, Maryland. 320pp.

Dissertations/Theses Completed

Gustafson, G.T. Phylogenetics and diversification of whirligig beetles. Ph.D. Dissertation

ACTIVITIES IN LEARNED SOCIETIES

Contributed Talks/Posters (*presenter)

***Brantley, S.L.** Spider responses to wildfire. Poster. Research meeting, Southwest Jemez Mountains Resilient Landscapes and Collaborative Forest Landscape Restoration Project (CFLRP), Santa Fe, NM. April

***Brantley, S.L.** Signal in the noise: use of long-term spider data. Poster. International Congress of Arachnology, Golden, CO. July.

***Alfaro, R.E.** Comparative spigot ontogeny and morphology across the Lycosoidea. Presentation. International Congress of Arachnology, Golden, CO. July

***Leister, M.P.** Spider diversity in the Rio Grande bosque. Presentation. Crawford Symposium, Bosque Ecosystem Monitoring Program (BEMP), Albuquerque, NM. March

***Wright, K.W.** Evolution of diet breadth of *Melissodes* bees. International Congress of Entomology, FL. November.

C. Attendance at Professional Meetings

Brantley, S.L. Southwest Jemez Mountains Resilient Landscapes and Collaborative Forest Landscape Restoration Project (CFLRP), Santa Fe, NM. April

Brantley, S.L. International Congress of Arachnology, Golden, CO. July

Alfaro, R.E. International Congress of Arachnology, Golden, CO. July

Wright, K.W. International Congress of Entomology, Orlando, FL. November

Wright, K.W. Entomological Collections Network Annual Meeting, Orlando, FL. November.

Miller, K.B. International Congress of Entomology Meeting, Orlando, FL. November.

OTHER PROFESSIONAL ACTIVITIES

<u>Presentation to General Audience in a Scholarly Capacity</u>

PRESENTER

Brantley, S.L. Arthropod identifications and information for NPS Centennial BioBlitzes at Bandelier National Monument (May) and Valles Caldera National Preserve (August)

Brantley, S.L. Insects of New Mexico. City of Albuquerque Open Space lecture series. June

Brantley, S.L. and **D.C. Lightfoot**. Article by Ollie Reed in the *Albuquerque Journal* about the long-term arthropod study at Bandelier National Monument. November

Alfaro, R.E. *Tengella perfuga*: an evolutionary conundrum? Spiders: Species rediscovery and evolutionary questions. Bernalillo County Open Space lecture series, August

Alfaro, R.E. Article by Cody Hooks in *The Taos News* about tarantulas and the male 'migration', October

Sandra Brantley giving Albuquerque Open Space talk, June, 2016.

SERVICE

Several museum tours, including El Dorado High School AP Biology students (33), loan of teaching specimens (bees) for K-12 group (borrowed by Yadeeh Sawyer); tour for a private school K-8 students (20); tour and educational visit with a young girl very interested in entomology and her family; participated in freshman recruitment through Tim Schroeder's (UNM's STEM Collaborative Center director) "Road Trips" on campus to highlight science programs.

DONATIONS AND GIFTS RECEIVED

258 MSB asilids identified by Darren Pollock and Lisa Reichert

130 beetles from Karen Wright (mostly bycatch from her bee traps)

CURRENT STAFF

Faculty/Staff
Kelly Miller, Curator, Associate Professor
Sandra Brantley, Senior collection manager, Research Assoc. Professor
David Lightfoot, Senior collection manager, Research Assoc. Professor

Graduate students
Rachael Alfaro, Ph.D. candidate
Grey Gustafson, Ph.D. candidate
Matthew Leister, Master's student
Karen Wright, Ph.D. candidate

Undergraduate Student Workers and Volunteers
Lozen Benson
Caitlin Chapman (through TCN funding)
Joaquin Garcia
Katie Klonis
Kateri Lopez
Wesley Noe
Jaylen Quintana (UNM Los Alamos intern in the Accelerate Program)

MUSEUM ASSOCIATES

Research Associates
Robert Parmenter, Valles Caldera National Preserve
Ernest Valdez, NM Landscapes Field Station
Mark Ward, UNM/Valles Caldera National Preserve Research Scientist

DIVISION OF BIRDS

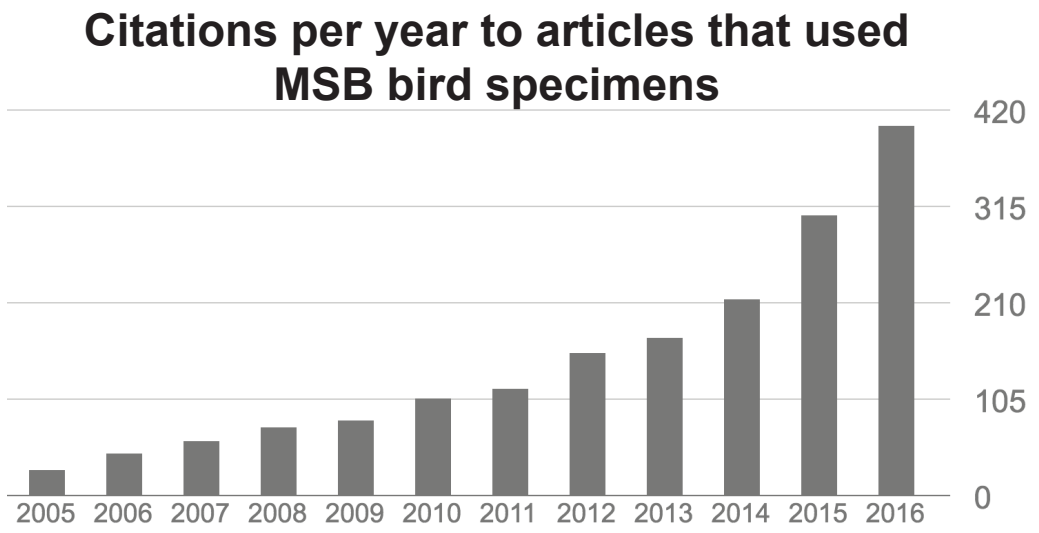
Highlights & Major events in 2016

- Major paper in *PNAS* on island evolution in birds.
- Major paper in *Nature Communications* about passerine diversification and biogeography.
- Major paper in *Nature Communications* about horizontal transfer of DNA between nematodes and birds.
- Major paper in *Science* about hemoglobin adaptation in birds.
- Major paper in *eLife* about evolution of avian carotenoid pigments.
- Arrival of four new graduate students (McCoullough, Brady, Williamson, Gadek) and one NSF Postdoctoral Fellow (Barrow)
- Graduation of two M.S. (Gaffney and Chavez) and one Ph.D. student (Beckman), all of whom moved on directly to competitive jobs in their field (USFWS, BLM, and University of Montana Philip Wright Museum, respectively).
- First major collecting efforts focused on sampling of New Mexico breeding bird communities in 21st century.
- Airing of *PBS Nature* documentary, *Super Hummingbirds*, featuring MSB research and viewed by over three-million people.
- New funded project on avian malaria of New Mexico, in cooperation with the Bureau of Land Management.
- Annual citations for publications based on the collection accelerates past 400 (up 33% in one year!).
- First *UNM Ornithology Retreat* to the Sevilleta, December 2016.

By the Numbers: MSB's metrics of productivity for the Bird Division, 2016:

1. Collection Growth (Specimens Cataloged): 1,026 specimens added, bringing total to ~46,000.
2. Outgoing Loans 2016: Twenty-three.
3. Professional visits to collection: Four.
4. Collection Database Hits: 14,888 queries returning 1,341,142 records.
5. Outside Publications Citing MSB Specimens: 14 (but 24 total publications that were based on collection in 2016, when including those by MSB personnel; we think the latter number is the one that MSB should be tracking).
6. Peer-Reviewed Publications by Staff: Fourteen (includes curator, research associate, and student authors, using MSB byline); 10 of these utilized specimens and/or specimen data from the MSB Bird Collection.
7. Graduate Students using or working in the collection: Eight.
8. Graduate Theses/Dissertations Completed: Three UNM; one external; one undergraduate honors thesis.
9. Undergraduate Students using or working in the collection: Twelve.

Figure 1. Exponential citations growth continues through 2016 for the MSB Bird Division. Source: *Google Scholar*.



TEACHING IMPACT OF THE MSB BIRD DIVISION

PART 3: UNM courses using the collection (specimens, data, electronic archives and other resources provided by the MSB Bird Division).

2016 semester	Course No.	Title	Students	Credit hrs.
Spring	BIOL 300 U 001	Evolution	24	72
Spring	BIOL 400 U 035	Senior Honors Thesis	2	3
Spring	BIOL 402 U 001	T: Brown Bag Research Seminar	29	29
Spring	BIOL 499 U 035	Undergraduate Problems	2	4
Spring	BIOL 502 M 001	T: Brown Bag Research Seminar	5	5
Spring	BIOL 502 M 045	T: Molecular Systematic Disc	1	1
Spring	BIOL 551 M 035	Research Problems	1	2
Spring	BIOL 599 M 035	Masters Thesis	2	3
Spring	BIOL 699 P 035	Dissertation	1	6
Fall	BIOL 402 U 001	T: Brown Bag Research Seminar	25	25
Fall	BIOL 419 U 002	T: High Altitude Biology	36	108
Fall	BIOL 502 M 001	T: Brown Bag Research Seminar	2	2
Fall	BIOL 502 M 026	T: Molecular Systematics Disc	1	1
Fall	BIOL 519 M 011	T: High Altitude Biology	5	15

Fall	BIOL 599 M 035	Masters Thesis	2	7
Fall	BIOL 699 P 035	Dissertation	1	3
Spring	BIOL 402 U 032	T: Avian Sci Specimen Prep	7	7
Spring	BIOL 402 U 012	T: Systematics Discusn Group	3	3
Spring	BIOL 499 U 004	Undergraduate Problems	1	2
Fall	BIOL 386L U 001	General Vertebrate Zoology	24	96
Fall	BIOL 386L U 002	General Vertebrate Zoology	28	112
Fall	BIOL 402 U 003	T: Avian Biogeoraphy Discussn	1	1
Fall	BIOL 499 U 060	Undergraduate Problems	1	1
Fall	BIOL 502 M 003	T: Avian Biogeoraphy Discussn	2	2
Spring	BIOL 386L U 001	General Vertebrate Zoology	24	96
Spring	BIOL 386L U 002	General Vertebrate Zoology	28	112

[Part 4. All courses listed taught in whole or in part by MSB Bird Division faculty curators and staff.]

Part 5. Collection Management.
In 2016, the Bird Division experienced unprecedented collections growth due to research activity in the Southwestern United States. We added 48 Arizona specimens, and 464 New Mexico specimens. This activity was mostly driven by three projects: BLM-sponsored project to survey Avian Malaria in New Mexico, and our ongoing division projects to understand migratory connectivity of New Mexico Yellow-rumped Warblers (led by the Schmitt family) and Hermit Thrushes (led by M. J. Baumann). The specimen preparation lab was more productive than ever before in 2016, with all graduate students, the curators, one post-doc, and several undergraduates participating. We were fortunate to have hired a dedicated, part-time post-bac preparator, Selina Bauernfeind, who prepared ~240 high-quality specimens in 2016. Additional strong contributions were made by students (especially Jenna McCoullough, Chauncey Gadek, Xena Mapel, Andrea Chavez, Ariel Gaffney, et al.) and Research Associates (M. J. Baumann, D. C. Schmitt, C. G. Schmitt).

RESEARCH IMPACTS OF THE MSB BIRD DIVISION

Part 6. AWARDS, GRANTS, AND CONTRACTS (Active grants and contracts to Curators or Staff for curation and/or specimen-based research)

2011-2017: Montane Biogeography Revealed by Quirks of the Evolutionary Process: Integrative Respiratory Phenotypes for Andean Birds; P.I.: C. C. Witt; co-P.I. Blair Wolf; co-P.I. Joann Mudge; National Science Foundation (Evolutionary Processes Cluster); $673,000; DEB-1146491.

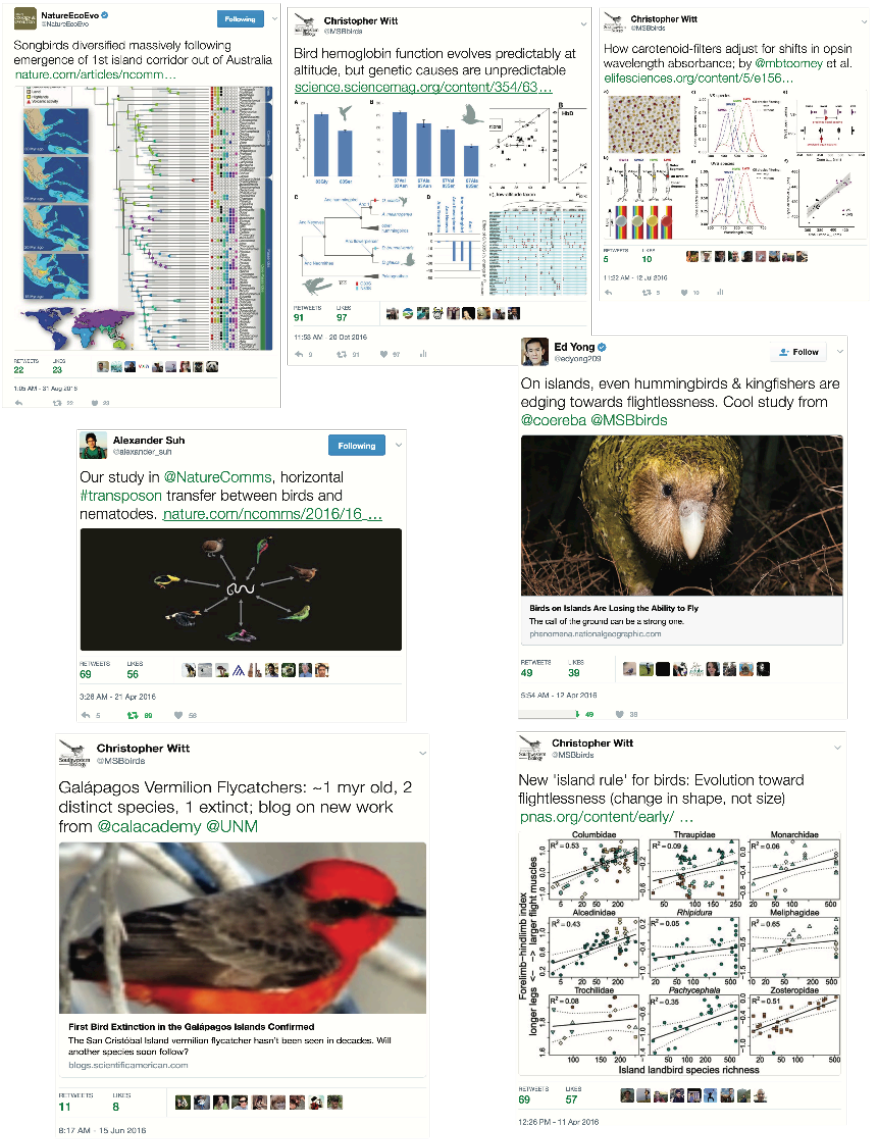
2016-2021: BLM Cooperative Agreement: Avian Malaria of New Mexico. PI: C. C. Witt; $100,000.

2015-2018: Collaborative Research: Causes of parallel molecular evolution: insights from protein engineering; P.I. (UNL): J. F. Storz; P.I. (UNM): C.C. Witt. $37,247 (UNM portion).

2016 -2021: Collaborative Research: Discovery and analysis in the cradle of speciation theory: biotic surveys of Melanesia's terrestrial vertebrates. P.I. (KU): R. G. Moyle; PI (AMNH): C. Filardi; P.I. (UNM): M. J. Andersen. $348,769 (UNM portion).

2016-2019: CSBR: Natural History: Upgrade and transfer of the Museum of Southwestern Biologys Division of Genomic Resources frozen tissue collection to Nitrogen vapor storage.
P.I. J. A. Cook, co-PI C. C. Witt, et al.; NSF Biological Research Collections Grant; $499,000.

Figure 2. Social media highlights from 2016, based on MSB Bird Division research.



Part. 7. PUBLICATIONS

A. Publications by personnel: (17 total; includes three theses and dissertations; only includes 2016 publications that have "Museum of Southwestern Biology" as part of the authors' affiliations)

Carriker, Colin R; Mermier, Christine M; VanDusseldorp, Trisha A; Johnson, Kelly E; Beltz, Nicholas M; Vaughan, Roger A; McCormick, James J; Cole, Nathan H; Witt, Christopher C; Gibson, Ann L; Effect of Acute Dietary Nitrate Consumption on Oxygen Consumption During Submaximal Exercise in Hypobaric Hypoxia, International journal of sport nutrition and exercise metabolism, 26, 4, 315-322, 2016.

Ortiz-Ramirez, Marco F; Andersen, Michael J; Zaldavar-Riverin, Alejandro; Ornelas, Juan Francisco; Navarro-Sigienza, Adolfo G; Geographic isolation drives divergence of uncorrelated genetic and song variation in the Ruddy-capped Nightingale-Thrush (Catharus frantzii; Aves: Turdidae), Molecular phylogenetics and evolution, 94, 74-86, 2016, Elsevier.

Benham, Phred M; Witt, Christopher C; The dual role of Andean topography in primary divergence: functional and neutral variation among populations of the hummingbird, Metallura tyrianthina, BMC evolutionary biology, 16, 1, 22, 2016, BioMed Central.

Johnson, Andrew; Robert W. Dickerman, 1926-2015, The Auk, 2016, The American Ornithologists' Union.

Wright, Natalie A; Steadman, David W; Witt, Christopher C; Predictable evolution toward flightlessness in volant island birds, Proceedings of the National Academy of Sciences, 201522931, 2016, National Acad Sciences.

Suh, Alexander; Witt, Christopher C; Menger, Juliana; Sadanandan, Keren R; Podsiadlowski, Lars; Gerth, Michael; Weigert, Anne; McGuire, Jimmy A; Mudge, Joann; Edwards, Scott V; Ancient horizontal transfers of retrotransposons between birds and ancestors of human pathogenic nematodes, Nature communications, 7, 2016, Nature Publishing Group.

Clark, William S; Galen, Spencer C; Hull, Joshua M; Mayo, Megan A; Witt, Christopher C; Contrasting molecular and morphological evidence for the identification of an anomalous Buteo: a cautionary tale for hybrid diagnosis, PeerJ, 5, e2850, 2017, PeerJ Inc.

Carmi, Ore; Witt, Christopher C; Jaramillo, Alvaro; Dumbacher, John P; Phylogeography of the Vermilion Flycatcher species complex: Multiple speciation events, shifts in migratory behavior, and an apparent extinction of a Galapagos-endemic bird species, Molecular phylogenetics and evolution, 102, 152-173, 2016, Academic Press.

Toomey, Matthew B; Lind, Olle; Frederiksen, Rikard; Curley Jr, Robert W; Riedl, Ken M; Wilby, David; Schwartz, Steven J; Witt, Christopher C; Harrison, Earl H; Roberts, Nicholas W; Complementary shifts in photoreceptor spectral tuning unlock the full adaptive potential of ultraviolet vision in birds, ELife, 5, e15675, 2016, eLife Sciences Publications Limited.

Natarajan, Chandrasekhar; Hoffmann, Federico G; Weber, Roy E; Fago, Angela; Witt, Christopher C; Storz, Jay F; Predictable convergence in hemoglobin function has unpredictable molecular underpinnings, Science, 354, 6310, 336-339, 2016, American Association for the Advancement of Science.

Moyle, Robert G; Oliveros, Carl H; Andersen, Michael J; Hosner, Peter A; Benz, Brett W; Manthey, Joseph D; Travers, Scott L; Brown, Rafe M; Faircloth, Brant C; Tectonic collision and uplift of Wallacea triggered the global songbird radiation, Nature Communications, 7, 2016, Nature Research.

Raymond A. Meyer, Deanne T. Meliopoulos, Grant M. Beauprez, Sartor O. Williams III; Breeding of the Short-eared Owl in New Mexico, Western Birds, 47, 2, 151-160, 2016, Western Field Ornithologists.

Clait E. Braun, Sartor O. Williams III; History of Sage-grouse (Centrocercus spp.) in New Mexico, Southwestern Naturalist, 60, 207-211, 2016, Southwestern Association of Naturalists.

Williams III, Sartor O.; Checklist of New Mexico Bird Species, New Mexico Ornithological Society, 2016.

Beckman, E. J. 2016. Genomics of a rapid radiation, the Andean siskins. Ph.D. Dissertation. University of New Mexico, Albuquerque, NM, USA.

Gaffney, A. M. 2016. Experimental and genetic comparison of elevational replacement hummingbird species. MS Thesis. University of New Mexico, Albuquerque, NM, USA.

Chavez, A. N. 2016. Evolution of the cinereous conebill, and Andean elevational generalist. MS Thesis. University of New Mexico, Albuquerque, NM, USA.

D. Publications Based on MSB Specimens/Data: (24 total, includes 10 by division personnel, from list above; 14 by outside researchers; includes four theses and dissertations).

Abrahamson, Bethany; Evaluating the Utility of Natural History Collections in Research and for the Public, 2016.

Beckman, E. J. 2016. Genomics of a rapid radiation, the Andean siskins. Ph.D. Dissertation. University of New Mexico, Albuquerque, NM, USA.

Benham, Phred M; Witt, Christopher C; The dual role of Andean topography in primary divergence: functional and neutral variation among populations of the hummingbird, Metallura tyrianthina, BMC evolutionary biology, 16, 1, 22, 2016, BioMed Central

Bubac, Christine M; Spellman, Garth M; How connectivity shapes genetic structure during range expansion: Insights from the Virginia's Warbler, The Auk, 133, 2, 213-230, 2016, The American Ornithologists' Union

Carmi, Ore; Witt, Christopher C; Jaramillo, Alvaro; Dumbacher, John P; Phylogeography of the Vermilion Flycatcher species complex: Multiple speciation events, shifts in migratory behavior, and an apparent extinction of a Galapagos-endemic bird species, Molecular phylogenetics and evolution, 102, 152-173, 2016, Academic Press

Chavez, A. N. 2016. Evolution of the cinereous conebill, and Andean elevational generalist. MS Thesis. University of New Mexico, Albuquerque, NM, USA.

Clark, William S; Galen, Spencer C; Hull, Joshua M; Mayo, Megan A; Witt, Christopher C; Contrasting molecular and morphological evidence for the identification of an anomalous Buteo: a cautionary tale for hybrid diagnosis, PeerJ Preprints, 5, e2850, 2016, PeerJ Inc.

Conrad, Cyler; Higham, Charles; Eda, Masaki; Marwick, Ben; Palaeoecology and Forager Subsistence Strategies during the Pleistocene-Holocene Transition: A Reinvestigation of the Zooarchaeological Assemblage from Spirit Cave, Mae Hong Son Province, Thailand, Asian Perspectives, 55, 1, 27-Feb, 2016, University of Hawai'i Press

Conrad, Cyler; Jones, Emily Lena; Newsome, Seth D; Schwartz, Douglas W; Bone isotopes, eggshell and turkey husbandry at Arroyo Hondo Pueblo, Journal of Archaeological Science: Reports, 10, 566-574, 2016, Elsevier

Ebbs, Erika T; Loker, Eric S; Davis, Norm E; Flores, Veronica; Veleizan, Aylen; Brant, Sara V; Schistosomes with wings: how host phylogeny and ecology shape the global distribution of

Trichobilharzia querquedulae (Schistosomatidae), International journal for parasitology, 46, 10, 669-677, 2016, Elsevier
Etherington, Graham J; Mobley, Jason A; Molecular phylogeny, morphology and life-history comparisons within Circus cyaneus reveal the presence of two distinct evolutionary lineages, Avian Research, 7, 1, 17, 2016, BioMed Central
Gaffney, A. M. 2016. Experimental and genetic comparison of elevational replacement hummingbird species. MS Thesis. University of New Mexico, Albuquerque, NM, USA.
Grimstead, Deanna N; Reynolds, Amanda C; Hudson, Adam M; Akins, Nancy J; Betancourt, Julio L; Reduced population variance in strontium isotope ratios informs domesticated turkey use at Chaco Canyon, New Mexico, USA, Journal of Archaeological Method and Theory, 23, 1, 127-149, 2016, Springer US
Jones, Emily Lena; Conrad, Cyler; Newsome, Seth D; Kemp, Brian M; Kocer, Jacqueline Marie; Turkeys on the fringe: Variable husbandry in marginal areas of the prehistoric American Southwest, Journal of Archaeological Science: Reports, 10, 575-583, 2016, Elsevier
Kim, Stephanie Soun; The effects of sympatry on patterns of bill morphology between closely related species of birds, worldwide, 2016, Canadian theses
Macfarlane, Colin Bran Alexander; Natola, Libby; Brown, Mike W; Burg, Theresa M; Population genetic isolation and limited connectivity in the purple finch (Haemorhous purpureus), Ecology and Evolution, 6, 22, 8304-8317, 2016, Wiley Online Library
May, Roy H; Colecciones de aves de Costa Rica., Zeledonia, 20, 1, 2016.
Natarajan, Chandrasekhar; Hoffmann, Federico G; Weber, Roy E; Fago, Angela; Witt, Christopher C; Storz, Jay F; Predictable convergence in hemoglobin function has unpredictable molecular underpinnings, Science, 354, 6310, 336-339, 2016, American Association for the Advancement of Science
Persons, Nicholas W; Hosner, Peter A; Meiklejohn, Kelly A; Braun, Edward L; Kimball, Rebecca T; Sorting out relationships among the grouse and ptarmigan using intron, mitochondrial, and ultra-conserved element sequences, Molecular phylogenetics and evolution, 98, 123-132, 2016, Elsevier
Rodgers, Randy D; A history of lesser prairie-chickens, Ecology and conservation of lesser prairie-chickens. Studies in avian biology (DA Haukos and CW Boal, editors). CRC Press, Boca Raton, Florida, 15-38, 2016.
Roulin, Alexandre; Evolutionary tradeâ€□off between naturally and sexually selected melanin based colour traits in worldwide barn owls and allies, Biological Journal of the Linnean Society, 119, 2, 455-476, 2016, Wiley Online Library
Suh, Alexander; Witt, Christopher C; Menger, Juliana; Sadanandan, Keren R; Podsiadlowski, Lars; Gerth, Michael; Weigert, Anne; McGuire, Jimmy A; Mudge, Joann; Edwards, Scott V; Ancient horizontal transfers of retrotransposons between birds and ancestors of human pathogenic nematodes, Nature communications, 7, 2016, Nature Publishing Group
Toomey, Matthew B; Lind, Olle; Frederiksen, Rikard; Curley Jr, Robert W; Riedl, Ken M; Wilby, David; Schwartz, Steven J; Witt, Christopher C; Harrison, Earl H; Roberts, Nicholas W; Complementary shifts in photoreceptor spectral tuning unlock the full adaptive potential of ultraviolet vision in birds, ELife, 5, e15675, 2016, eLife Sciences Publications Limited
Wright, Natalie A; Steadman, David W; Witt, Christopher C; Predictable evolution toward flightlessness in volant island birds, Proceedings of the National Academy of Sciences, 201522931, 2016, National Acad Sciences.

Part 9: OTHER PROFESSIONAL ACTIVITIES

A. Outreach (selected examples)

Johnson, A.B. Bird Research: Relationships Among Species and Patterns of Global Diversity Bachechi Naturalist Series, Bachechi Open Space 19 November 2016.

Witt, C. C. 2016. *Bird Life, Elevated.* NM PBS Science Cafe Event, Highland Theater, Albuquerque, NM, October 20.

Witt, C. C. 2016. *Bird Life, Elevated.* Invited talk at Denver Museum of Natural History, Denver, Colorado, November 8.

PBS Nature documentary, *Super Hummingbirds*, featuring MSB hummingbird research and viewed by over three-million people.

12. DONATIONS AND GIFTS RECEIVED

The following individuals donated to the Museum of Southwestern Biology Division of Birds in 2016:

Matthew J. Baumann
Andrea N. Chavez
David Marchiondo
Thomas P. Witt

13. CURRENT STAFF (See webpage: http://msb.unm.edu/divisions/birds/people/index.html)

A. Faculty/Staff

Christopher Witt, Curator
Michael Andersen, Associate Curator
Blair Wolf, Associate Curator
Andrew Johnson, Senior Collections Manager
Lisa N. Barrow, NSF Postdoctoral Fellow

Figure 3. Most personnel affiliated with the MSB Bird Division (a.k.a. *UNM Ornithology*) as of the end of 2016, as depicted on the 2017 UNM Ornithology Poster.

B. Graduate students affiliated with the MSB Division of Birds in 2016. These students are formally trained by our division in curatorial practices and standards of field data collection, specimen preservation, and institutional animal care guidelines.

Elizabeth Beckman, Ph.D, 2016
Andrea Chavez, M.S., 2016
Ariel Gaffney, M.S., 2016
Chauncey Gadek, M.S. in progress
Jessie Williamson, Ph.D. in progress
Serina Brady, M.S. in progress
Jenna McCullough, M.S. in progress

C. Undergraduate Student Workers and Volunteers. These students are formally trained by our division in curatorial practices and standards in the museum collection; a subset are also trained in field protocols, specimen preparation, and institutional animal care guidelines. This list includes undergraduates who are employed through Federal or State Work-Study programs, externally funded research grants and contracts, or education-training programs.
Selina Bauernfeind
Katrina Derieg
Jason Kitting
Anh Nguyen
Paula Barteau
Myranda Robinson
Adam Henry
Celina Aguilar
Xena Mapel

14. MUSEUM ASSOCIATES. These individuals are formally affiliated with the MSB Division of Birds and conduct research or curation on our behalf.

A. Research Associates
John Hubbard
Matthew J. Baumann
Donna Schmitt
Gregory Schmitt
Sartor O. Williams III

DIVISION OF GENOMIC RESOURCES

Joseph A. Cook, Curator
Mariel L. Campbell, Collection Manager

1. DIVISION HIGHLIGHTS.

The Division of Genomic Resources (DGR) of the Museum of Southwestern Biology (MSB) is a centralized repository for cryogenic material from all MSB divisions at the University of New Mexico. In 2016, we continued our collaborative efforts with the New Mexico Museum of Natural History, the U.S. Fish and Wildlife Service Mexican Wolf Recovery Program, U. S. Geological Survey, and National Park Service. We also continued our longstanding efforts in zoonotic pathogen discovery work with a number of US (e.g., Centers for Disease Control) and foreign institutions (e.g., Gorgas Institute in Panama City). The DGR frozen tissue collection has become a taxonomically broad repository with >500,000 tissue samples from over 200,000 specimens, including Mammals, Birds, Reptiles, Amphibians, and Fishes. The collection is now ranked as the largest cryogenic collection of wild mammal tissues worldwide and one of the top ten cryogenic collections of bird tissues in North America.

This year saw tremendous growth in numbers of tissues in the collection. We also submitted a grant to NSF and received funding ($500,000) for the upgrade to LN2 vapor storage. UNM provided another $500,000 for expansion and renovation of the facility adding about 400 sq ft to the DGR footprint on the third floor of CERIA. Demolition began in the late fall.

Collection Growth.

1. A large number of tissues (6166 specimens) were cataloged in the Division of Mammals (includes parasites as mammal parts to be later be converted to MSB Para)
2. Some 353 specimens with tissues were cataloged from the Division of Birds.
3. Some 77 specimens with tissues cataloged from the Division of Reptiles and Amphibians
4. Approximately 10,000 new specimens and 23,568 tissue vials archived in the DGR frozen tissue collection in the Arctos Object Tracking System.

Collection Management:

1. Legacy material inventoried, awaiting barcoding and cataloging or association with cataloged records:
   a. Robert Nofchissey: 486 legacy specimens and 972 legacy vials;
   b. Jerry Dragoo approx.1,000 vials
2. Legacy material in holding freezers inventoried and barcoded, awaiting cataloging or association with cataloged records:
   a. Panama: 4806 vials
   b. Troy Best: 1,458 vials
   c. MSB Herp: 1651 vials
   d. Yadeeh Sawyer: 1,134 vials
   e. Other misc: approx. 2,000 vials
   f. Total = 17,249 vials.
3. Barcoding of -80 freezers for conversion to Arctos Object Tracking (CSBR grant):
   a. DGR2: 9,091 samples representing 4217 specimens barcoded and associated with catalog records

b. New Mexico Museum of Natural History and Science: 6200 specimens barcoded, awaiting upload to cataloged records

Collection Usage.
1. The DGR collection issued 62 loans from over 1900 specimens from the Mammal, Bird, Fish, Herp, and Parasite Divisions in 2016.
2. Publications in 2016 related to DGR loans are reported in the Divisions of Mammals, Birds, Fishes, and Amphibians and Reptiles annual reports.

Training in specimen based research and curation.

Training in specimen collection, preparation, curation, and data management remains one of the integral goals of all of the MSB divisions. Students gain experience in bioinformatics, natural history collection preparation and curation, and field and laboratory based research.

a. 8 UNM students were paid as DGR staff in 2016
    1) 4 graduate students
    2) 4 graduate
    3) 3 paid undergraduates (2 later became graduate students)
    4) 2 undergraduate independent study students
    5) 1 UNM post-baccalaureate volunteer

b. 10 Students were mentored by in DGR by the Collection Manager and Curator:
    1) 5 undergraduates
    2) 2 undergraduate students conducting independent study projects
    3) 3 high school student interns

Of these 18,
1. 15 were females
2. 8 were from under-represented groups
3. 3 presented museum-related projects at regional scientific conferences
4. 5 chose to continue subsequent museum and/or biology-related independent study/research

Publications citing MSB DGR specimens.

The MSB DGR tissue resource has become a foundation for considerable research worldwide. DGR attempts to track all publications utilizing our tissue specimens and incorporate the manuscripts into the ARCTOS database with linkages to specimen records, loans, and GenBank information. Tracking publications is now easier with the advent of electronic information sharing, but some publications using our specimens or their derivatives (e.g., sequences) are still unreported.

Theses/Dissertations. See Other Divisional Reports.

MSB Arctos database and collection accessibility.

B. **Arctos database and collection accessibility.** The Arctos database is a cutting-edge relational database that continues to provide an invaluable resource for biodiversity and environmental questions for researchers, educators, public health workers, and natural resource managers worldwide. Arctos is web-accessible and greatly enhances the visibility of the MSB. See MSB Mammal summary of Arctos usage.
C. Since the MSB DGR interface was discontinued in 2014, the DGR collection records are now accessed directly from the Arctos interface for the respective divisions. The tissue collections for the Divisions of Mammals and Birds are fully online; MSB Fish and MSB Herps are in the process of upload.

2. COLLECTION USE

Collection Growth (samples archived)	Loans (# of specimens)	Visitors	Publications Citing MSB DGR Specimens
~ 23,568 Mamm and Bird Vials representing ~10,000 specimens	MSB Mamm 49 (1200)* MSB Bird 14 (699)** MSB Herp 2 (12) MSB Para 1 (1) Total Loans: 66 (1692)	(DGR)	See other divisions

* Mamm/DGR Mamm combined tissue loans (number of specimens)
** Birds/DGR Birds combined tissue loans (number of specimens)
*** Mammals/Birds/DGR/Fish/Herp/Para

Collection Usage:
MSB DGR issued 10,699 NK numbers in 2016 for collection of new specimens. The Division issued 62 loans of over 1900 specimens to researchers in 4 countries including Belgium, Brazil, Chile, and Norway, and multiple institutions across the United States.

3. COURSES USING THE COLLECTION

UNM Classes receiving loans of DGR material for educational purposes

BIOL 599 – Masters Thesis. Spring	(1 student, 1 tissue loan)
BIOL 599 – Masters Thesis. Summer, Fall	(5 students, 4 tissue loans)
BIOL 699 – Dissertation. Spring	(1 student, 1 tissue loans)
BIOL 699 – Dissertation. Summer, Fall	(7 students, 10 tissue loans)

Total: 15 student loans representing use of 898 specimens:

MS Donavan Jackson, 1 loan, 13 mammal specimens, Spring 2016
MS Schuyler Liphardt, 2 loans, 79 mammal specimens, 1 Summer, 1 Fall 2016
MS Jonathan Schmidt 1 loan, 16 bird specimens, Fall 2016
MS Andrea Chavez, Elizabeth. Beckman, Jenna McCollough, 1 loan, 64 bird specimens, Summer 2016

PHD Bryan Mclean 1, 119 mammal specimens, Spring 2016
PHD Carlos Carrion 2 loans, 53 specimens, Summer 2016; 1 loan, 54 mammal specimens, Fall 2016
PHD Kayce Bell: 1 loan, 52 mammal specimens, fall 2016
PHD Jocie Colella, 2 loans, 20 mammal specimens, Fall 2016
PHD Jessica Weber 1 loan, 20 mammal specimens, Fall 2016
PhD Bryan Mclean, 1, 14 mammal specimens, Fall 2016
Postdoc/Undergrad Lisa Barrow, Rosario Marroquin Flores 1 loan, 316 bird specimens, Fall 2016

UNM courses or programs using the DGR collection through visits or staff presentations.

UNM Art and Ecology
MSST Museum Studies Class Group
UNM Prep and IMSD programs

Visiting researchers: Institutions or Departments.

K-12 schools and educational group.

See MSB Mammal/MSB Bird Divisional Reports.

COURSES TAUGHT BY DGR PERSONNEL

Faculty/Collection Managers Student Mentoring:

J. A. Cook (see Mammal Division Report)

Mariel L. Campbell:

Undergraduates

Lizon Cenac, BCP Flea Independent Study*;* Project: *Fleas of Beringian Shrews (Sorex spp.)* presented at annual meeting of the Southwestern Association Parasitologists, Lake Texoma, OK, April 2016

Laurel Cenac, BCP Flea Independent Study; Project: *Fleas of Beringian Shrews (Sorex spp.);* presented at annual meeting of the Southwestern Association Parasitologists, Lake Texoma, OK, April 2016

Elisa Gagliano, Marten Endoparasite Study; Project: *Patterns of Infection of American Marten (Martes americana) by the Nematode Parasite Soboliphyme baturini in Interior Alaska.;* presented at annual meeting of the Southwestern Association Parasitologists, Lake Texoma, OK, April 2016

Steven Guerin, Marten Endoparasite Study, Project: *Patterns of Infection of American Marten (Martes americana) by the Nematode Parasite Soboliphyme baturini in Interior Alaska – A follow-up.*

Emma Fries, Marten Endoparasite Study, Project: *Patterns of Infection of American Marten (Martes americana) by the Nematode Parasite Soboliphyme baturini in Interior Alaska – A follow-up.*

High School

Victoria Crosby (co-mentored with Dr. Stephen Greiman) (Amy Biehl High School) Project: ***A Morphological and Molecular Study of Cestodes of the Pygmy Shrew, Sorex hoyi.*** presented at annual meeting of the Southwestern Association Parasitologists, Lake Texoma, OK, April 2016

Livia Coletta (Amy Biehl High School), CIIBA RAHSS intern in parasitology; Project: Curation of Beringian Coevolution Project parasites

Samuel Nasci (CNM), CIIBA RAHSS intern in parasitology, Project: Curation of Beringian Coevolution Project parasites

Volunteers

Monica Naranjo, training in museum collections management, data entry, object tracking

Liota Weinbaum, training in bird and mammal helminth parasite necropsy techniques.

COLLECTION MANAGEMENT

MSB DGR added ~10,000 new specimens and installed 23,568 frozen tissue vials during 2016. All incoming tissue samples installed in 2016 were barcoded and scanned in the Arctos Object Tracking System. An additional 10,699 NK numbers were assigned for collection of new specimens. 62 consumable, nonreturnable loans of frozen tissue subsamples from >1900 specimens were processed.

Two -80C freezers failed in 2016; one (DGR2) was repaired. Tissues were transferred to backup before rising above -60C.

Funds in the amount of $499,976 were awarded in Spring 2016 by the National Science Foundation (Award#DEB1561342, PI Cook, Co-PI Campbell, Dunnum, Turner, Witt) for the purchase of 3 vapor phase nitrogen freezers and a liquid nitrogen cryogenerator. This three-year grant also provided staff to begin barcoding of legacy cryovials for the transfer from the DGR Locator system to Arctos Object Tracking. The equipment purchase RFP and initial purchasing began in Fall 2016, coordinated with a simultaneous UNM facilities upgrade for expansion and remodel. The combined equipment purchase and facilities upgrade totals >$1,000,000. Staff were hired and trained for the object tracking conversion in summer/fall 2016; approx. 20,000 samples representing approx. 10,000 specimens barcoded (DGR2 and NMMNHS).

Current projects generating specimens for DGR

Incorporation of other collections (Troy L. Best, Robert Nofchissey, Jerry Dragoo)
CIIBA – NSF (Cook, Hoberg, Galbreath); Canada, wolverines
High Latitude Contact Zones - Andrew Hope – Alaska (USGS, NPS, NSF-CIIBA)
Marten Endoparasite Project (Alaska ADFG) (Cook, Campbell)
Mexican wolf reintroduction – USFWS (Dunnum, Cook)
Mongolian Vertebrate Parasite Project –
NSF (Scott Gardner-U Nebraska, Cook UNM, Town Peterson—Kansas U)
Panama Hantavirus –Cook, Dunnum, Blas Armien,
Bighorn Sheep Reintroduction Program – NMGF
Pecos Shrew Survey – Steven Greiman, Cook (NSF Postdoc and NSF-CIIBA)
Gila Carnivore Survey---Cook, Warren
Gila River Mammal Survey – Keith Geluso (U Nebraska)
Black bear /elk predation project – NMDGF
Mammalogy and Tropical Biology classes--Cook
Peruvian Bird Survey –Chris Witt (NSF)
El Malpais BLM Survey—Cook, Dunnum
Great Basin Sciurid Survey—Bryan McLean, Cook (USFWS).

The majority of staff time was spent:

1. Managing and curating the DGR collection.
2. Processing and shipping tissue loans for multiple museum divisions.
3. Supervising and training students and personnel in museum, field, and lab specimen curation and data management.
4. Equipment maintenance including: 17 ultra-cold freezers, multiple alarm systems, computers, and a bio-safety cabinet.
5. Equipment monitoring 24 hours a day, 7 days a week.
6. Maintaining the DGR Bio-safety Level II Laboratory.
7. USDA, UNM Bio-safety inspections and compliance.
8. Conversion of DGR locator to Arctos object tracking system
9. Preparation, cataloging, and installation of new specimens.
10. UNM remodel and expansion of DGR collections space; RFP submittal, equipment purchase, staff hiring and training. Grant written Fall 2015; awarded Spring 2016 (3-year, $499,976 NSF grant for vapor-phase nitrogen equipment purchase to be coordinated with simultaneous).

AWARDS, GRANTS, AND CONTRACTS

See MSB Mammal/MSB Bird/MSB Parasite/MSB Fish/MSB Herp divisional reports

PUBLICATIONS

See MSB Mammal/MSB Bird/MSB Parasite/MSB Fish/MSB Herp divisional reports

A. Books, Book Chapters, Edited Volumes

See MSB Mammal/MSB Bird/MSB Parasite/MSB Fish/MSB Herp divisional reports

B. Journal Articles

See MSB Mammal/MSB Bird/MSB Parasite/MSB Fish/MSB Herp divisional reports

C. Web-Based

All publications in the MSB series are available via free-download from our website.

D. Technical Reports

Annual Report, Division of Genomic Resources, Museum of Southwestern Biology

E. Theses/Dissertations Completed

See MSB Mammal/MSB Bird/MSB Parasite/MSB Fish/MSB Herp divisional reports

F. Work In Progress (Only *in press* and already submitted)

G. Publications/Reports Based on MSB Specimens/Data by Outside Researchers

See MSB Mammal/MSB Bird/MSB Parasite/MSB Fish/MSB Herp divisional reports

H. Theses/Dissertations

See MSB Mammal/MSB Bird/MSB Parasite/MSB Fish/MSB Herp divisional reports

ACTIVITIES IN LEARNED SOCIETIES

Attendance at Professional Meetings

Elisa Gagliano, Mariel L. Campbell, Kerry L. Nicholson, and Joseph A. Cook. *Patterns of Infection of American Marten (Martes americana) by the Nematode Parasite Soboliphyme baturini in Interior Alaska.* Presented at the regional meeting of the Southwestern Association of Parasitologists, Lake Texoma, OK, April 14-16, 2016.

Laurel, Cenac, Lizon Cenac, Ralph Eckerlin, Mariel L. Campbell, and Joseph A. Cook. *Fleas of Beringian Shrews (Sorex spp*.). Presented at the regional meeting of the Southwestern Association of Parasitologists, Lake Texoma, OK, April 14-16, 2016.

OTHER PROFESSIONAL ACTIVITIES

Joseph A. Cook's Efforts Reported in Mammal Division Report

Presentations in a Scholarly Capacity at Hearings, Workshops, Legislative Committees, etc.

Webinar: International Society of Biological and Environmental Biorepositories, Enviro-Bio Working Group, "The Accidental Collector", June 2016 (Campbell)

Scholarly Service as a Member of a Local/State/Regional/National Committee, Panel, etc.

Campbell, Mariel L.

1. Arctos Database Working Group
2. EnviroBio Working Group, International Society for Biological and Environmental Repositories
3. Global Genome Biodiversity Initiative, MSB representative

SERVICE

A. Symposia, Workshops, Conferences, etc. Sponsored, Organized, Held, etc.

Arctos Wiki Environment (AWE) Workshop, Sevilleta Field Station, Bernardo, NM, February 18-20, 2016. Local Committee.

IsoBank Workshop, Sevilleta Field Station, Bernardo, NM, April 21-24, 2016. Local Committee.

Public Service
General

A significant portion of DGR staff time is spent providing information or assistance to the public either during visits to the collection, through phone calls, emails or through research tissue loans. This is an important and ongoing activity of all DGR personnel.

Divisional tours and presentations – provided educational tours and information for visitors and school group for MSB DGR, MSB Mamm, and MSB Para, August – December 2016.

CURRENT STAFF

Faculty/Staff

Joseph A. Cook, Curator (see Division of Mammals report for J.A. Cook, since 2003)
Mariel L. Campbell, Collection Manager (August 2014 to present)

Graduate students
Cook, J.A.
(Reported in Mammal Division report)

Grad Student Research Assistants DGR

1. Dianna Krejsa (Spring, Fall 2016)
2. Carlos Carrion (Summer, Fall 2016)
3. Lindsey Frederick (Fall 2016)
4. Kaylen Marie Jones (Fall 2016-partial)

Undergraduate Student Workers and Volunteers

1. Lindsey Frederick (Summer 2016)
2. Kaylen Marie Jones (Summer 2016)
3. Monica Naranjo (Summer, Fall 2016)
4. Dior Nishite (Fall 2016)

DIVISION OF FISHES

DIVISION HIGHLIGHTS

Currently, the MSB Division of Fishes has 100,162 cataloged lots of fishes (4,038,648 specimens). During the year, 1,375 lots of fishes (33,944 specimens) were cataloged and integrated into the main collections. To date, there are 91,226 digital files of field notes and 650 jpg files of habitat photographs and specimens (for color). There are 41,920 specimen locality records, georeferenced using decimal latitude and longitude. Guests hosted Dr. Keith B. Gido, Kansas State University, Manhattan KS.

MSB Staff Outreach Summary: UNM Freshmen Student Tour *Discover Your Science Festival*, August 2016; UNM MSB Open House for Research Day, March 2016; UNM Museum Collection Management MSST476/576, March 2016; UNM Post-Baccalaureate Research and Education Program (PREP) students, February 2016; High School (AIMS) Student project for *Central NM Science and Engineering Research Challenge*, March 2016; Bernalillo County Open Space *Naturalist Series: Chihuahua Desert Pupfishes and Conservation,* Bachechi Center, Albuquerque, February 2016; *Fishes of New Mexico*, MacArthur Elementary School, kindergarten classes March 2016.

TABLE OF COLLECTION USE

Collection Growth	Loans Out	Professional Visitors	Collection Web Activity	Outside Publications Citing MSB	Publications by MSB Staff
33,944 specimens	11	18	1,298	2	9
		Graduate Theses/Dissertations Completed	Graduate Students	Undergraduate Students	
		2	2	11	

UNM COURSES USING THE COLLECTIONS

TERM	COURSE	TITLE	STUDENTS
Spring 2016	BIOL386	General Vertebrate Zoology	20
Fall 2016	BIOL 386	General Vertebrate Zoology	24
Spring 2016	BIOL 204	Plant and Animal Form and Function	55

Fall 2016 BIOL 204 Plant and Animal Form and Function 55

UNM COURSES TAUGHT BY MSB STAFF

INSTRUCTOR	TERM	COURSE	TITLE	STUDENTS
Turner, T.F	2016 Spring	BIOL 402 U 027	T: Ecology & Evolution of Fishes	2
Turner, T.F	2016 Spring	BIOL 502 M 027	T: Ecology & Evolution of Fishes	4
Turner, T.F	2016 Spring	BIOL 551 M 032	Research Problems	3
Turner, T.F	2016 Spring	BIOL 599 M 032	Masters Thesis	2
Turner, T.F	2016 Spring	BIOL 651 P 032	Advanced Field Biology	1
Turner, T.F	2016 Fall	BIOL 402 U 015	T: Ecology and Evolution of Fishes	2
Turner, T.F	2016 Fall	BIOL 502 M 015	T: Ecology and Evolution of Fishes	3
Turner, T.F	2016 Fall	BIOL 551 M 033	Research Problems	2
Turner, T.F	2016 Fall	BIOL 599 M 033	Masters Thesis	2
Turner, T.F	2016 Fall	BIOL 651 P 004	Advanced Field Biology	1

COLLECTION MANAGEMENT

The MSB records of fishes-100,162 total-were successfully reformatted in preparation for uploading to Arctos, a collaborative database of natural history collections available to researchers and the general public. http://arctos.database.museum/ The MSB records of fishes are also available via FishNet2, a portal for museum fish collections data, about 50 partner institutions. http://www.fishnet2.net

Over the past year, 25 requests for specimen data and information on curatorial technique, specimen preparation, supplies and materials were handled, requiring an average of 30 minutes per response and up to 60 minutes to find and collate supporting documentation.

Due to a recommendation made by the Region 6 Inspection Team for the Federal Emergency Management Administration (FEMA), additional AMCO shelving ledges were purchased and received July 2016. These 18" ledges were installed on shelving uprights positioned between shelves to stabilize jars during seismic events causing side-to-side movement of shelves.

UNM undergraduate students continue to accomplish the "lion's share" of curatorial work. Five students were trained in curatorial techniques for fluid preserved collections of fishes, data management protocol for ichthyological and ecological information related to fishes, and developing digital files of field books. On average, these students worked 15 hours a week in the spring semester and 30 hours a week during the summer semester. They processed over 600 collections of larval fishes (cleaning field samples, restoring preservation fluid, labeling and organizing collections in preparation for cataloging). For Spring Semester of 2016, two volunteer UNM undergraduates in Biology were mentored by the Collections Manager for a total of 20 hours per week. These students were exposed to fish systematics, taxonomy, data management, and museum technique. To learn these aspects of museum work, the students were assigned an accession of 2015 Wyoming fishes, corresponded with the Wyoming research team as they verified species and finally, cataloged the collections.

Collections were received from the following sources and projects: Wyoming Dept. Game and Fish, Laramie WY, USGS Grand Canyon Monitoring Center, Flagstaff AZ, Southwest Native Aquatic

Resources and Research Center, Dexter NM, USFWS NM/TX Fish and Wildlife Conservation Office, Albuquerque NM, US Bureau of Reclamation (Salt Lake City and Albuquerque), US Bureau of Land Management (Taos and Las Cruces), BioPark Aquatic Conservation Facility, Albuquerque NM, American Southwest Ichthyological Researchers, and New Mexico Dept. Game and Fish.

Research projects generated by Turner Lab, UNM Biology supported by MSB collection management: Rio Grande Silvery Minnow (*Hybognathus amarus*) Genetic Monitoring, Nevada Bonytail Chub (*Gila elegans*) Genetic Monitoring, Gila Trout (*Oncorhynchus gilae*) Genetics, Gila River Native Fishes, and Canadian River Native Fishes.

AWARDS, GRANTS, AND CONTRACTS:
New Mexico Research Grant-High Priority. UNM Graduate Program Student Association. A.L. Barkalow and T.F. Turner. New analytical techniques to uncover aquatic foodweb responses on managed streams and rivers in New Mexico. Sept – Jan 2017. Total: $5,000

Rogers Research Grant, UNM Office of Graduate Studies. A.L.Barkalow. Using stable isotopes to investigate the early life history and resource use of larval suckers in the Colorado River within the Grand Canyon. Sept – Jan 2017. Total: $1,000

Center for Stable Isotopes Pilot Grant, UNM Center for Stable Isotopes. A.L. Barkalow. Investing feeding ecology and resource use of larval catostomidae in the Colorado River within the Grand Canyon. Sept – Jan 2017. Total: $500

Rio Grande Silvery Minnow Genetics Assessment and Monitoring. US Bureau of Reclamation. M.J. Osborne PI. 6 Jan 2015 to 30 Nov 2016. Total: $318,000

Sacramento Mountain (*Aneides hardii*) and Jemez Mountain (*Plethodon neomexicanus*) Salamander Population Genetics, New Mexico. NM Dept. of Game and Fish. M.J. Osborne PI. 15 February 2016 to May 14 2017. Total: $15,526.

Development of eDNA detection methodology for Jemez Mountains(*Plethodon neomexicanus*) and Sacramento Mountain (*Aneides hardii*)Salamanders. The Nature Conservancy. M.J. Osborne PI. 1 June 2015 to 30 Nov 2016. Total: $11,965

Lower Colorado River Multi-Species Conservation Program- Genetic and Demographic Studies to Guide Conservation Management of Bonytail Chub (*Gila elegans*) in Off-Channel Habitats. US Bureau of Reclamation. M.J. Osborne PI, 20 Sept 2016 to 10 April 2017. Total: $125,225

New Mexico Research Grant-High Priority. UNM Graduate Program Student Association. R.A. Reese and T.F. Turner. Jan –May 2016. Total: $5,000

Local-to-landscape-scale distribution of genetic variation in catostomid suckers of Colorado, with emphasis on genetic contribution to larval drift in streams of the Gunnison River Basin. E.W. Carson PI. M. J. Osborne, T.F. Turner, and M.R. Schwemm. 1Oct 2015 to 30 Jun 2018. Total: $96,467.

MSB Division of Fishes, Curatorial Services and Data Synthesis and Integration, San Juan River Restoration Implementation Program Specimens and Data. A.M. Snyder PI. and T.F. Turner. US Bureau of Reclamation, Salt Lake City UT. 24 Jun 2013 to 30 Sep 2017. Total: $547,639.

Seismic Mitigation for Museum of Southwestern Biology Fluid Preserved Collections. Federal Emergency Management Agency (FEMA), NM Dept. Homeland Security. A.M. Snyder PI. 25 Jul 2014 to 30 Jul 2017. Total: $90,081

CSBR: Natural History: Upgrade and transfer of the Museum of Southwestern Biology's Division of Genomic Resources frozen tissue collection to Nitrogen vapor storage. National Science Foundation. J. Cook PI, T.F. Turner co-PI with three others, 17 March 2016 to 16 March 2018. Total: $439,997.

Next-generation conservation genetics for Gila trout: Phase I. Trout Unlimited. T. Turner PI. 1 December 2015 to 31 November 2016. Total: $28,514

MRI: Acquisition of Instrumentation for Compound-Specific Stable Isotope Analysis at the University of New Mexico. National Science Foundation. S. Newsome PI, T.F. Turner co-PI with three others. 1 August 2014 to 31 July 2016. Total: $314,315

Model-based projection of the genetic effects of natural recolonization of Gila trout. US Fish & Wildlife Service. T.F. Turner PI. 1 July 2016 to 31 May 2018. Total: $80,000

PUBLICATIONS

Journal Articles

Christman B.L, A.L. Barkalow, R.D. Jennings, G.L. Hamilton, J. Bain. CROTOLUS LEPIDUS KLAUBERI (Banded Rock Rattlesnake) DIET / MORTALITY. Herpetological Review 47(3):477.

Clark, S.R. 2016. The effects of passive integrated transponder (PIT) tags on the physiology and swimming performance of a small-bodied stream fish. Transactions of the American Fisheries Society. 145:1179-1192.

Clark, S.R. and J.F. Schaefer. 2016. Ecological influences on the local movement dynamics of the Blackspotted Topminnow, *Fundulus olivaceus*. Behavioral Ecology and Sociobiology. 70:557-567.

Osborne, M.J., Pilger, T.J., Lusk, J. and Turner, T.F. (2016) Spatio-temporal variation in parasite communities maintains diversity at the major histocompatibility complex class II in the endangered Rio Grande Silvery Minnow. Molecular Ecology, Available Online Early DOI: 10.1111/mec.13936.

Matthews, W.J., Turner, T.F. and Osborne, M.J. (2016) Breakdown of a hybrid swarm between two darters (Percidae) *Etheostoma radiosum* and *Etheostoma spectabile*, with loss of one parental species. Copeia 104(4):873-878.

Carson, E.W., T.F. Turner, M.J. Saltzgiver, D. Adams, B.R. Kesner, P.C. Marsh, T.J. Pilger, and T.E. Dowling. 2016. Retention of ancestral genetic variance across life-stages of an endangered, long-lived iteroparous fish. Journal of Heredity, 107: 567-572. DOI:10.1093/jhered/esw036.

Bertrand, K. N., J. A. VanDeHey, T. J. Pilger, E. A. Felts and T. F. Turner. 2016. Genetic structure of a disjunct peripheral population of Mountain Sucker *Pantosteus jordani* in the black Hills, South Dakota, USA. Conservation Genetics, 17: 775-784. DOI: 10.1007/s10592-016-0820-y

Osborne, M.J., T. A. Diver, C. W. Hoagstrom, T. F. Turner. 2016. Biogeography of '*Cyprinella lutrensis*': intensive genetic sampling from the Pecos River 'melting pot' reveals a dynamic history and phylogenetic complexity, Biological Journal of the Linnean Society 117: 264-284. DOI: 10.1111/bij.12664

Gori D., M.S. Cooper, E.S. Soles, M Stone, R. Morrison, T.F. Turner, D.L. Propst, et al. 2016. Gila River Flow Needs Assessment. The New Mexico Botanist 5: 24-32. URI http://hdl.handle.net/1808/21029

Technical Reports

Kegerries, R. B. Albrecht, R. Rogers, E.I. Gilbert, W.H. Brandenburg, A.L. Barkalow, S. P. Platania, M. McKinstry , B. Healy, J. Stolberg, E. O. Smith, C. Nelson, and H. Mohn. 2016. Razorback Sucker *Xyrauchen texanus* research and monitoring in the Colorado River inflow area of Lake Mead and the lower Grand Canyon, Arizona and Nevada. Final report prepared by BIO-WEST, Inc., for U.S. Bureau of Reclamation, Upper Colorado Region, Salt Lake City, UT. 64pp.

Farrington M. A., R. K. Dudley, J. L. Kennedy, S. P. Platania and G. C. White. 2016. San Juan River 2015 Colorado Pikeminnow and Razorback Sucker larval fish survey. Research report submitted to the San Juan River Basin Implementation Recovery Program. 63 pp.

Lyons D., Farrington M. A. and S. P. Platania. 2016. San Juan and Animas rivers Diversion Study. Research report submitted to the San Juan River Basin Implementation Recovery Program 168 pp.

Osborne, M.J. and Turner, T.F. Genetic and Demographic Studies to Guide Conservation Management of Bonytail Chub in Off-Channel Habitats. 2016 Final Report to U.S. Bureau of Reclamation, Boulder City, NV. 15 pp.

Osborne, M.J., Carson, E. and T.F. Turner. Genetic monitoring of Rio Grande Silvery Minnow. 2016 Final Report to U.S. Bureau of Reclamation, Albuquerque New Mexico. 39 pp.

Osborne, M.J., Cordova, S. and T.F. Turner. Environmental DNA methods for Plethodontids endemic to New Mexico. Final Report to The Nature Conservancy, 13 pp.

Dudley, R. K. and S. P. Platania. 2016. Rio Grande Silvery Minnow population monitoring program results (February, April, May, June, July, August, September, October, and December 2016). Monthly reports to the Middle Rio Grande Endangered Species Collaborative Program and the US Bureau of Reclamation, Albuquerque, NM. 270 pp.

Dudley, R. K., S. P. Platania, and G. C. White. 2016. Rio Grande Silvery Minnow population monitoring program results from February to December 2015. Annual report to the Middle Rio Grande

Endangered Species Collaborative Program and the US Bureau of Reclamation, Albuquerque, NM. 186 pp. DOI:10.13140/RG.2.2.27029.93923

Dudley, R. K., S. P. Platania, and G. C. White. 2016. Rio Grande Silvery Minnow reproductive monitoring during 2016 in the Rio Grande and selected irrigation canals. Annual report to the Middle Rio Grande Endangered Species Collaborative Program and the US Bureau of Reclamation, Albuquerque, NM. 25 pp. DOI:10.13140/RG.2.2.32063.10407

Snyder, A.M. and T.F. Turner. 2016. Curation of the 2015 San Juan River collections of fishes, University of New Mexico, Museum of Southwestern Biology. Award R13AP40007. Annual Report to San Juan River Basin Recovery Implementation Program, US Bureau of Reclamation, UT. 22 pp.

Independent Science Advisory Board (T. F. Turner is a member and co-author) and Independent Scientific Review Panel. 2016. Critical Uncertainties for the Columbia River Basin Fish and Wildlife Program. http://www.nwcouncil.org/media/7149870/isabisrp2016-1.pdf. 168 pp. plus supplementary links.

Publications/Reports Based on MSB Specimens/Data by Outside Researchers
Conway, K.W. and D. Kim. 2016. Redescription of the Texas Shiner *Notropis amabilis* from the southwestern United States and northern Mexico with the reinstatement of *N. megalops* (Teleostei: Cyprinidae). Ichthyol. Explor. Freshwaters 26(4):305-340.

Dombrosky, J., S. Wolverton, L. Nagaoka. 2016. Archaeological data suggest broader early historic distribution for blue sucker (*Cycleptus elongatus*, Actinoptergii, catostomidae) in New Mexico. Hydrobiologia DOI 10.1007/s10750-015-2639-9:1-9.

ACTIVITIES IN LEARNED SOCIETIES

A. Invited Talks/Plenary

Cordova, S. Environmental DNA of New Mexican plethodontids. Chiricahua Desert Museum, Rodeo NM, 30 July 2016

Krabbenhoft, T. K., and T. F. Turner. *Climate Change and Flow Regulation Alter Fish Community Structure through Species-Specific Effects on Reproductive Phenology*. Symposium, Documented and Documenting the Effects of Climate Change on Inland Fish and Fisheries. American Fisheries Society 146th Annual Meeting, Kansas City MO, 21-25 August 2016

Propst, D.L., and K.B. Gido. *Using long-term datasets to characterize effects of major disturbances on arid-land fish assemblages.* Lessons From, and Visions For, Long-term Studies of Freshwater Fish Communities Symposium, American Society of Ichthyologists and Herpetologists 96th Annual Meeting, New Orleans LA, 6-10 July 2016.

Ross, S.T. *ASIH, our biology family: looking back, looking forward, celebrating 100 years.* 100 Year Symposium, American Society of Ichthyologists and Herpetologists 96th Annual Meeting, New Orleans LA, 6-10 July 2016.

Ross, S.T. Panel Leader, Lessons From and Visions For, Long-term Studies of Freshwater Fish Communities. American Society of Ichthyologists and Herpetologists 96th Annual Meeting, New Orleans LA, 6-10 July 2016.

Turner, T.F., T.J. Pilger, and E. W. Carson. *Estimation of Contemporary Dispersal in River Networks Using Genetic Time Series Data.* Invited Presentation, AFS Symposium, "Managing Riverscapes: Conservation Tools to Assess and Improve Stream Fisheries". American Fisheries Society 146th Annual Meeting, Kansas City MO, 21-25 August 2016.

B. Contributed Talks/Posters (Presenters' name in bold)

Barkalow, A.L., Turner, T.F., Atudorei, N., Newsome, S.D., McKinstry, M.C., Platania, S.P. Evaluating the relationship of temperature and growth of larval Colorado River catostomids through otolith aging and stable isotopes ($\delta^{18}O$). Desert Fishes Council 48th Annual Meeting, Albuquerque NM, 15-19 November 2016.

Brandenburg, W. H., M. C. McKinstry, C. Cheek, P. MacKinnon, R. K. Dudley, S. P. Platania, K. R. Bestgen, M. Ulibarri, w. Knight. Evaluation of the Hogback Diversion fish weir–transport and entrainment of fishes. Colorado River Aquatic Biologists. Laughlin, NV January 2016.

Brandenburg, W. H., M. C. McKinstry, C. Cheek, P. MacKinnon, R. K. Dudley, S. P. Platania, K. R. Bestgen, M. Ulibarri, w. Knight. Evaluation of the Hogback Diversion fish weir–transport and entrainment of fishes. Upper Colorado River Basin Researchers Meeting. Durango, CO January 2016.

Brandenburg, W. H., M. C. McKinstry, C. Cheek, P. MacKinnon, R. K. Dudley, S. P. Platania, K. R. Bestgen, M. Ulibarri, w. Knight. Evaluation of the Hogback Diversion fish weir–transport and entrainment of fishes. San Juan River Basin Recovery Implementation Program. Durango, CO February 2016.

Brandenburg, W. H., J. L. Kennedy, S. P. Platania. Historical distribution of the the Gila robusta complex in the Gila River Basin, New Mexico, based on morphological analysis. ASIH-AFS Committee on Names of Fishes. Phoenix, AZ April 2016.

Brandenburg, W. H., D. E. Snyder, S. P. Platania. Cyprinid fish larvae and early juveniles of the Pecos River, New Mexico and Texas–morphological descriptions and comparisons. Desert Fishes Council 48th Annual Meeting. Albuquerque, NM. November 2016.

Camak, D.C., Turner, T.F. Estimating introgression between Gila trout (Oncorhynchus gilae) and rainbow trout (O. mykiss) using next-generation DNA sequencing. Desert Fishes Council 48th Annual Meeting, Albuquerque. NM. 15-19 November 2016.

Clark, S., T. Slack, B. Kreiser, and J. Schaefer. Persistence and stability of Pearl Darter (*Percina aurora*) populations in the Pascagoula River system. Southeastern Fishes Council. Jackson MS, 10-11 November 2016.

Conway, K., Osborne, M.J., Portnoy, D. The plight of the Rio Grande shiner, Notropis jemezanus, in the lower Rio Grande along the Texas/Mexico border. Desert Fishes Council 48th Annual Meeting. Albuquerque NM. 15-19 November 2016

Cordova, S. Environmental DNA of the Sacramento Mountain Salamander (*Aneides hardii*). American Society of Ichthyologists and Herpetologists 96th Annual Meeting. New Orleans LA, 6-10 July, 2016.

Cordova, S. Environmental DNA of the Sacramento Mountain Salamander (*Aneides hardii*). Research Day 25th Annual Meeting, UNM Biology Department, Albuquerque NM, March 2016.

Farrington M. A., R. K. Dudley, J. L. Kennedy, S. P. Platania and G. C. White. Larval Fish monitoring in the San Juan River (1999-2015). San Juan River Basin Implementation Recovery Program. Durango CO, February 2015.

Gilbert, E.I., Archdeacon, T.P. Davenport, S.R., Mata-Gonzales, M.M., Paroz, Y.M., Myer, D.M., Osborne, M.J., Wick, J.M. Native fish conservation and management in the Upper/Middle Rio Grande, Pecos River, Canadian River, Tularosa and Guzman basins, New Mexico in 2016. Desert Fishes Council 48th Annual Meeting. Albuquerque NM. Nov 2016.

Lyons D., **Farrington M. A.** and S. P. Platania. San Juan and Animas rivers Diversion Study. San Juan River Basin Implementation Recovery Program. Durango CO, May 2015.

Osborne, M.J., Sanchez, A.V. and Turner, T.F. Reproductive success of Bonytail Chub (*Gila elegans*) in off-channel habitats. Colorado River Aquatic Biologist Annual Meeting. Laughlin NV, 6 – 7 Jan 2016

Osborne, M.J., Sanchez, A.V. and Turner, T.F. Reproductive success of Bonytail Chub (*Gila elegans*) in off-channel habitats. Desert Fishes Council 48th Annual Meeting. Albuquerque NM, Nov 2016

Osborne, M.J., Pilger, T.J., Lusk, J. and Turner, T.F. Spatio-temporal variation in parasite communities maintains diversity at the major histocompatibility complex class II in the endangered Rio Grande Silvery Minnow (*Hybognathus amarus*). Desert Fishes Council 48th Annual Meeting. Albuquerque NM. 15-19 November 2016

Pilger T.J., K.B. Gido, S.C. Hedden, D.L. Propst, J.E. Whitney and T.F. Turner. Wildfire effects on genetic diversity and recolonization of Longfin Dace, *Agosia chrysogaster*. Joint Annual Meeting of AZ & NM Chapters of the Wildlife and Fisheries Societies. Flagstaff AZ, 4-6 February 2016

Pilger, T.J., K.B. Gido, D.L. Propst, J.E. Whitney and T.F. Turner. Wildfires differentially affect populations genetics of native and nonnative fishes of the Gila River. American Society of Ichthyologists and Herpetologists 96th Annual Meeting. New Orleans LA, 6-10 July 2016.

Pilger, T.J., K.B. Gido, D.L. Propst, J.E. Whitney and T.F. Turner. Using genetics to characterize native fish response to disturbance: a case study from the Upper Gila River basin. Desert Fishes Council 48th Annual Meeting. Albuquerque NM. 16-18 November 2016.

Propst, D.L., J.E. Williams, K.R. Bestgen, and C.W. Hoagstrom. Standing Between Life and Extinction: Ethics and Ecology of Conserving Aquatic Species in the American Southwest. Desert Fishes Council 48th Annual Meeting. Albuquerque, NM. 15-19 November 2016.

Reese, R.A., T.A. Diver, N.R. Franssen, T.J. Pilger and T.F. Turner. Genetic and phenotypic variation of Longfin dace (*Agosia chrysogaster*), in the Gila River, NM. Desert Fishes Council 48th Annual Meeting. Albuquerque NM. 16-18 November 2016.

Schwemm, M.R., Carson, E.W., Thompson, K.G., Osborne, M. J. Turner, T. F.
Spatial and temporal variation in genetic composition of larval drift of catostomid suckers. Desert Fishes Council 48th Annual Meeting. Albuquerque NM. 15-19 November 2016

Turner, T. F., and University of New Mexico Evolution and Ecology of Fishes Discussion Group. Genetic Considerations for Recovery Criteria and Tasks for Gila trout, Oncorhynchus gilae.Desert Fishes Council Annual Meeting. Albuquerque New Mexico. Nov 2016

Turner, T. F. Stable isotopes and museum specimens offer new insights into ecological processes over centuries of environmental change. Annual Joint Meeting of Ichthyologists and Herpetologists. New Orleans, Louisiana, 6-10 July 2016.

Attendance at Professional Meetings

A.L. Barkalow

Desert Fishes Council, 48th Annual Meeting, Albuquerque NM, 15-19 November 2016.

W. H. Brandenburg

Colorado River Aquatic Biologists. Laughlin, NV. 6-8 January 2016.
Upper Colorado River Basin Researchers Meeting. Fort Lewis Collage, Durango, CO. 12-13 January 2016
San Juan River Basin Recovery Implementation Program, Biology Committee. San Juan Public Lands Center, Durango, CO. 22-24 February 2016.
ASIH-AFS Committee on Names of Fishes. Arizona Department of Game and Fish, Phoenix AZ. 4 April 2016.
Lake Mead Razorback Sucker Working Group. Nevada Department of Wildlife, Bolder City NV. 11-12 October 2016
Desert Fishes Council, 48th Annual Meeting, Albuquerque NM, 15–19 November 2016.

D.T. Camak

Bioinformatics Bootcamp, Auburn University AL. 6-12 June 2016.
American Society of Ichthyologists and Herpetologists 96th Annual Meeting, New Orleans, LA. 5-10 July 2016.
Desert Fishes Council 48th Annual Meeting, Albuquerque, NM. 15-19 November, 2016.

S.R. Clark

American Society of Ichthyologists and Herpetologists 96th Annual Meeting, New Orleans LA, 6-10 July 2016.

San Juan River Basin Recovery Implementation Program, Biology Committee. San Juan Public Lands Center, Durango, CO. November 2016.

S. Cordova

American Society of Ichthyologists and Herpetologists 96th Annual Meeting, New Orleans LA, 6-10 July, 2016.

R.K. Dudley

Desert Fishes Council, 48th Annual Meeting, Albuquerque NM, 15–19 November 2016.

M.J. Osborne

Desert Fishes Council, 48th Annual Meeting, Albuquerque NM, 15-19 November 2016.
Colorado River Aquatic Biologist Annual Meeting. Laughlin NV, 6 – 7 January 2016

T.J. Pilger

Joint Annual Meeting of AZ & NM Chapters of the Wildlife and Fisheries Societies. Flagstaff AZ, 4-6 February 2016.
American Society of Ichthyologists and Herpetologists 96th Annual Meeting, New Orleans LA, 6-10 July 2016.
Desert Fishes Council 48th Annual Meeting, Albuquerque, NM, 16-18 November 2016.

D.L. Propst

Gila Natural History Symposium, Western New Mexico University, Silver City, NM. 25-26 February 2016.
American Society of Ichthyologists and Herpetologists 96th Annual Meeting, New Orleans LA, 6-10 July, 2016.
Desert Fishes Council 48th Annual Meeting, Albuquerque, NM. 15-19 November 2016.

M.A. Farrington

San Juan River Basin Recovery Implementation Program, Biology Committee. San Juan Public Lands Center, Durango CO, February, May, and November 2016.
San Juan River Basin Recovery Implementation Program, Environmental Flows Workshop #2 USFWS Ecological Services Office, Albuquerque NM. April 2016.
Desert Fishes Council 48th Annual Meeting, Albuquerque NM. November 2016.

S.T. Ross

San Juan River Basin Recovery Implementation Program, Biology Committee. San Juan Public Lands Center, Durango CO, February, May, and November 2016.
San Juan River Recovery Implementation Program, Environmental Flow workshop. Albuquerque, New Mexico, 5-6 April 2016.
American Society of Ichthyologists and Herpetologists, 96th annual meeting, New Orleans, Louisiana, 6-10 July, 2016.
Desert Fishes Council, 48th Annual Meeting, Albuquerque, New Mexico. 15-19 November, 2016.

A.M. Snyder

American Society of Ichthyologists and Herpetologists 96th Annual Meeting, New Orleans LA. 6-10 July, 2016

Desert Fishes Council 48th Annual Meeting, Albuquerque NM. 16-20 November 2016

T.F. Turner

Colorado River Aquatic Biologist Annual Meeting. Laughlin NV. 6 – 7 January 2016

San Juan River Recovery Implementation Program, Biology Committee Meeting and annual public meeting, Durango CO. 10-11 May 2016.

American Society of Ichthyologists and Herpetologists 96th Annual Meeting, New Orleans LA. 6-10 July, 2016.

American Fisheries Society 146th Annual Meeting, Kansas City, MO. 21-25 August 2016

Desert Fishes Council 48th Annual Meeting, Albuquerque, NM. 15-19 November 2016.

San Juan River Recovery Implementation Program, Biology Committee Meeting, Durango, CO. 29-30 November, 2016.

Service as Editor or on Editorial Board of a Journal

S.T. Ross

Book Review Editor for the American Fisheries Society.

Co-Editor, Volume 3, North American Freshwater Fishes, Johns Hopkins University Press.

T.F Turner

Contributing Editor – Aquatic Biology 2008-present

Guest Editor – Oecologia 2015-present

Editorial Board, Ecology of Freshwater Fishes 2016-present

Service as Officer of Professional Society/Organization

S.T. Ross

Member, Long Range Planning and Policy Committee, American Society of Ichthyologists and Herpetologists, 2007-present.

Board of Governors, American Society of Ichthyologists and Herpetologists, 2012-2017.

A.M. Snyder

Institutional Animal Care and Use Committee, American Society of Ichthyologists and Herpetologists, 2015-present.

Ichthyological and Herpetological Collections Committee, American Society of Ichthyologists and Herpetologists, 1988-present.

T. F. Turner

Board of Governors, American Society of Ichthyologists and Herpetologists, 2013-2018

Chair, Stoye Award Committee, American Society of Ichthyologists and Herpetologists

Member, Genetics Section, American Fisheries Society

OTHER PROFESSIONAL ACTIVITIES

A. Presentation to General Audience in a Scholarly Capacity

A.L. Barkalow

Understanding aquatic food webs through compound specific carbon analysis and next generation DNA sequencing. University of New Mexico's Center for Stable Isotopes Seminar. 24 October, 2016.

E.W. Carson

Naturalist Series: Chihuahua Desert Pupfishes and Conservation. Naturalist Series. Bernalillo County Open Space, Bachechi Open Space, Albuquerque NM. 15 February 2016.

T.J. Pilger

Genetic assessment of Rio Grande Sucker, *Pantosteus plebeius*, in New Mexico. 1st Annual Rio Grande Chub and Rio Grande Sucker Conservation Team Meeting. Taos, New Mexico. 27-28 January 2016

Wildfire effects on genetic diversity and recolonization of longfin dace, *Agosia chrysogaster*. 6th Natural History of the Gila Symposium. Silver City, New Mexico. 25-26 February 2016.

A.M. Snyder

Best Practices in Fluid Collections Conservation. Museum Techniques BIOL406. B. Hanelt, University of New Mexico, Albuquerque NM. 19 and 26 April 2016.

T. F. Turner

Challenges to balancing water use and biodiversity in New Mexico's rivers. UNM Science on Tap, 4 February 2016.

Scholarly Service as a Member of a Local/State/Regional/Nat'l Committee, Panel

W. H. Brandenburg

Member, Desert Fishes Council Planning Committee for 2016 annual meeting

R.K. Dudley

Member of Technical Subgroup, Rio Grande Silvery Minnow (*Hybognathus amarus*) Recovery Team, US Fish and Wildlife Service.

M.A. Farrington

Appointed Member (Conservation Representative) for the Citizen Advisory Committee Habitat Stamp Improvement Program, New Mexico Department of Game and Fish.
Member, Desert Fishes Council Planning Committee for 2016 annual meeting.

M.J. Osborne

Member, Rio Grande Silvery Minnow Propagation and Genetics Workgroup
Member, Rio Grande Silvery Minnow Adaptive Management Team
Member, Desert Fishes Council Planning Committee for 2016 annual meeting.

T.J. Pilger

Member, Desert Fishes Council Planning Committee for 2016 annual meeting
Member, Rio Grande Silvery Minnow Propagation and Genetics Workgroup

Member, Rio Grande Chub and Sucker Conservation Team

D.L. Propst

Leader, Gila Trout and Chihuahua Chub Recovery Team
Chair, Desert Fishes Council Planning Committee for 2016 annual meeting

S.T. Ross

Member, Peer Review Panel, San Juan River Basin Recovery Implementation Program (SJRRIP)2016
Member, Desert Fishes Council Planning Committee for 2016 annual meeting.

A.M. Snyder

Member, University of New Mexico Pre-Disaster Planning Committee

T.F. Turner

Member, Desert Fishes Council Planning Committee for 2016 annual meeting
Member, Gila Trout and Chihuahua Chub Recovery Team
Member, Rio Grande Silvery Minnow Propagation and Genetics Workgroup
Appointed UNM Representative to the Executive Committee, Middle Rio Grande Endangered Species Act Collaborative Program (MRGESACP).
Member, Independent Science Advisory Board, Northwest Power and Conservation Council
UNM Animal Research and Care Committee
UNM Chemical/Laboratory Safety Committee
UNM Museum Council, College of Arts & Sciences Representative
UNM Research Council
UNM Research Excellence Workgroup, Research Strategic Plan
PAIS Building Executive Committee
UNM Higher Learning Commission Accreditation Committee
MSB Planning Committee
MSB Publications Editorial board
MSB Executive Committee

Journal Referee

W. H. Brandenburg
PLOS One (1)

S.R. Clark
Copeia (1) Southeastern Naturalist (1)

M.J. Osborne
Molecular Ecology (3), Ecology and Evolution (1), Journal of Biogeography (1), Freshwater Biology (1), Aquatic Biology (1)

D.L. Propst
Reviews in Fish Biology and Fisheries (1), Environmental Monitoring and Assessment (1), Western North American Naturalist (1)

T.J. Pilger
Fishery Bulletin (1), Journal of Biogeography (1), Transactions of the American Fisheries Society (1)

T.F. Turner
Oecologia (1), Copeia (1), Ecology (1), Evolutionary Applications (1), Fish and Fisheries (1) Freshwater Biology (1), Freshwater Science (1) Aquatic Biology (2), Proceedings of the Royal Society B – Biological Sciences (1), Transacations of the American Fisheries Society (2)

SERVICE

A.L. Barkalow

Volunteer, University of New Mexico's Center for Stable Isotopes open house, 24 Feb 2016.
Volunteer, 48th Annual Desert Fishes Council Meeting, Albuquerque, NM 15 –19 Nov 2016.
Volunteer, instructor (larval fish and museum specimens), student and young professionals Desert Fishes Council Outreach on the Rio Grande River. 15 November 2016.

W. H. Brandenburg

MacArthur Elementary School, Albuquerque, NM, Elizabeth Sehlmeyer and Shelly Salazar Fishes of New Mexico using specimens from MSB 18 March 2016.

T.J. Pilger

Invited editor for The Nature Conservancy's Writing Workshop for the Science Impact Project and NatureNet Science Fellows, Santa Fe NM, 4 – 7 April 2016
Organized student volunteer trip to Mora National Fish Hatchery for Gila Trout spawning. Mora, NM 15-17 March 2016

A.M. Snyder

Panel Member, Maxwell Museum NEA pre-proposal for renovation of archives for cultural collections, February 2016.
Mentor, UNM Biology Volunteer (2) Undergraduate Students in Museum Technique and Fishes

ADVANCED STUDY, HONORS, AWARDS, FELLOWSHIPS, ETC.

R.K. Dudley, S.P. Platania, and G.C. White

2016 Recovery Champion Award. Presented by the US Fish and Wildlife Service at the Southwest Regional Office (Region 2), Albuquerque, NM on 13 July 2016.

CURRENT STAFF

A. Faculty/Staff

Kendra Brunet Lecomte, Staff Curatorial Assistant
Scott R. Clark, Postdoctoral Research Fellow
Megan J. Osborne, Research Assistant Professor
Tyler J. Pilger, Postdoctoral Research Fellow
Steven P. Platania, Associate Curator of Fishes
David L. Propst, Curatorial Associate and UNM Adjunct Professor of Biology
Stephen T. Ross, Curator Emeritus and UNM Adjunct Professor of Biology
Alexandra M. Snyder, Collections Manager
Thomas F. Turner, Curator of Fishes, Professor of Biology, and Assoc. Dean for Research

B. Graduate students
Museum Research Assistants-Graduate Student TA
David Camak, Fall 2016

MSB Fishes Graduate Students, UNM Biology
Adam L. Barkalow, M.Sc. student
David Camak, Ph.D. student
Samantha Cordova, M.Sc. student

C. Undergraduate Student Employees and Volunteers, Lab and Museum
Kendra Brunet Lecomte, A&S Biology
Jenna Burgess, UNM Health Sciences
Hanna Carver, A&S Biology
Larissa E. Garcia, UNM School of Business
Holly L Hayes, A&S Psychology
Sarah Hogland, A&S Biology
Shiloh Langwell, A&S Art
Katie Taylor McCullough, A&S Biology
Alyssa Sanchez, A&S Biology
Sara Stienecker, A&S Biology
Yvonne Rivera, A&S Psychology

MUSEUM ASSOCIATES
A. Curatorial Associates
David L. Propst, Curatorial Associate and UNM Adjunct Professor of Biology

B. Research Associates
W. Howard Brandenburg, American Southwest Ichthyological Researchers, Albuquerque
James E. Brooks, US Fish and Wildlife Service, Albuquerque (Ret.)
Brooks M. Burr, Ph.D. Southern Illinois University, Carbondale
Robert K. Dudley, Ph.D. American Southwest Ichthyological Researchers, Albuquerque
Michael A. Farrington, M.S. American Southwest Ichthyological Researchers, Albuquerque
Eliza I. Gilbert, M.S. American Southwest Ichthyological Researchers, Albuquerque

Herbarium

DIVISION HIGHLIGHTS

The UNM Herbarium contained 133,735 specimens at the end of 2016. UNM has the largest collection of plant specimens in New Mexico, and is archived primarily for use in scientific research. Each specimen represents the field efforts of the collector and is mounted individually by student employees, databased, stored, and available for web-based, in-house, or outgoing-loan access by the public.

In our move to modernize the herbarium and make this resource available for wider use and enjoyment by the public we have imaged twenty-four thousand specimens that are available for high-resolution viewing and research. This recent emphasis by the staff and students at the herbarium complements the fully databased and web-accessible holdings of this division of the museum. These resources are available through multiple internet portals that receive thousands of views per month. Interpretive activities or collections-related outreach includes tours for the public, including K-12 and UNM students. The Herbarium works closely with the Native Plant Society of New Mexico (NPSNM) and the New Mexico Rare Plant Technical Council, as well as local schools and the Bosque Ecosystem Monitoring Project.

TABLE OF COLLECTION USE

2016
1. Collection: growth & current size (New Specimens Cataloged/total specimens): **825 / 133,735**
2. Loans Out: **18**
3. Professional Visitors to the Collections: **296**
4. Collection Database Web Site Hits **244,000**
6. Outside Publications Citing MSB Specimens ? 2
7. Peer-Reviewed Publications by Staff - 1
8. Graduate Students (using or working in collections) - 1
9. Graduate Theses/Dissertations Completed (UNM/Other*) – 0, 0
10. Undergraduate Students (using or working in collections) - 1

* List Other Institutions

COURSES USING THE COLLECTIONS

BIOL 463L, Tim Lowrey, Fall 2016, 11 students.

COURSES TAUGHT BY MSB PERSONNEL

A. Faculty/Collection Managers

CURATOR

BIOL 463L, Tim Lowrey, Fall 2016, 11 students.

BIOL 463L	*Flora of New Mexico*	*11*
BIOL 599	*Masters Thesis*	*1*
BIOL 699	*Dissertation*	*1*
BIOL 406	*Museum Studies*	*16*

BIOL 406, Phil Tonne, Spring 2016, 16 students. Museum Studies.

5. COLLECTION MANAGEMENT

This year we completed the imaging of thirteen plant families, including our largest, the sunflower family, or Asteraceae. We serve over twenty-four thousand specimen images through both the SEINet

(http://swbiodiversity.org) and iDigBio (https://www.idigbio.org/) portals. Our entire collection is digitized; all of the label information for over 130,000 specimens is available for use by the public and scientific research community.

We completed the remounting of a few thousand specimens from the early 1900s in 2016.

These specimens, part of the Brother Arsene Collection, were imaged in their original condition and then removed from their acidic paper. Once free they were mounted onto acid-free paper using modern techniques to preserve both the specimen and the historic label.

Our specimens traveled on loan to eighteen different institutions for taxonomic and systematic research this year. We received 296 visits to our division by the botanical community as well as group visits by schools and organizations. We average 2-3 information requests per week by e-mail and/or phone, and the SEINet and iDigBio portals receive thousands of visits to our collection.

While growth of the collection slowed this year, access to, and usability of, the collection grew tremendously. We have had the privilege of working with innovative bioinformatics programmers to maximize the availability of UNM's collections and information to the national and international community. This year's planning will lead to further growth and access to information.

We hosted the Southwest Carex Working Group once again in January. They are completing research on genera including *Carex, Cyperus*, and *Juncus*. Members include Max Licher, Jim McGrath, Bill Norris, and Glenn Rink. They are working on various treatments within this group for inclusion in the revision of the state's flora, Flora Neomexicana, as well as other state and regional reports and publications. Our sedge family holdings have been reviewed, verified, and revised within this process.

PUBLICATIONS

Journal Articles

Tonne, P., 2016. First New World records of *Cyperus glomeratus* in New Mexico, USA. Noteworthy Collection. Madrono, Vol. 63, No. 1, pp. 5-6, 2016.

Technical Reports

Tonne, P. 2016. **BEMP Vegetation Report 2015**. A description of the findings of the vegetation crew within the long-term monitoring sites of the Bosque Ecosystem Monitoring Program. Submitted to the Bosque School, Albuquerque, NM.

Publications Based on MSB Specimens/Data
(OTHER THAN THOSE REPORTED ABOVE)

Sivinski, R.C. 2016. New Mexico Thistle Identification Guide. Native Plant Society of New Mexico. Available: http://www.npsnm.org/education/thistle-identification-booklet/

OTHER PROFESSIONAL ACTIVITIES

Presentation to General Audience in a Scholarly Capacity

PRESENTER

Lowrey, T. Poisonous Plants of New Mexico. Western Heritage Museum. Hobbs, New Mexico, March 1 2016.

Lowrey, T. Asteraceae; key characteristics and identification. Three Day workshop for the Native Plant Society of New Mexico. Sevilleta Field Station. September 2016. 25 participants.

Scholarly Service as a Member of a Local/State/Regional/National Committee, Panel, etc.

Lowrey, T.:

Graduate Policy Committee
Ph.D. Committee of F.J. Triepke, Chair
M.S. Committee of M. Gattreaux
Ph.D. Committee of Karen Wright
Provost's Committee on Tenure and Promotion
Presidential Search Committee
Provost's Committee on Academic Success
Academic Program Reviews- Grad Studies Rep.
Assoc. Deans of Research Advisory Committee
NM Rare Plant Technical Council
Council of Graduate Deans

Tonne, P. NM Rare Plant Technical Council

Journal Referee

Lowery, T. 5 manuscripts/proposals reviewed.
Tonne, P. 2 manuscripts/proposals reviewed.

SERVICE

Research Associate, Missouri Botanical Garden, St. Louis, MO. 1985-present.

CURRENT STAFF

A. Faculty/Staff

Tim Lowrey, Professor, Curator and Associate Dean
Phil Tonne, Senior Collection Manager

B. Graduate students

Jack Triepke, PhD candidate, PhD submitted.
Matt Gautreaux, Masters student.
Samantha Stutz, Herbarium Graduate Assistant.

C. Undergraduate Student Workers and Volunteers

Kyle Robinson
Trent Llewellyn

MUSEUM ASSOCIATES

Research Associates

Daniela Roth, State Forestry Division Botanist, EMNRD.
Robert Sivinski, retired State Forestry Division Botanist; botanical consultant at present.

Division of Mammals

DIVISION HIGHLIGHTS

Collection Growth. The DOM added 10,246 new specimens to its catalogue during 2016 and now contains 292,452 cataloged specimens. The collection is the 2rd largest collection in the Western Hemisphere and in the top 3 worldwide. New accessions (130) of mammalian material amounted to >6,000 specimens.

The continued exceptional growth is the result of several facets of our operation:

a. **Specimen growth through fieldwork**
   1) Directed specimen-based studies within Joseph Cook's research program.
   2) Highly successful fieldwork in a wide variety of projects spanning the Western Hemisphere, eastern Asia, and collaborations with state and federal resource agencies in the western US and Canada. Work primarily sponsored by the National Science Foundation, National Institutes of Health, USDA Forest Service and US Fish and Wildlife Service.
   3) New initiatives focused on building the collection in key geographic regions and for critical taxa.
   4) Specimen growth through donation
   5) A well-developed network of researchers and agencies worldwide are now heavily invested in the DOM, by continuing to deposit their material here and later track and retrieve information via the Arctos database.
   6) Donations of personal collections from individual researchers.
   7) Transfer of collections from other institutions (i.e. NMMNHS, USGS).

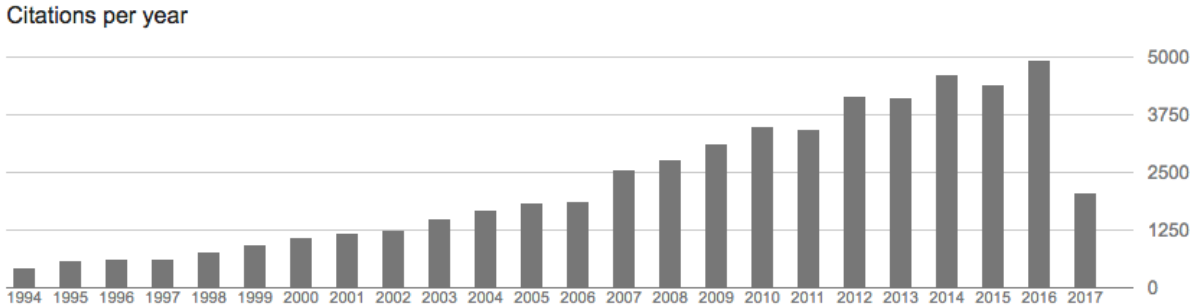
Continued growth and use, in addition to recognition by several agencies that DOM is a primary repository for research material, points to the strength and good standing of this infrastructure in the greater scientific community.

Training in specimen based research and curation. Training remains one of the integral goals of the DOM. Students gain experience in bioinformatics, natural history collection preparation and curation, and field and laboratory based research. Students were involved in all activities of the division during 2016.

Each year, MSB Mammals hosts several high school interns from local schools.

a. 27 UNM students worked in the division in 2016
    i. 2 graduate student
    ii. 10 paid undergraduates
    iii. 15 volunteer undergraduates
    iv. Of these 27:
        1. 22 were females, 5 males
        2. 11 were from under-represented groups
b. 21 Albuquerque Public Schools high school interns/volunteers

Publications utilizing MSB DOM specimens or data. The DOM collection continues to be utilized heavily in a wide range of disciplines and is the basis for a large number of peer-reviewed publications and agency reports. Tracking all publications that utilize our specimens is difficult, as not all authors are careful to acknowledge use of DOM specimens. Thus, the number of publications based on our material should be viewed as an underestimate.



Publications citing MSB mammal specimens have increased dramatically in the last decade and establish MSB as critical research infrastructure globally.

During 2016 DOM specimens were cited or specimen data was utilized in at least 66 studies published in 46 journals and 3 books:

1. Acta Chiropterologica
2. American Museum Novitates
3. Archives of Zoological Museum of Moscow State University
4. Asian Perspectives
5. Biological Conservation
6. Biological Journal of the Linnean Society
7. BioScience
8. BMC immunology
9. Bol. Soc. Bras. Mastozool
10. Bulletin of the American Museum of Natural History
11. Canadian Journal of Zoology
12. Check List
13. Cladistics
14. Current Zoology
15. Ecology and Evolution
16. Evolution
17. Geoarchaeology
18. Infection, Genetics and Evolution
19. Journal of Mammalian Evolution
20. Journal of Mammalogy
21. Journal of Virology
22. Mammal Research
23. Mammalia
24. Mammalian Biology-Zeitschrift für Säugetierkunde
25. Mastozoología neotropical
26. Molecular biology and evolution
27. Molecular ecology resources
28. Molecular Ecology
29. Molecular phylogenetics and evolution
30. Museum of Texas Tech, Special Publications
31. Occasional Papers, Museum of Texas Tech University
32. Paleobiology
33. Parasitology Research
34. PLoS Negl Trop Dis
35. Proceedings of the Royal Society B
36. Scientific reports
37. Southeastern Naturalist
38. Systematic parasitology
39. The Journal of Wildlife Management
40. Tropical Medicine and Health
41. USFS Science Findings
42. Vector-Borne and Zoonotic Diseases
43. Virology journal

44. Western North American Naturalist
45. Zoologica Scripta
46. Zoological Journal of the Linnean Society

Theses/Dissertations.

c. In 2016, at least 4 theses or dissertations were completed that utilized MSB mammal specimens.

Bat diversity is well represented in the MSB Mammal Division.

Arctos database and collection accessibility. The Arctos database is a cutting-edge relational database that continues to provide an invaluable resource for researchers, educators, public health workers, and natural resource managers worldwide. Arctos is web-accessible and greatly enhances the visibility of the MSB.

d. Web visits to Arctos tracked via Google analytics = 118,356 visits
e. 6,408 (27.7%) visitors referred to our site were from GenBank.
f. Global Impact--visitors came from 202 countries.
g. Queries containing records from DOM, DGR Mammals, or DOM observations:

Collection	Queries	Specimen Records
DGR Mammals	2275	23,107
MSB Mamm Obs	234	559
DOM	52,949	24,807,336

TOTAL	55,458	24,810,202

Barcoding of USGS collection – Barcoding of USGS tissue samples is about 1/3 completed.

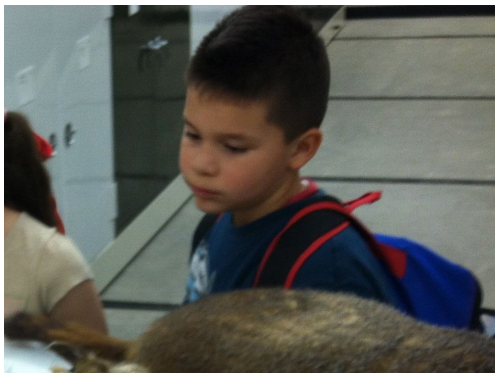
Collection Donations

h. **Ernest Thompson Seton mammal collection** Transfer of > 400 mammal voucher specimens previously held at the Philmont Scout Ranch was completed. This important collection is composed of specimens dating from the late 1800-1920's and documents the southwestern US, as well as Canada and England.

i. **Ryan Stephens collection** – 1000 small mammals documenting contemporary diversity in New Hampshire from federally funded monitoring projects on USDA Forest Service lands. All specimens are excellently prepared by Stephens and have associated tissues.

j. **Canadian carnivores - Suzanne Carriere and Thomas Jung** –1300 wolverine and 300 marten skulls and tissues from NWT and Yukon.

k. **Troy Best Collection** – approximately 300 specimens from Oklahoma and New Mexico mostly from the 1980s were donated from Dr. Best's personal collection. To date, Dr. Best has deposited >3000 mammal specimens.



Throughout the year, we host numerous tours to school classes of all ages.

TABLE OF COLLECTION USE

2016	
1. Collection: growth & current size (New Specimens Cataloged/total specimens)	10,246/292,452
2. Loans Out	71 loans of 3,414 specimens
3. Professional Visitors to the Collections	66
4. Collection Database Web Site Hits	118,356
6. Outside Publications Citing MSB Specimens	56

7. Peer-Reviewed Publications by Staff	10
8. Graduate Students (using or working in collections)	31
9. Graduate Theses/Dissertations Completed (UNM/Other*)	4
10. Undergraduate Students (using or working in collections)	25

* List Other Institutions

COURSES USING THE COLLECTIONS

UNM Classes receiving loans of material for educational purposes (13 classes serving 951 students)

BIOL 204L - Plant and Animal Form and Function.	Spring	(180 students)
BIOL 204L - Plant and Animal Form and Function.	Fall	(180 students)
BIOL 203L – Ecology and Evolution.	Spring	(240 students)
BIOL 203L – Ecology and Evolution.	Fall	(240 students)
Biol 499/599 – Trop Biol- Ecuador		(20 students)
BIOL 386L – General Vertebrate Zoology.	Fall	(30 students)
BIOL 386L – General Vertebrate Zoology.	Spring	(40 students)
BIOL 389L – Mammalogy	Fall	(22 students)
BIOL Ecology of the Past (Smith)	Spring	
BIOL 599 – Masters Thesis.	Spring	(2 students, 2 loans)
BIOL 599 – Masters Thesis.	Fall	(2 students, 2 loans)
BIOL 699 – Dissertation.	Spring	(1 students, 1 loans)
BIOL 699 – Dissertation.	Fall	(4 students, 8 loans)

UNM courses or programs using collection through visits or staff presentations (269 students, 18 instructors from 11 classes/programs).

ART seminar (Andrea Poli)	Fall (3 students, 1 instructor)
ART Studio 141 (Intro art/ecol), 2 sections, Spring	(34 students, 2 instructors)
Land Arts of American West	(13 students, 1 instructor)
ART /ART HIST – Drawing I. 2 sec, Spring/Sum	(38 students, 2 instructors)
ANTRO Zooarchaelogy	(13 students, 1 instructor)
BIOL 499/599 (Tropical Biology)	(16 students, 2 instructors)
BIOL 486L General Vertebrate Zoology	(52 student, 2 instructors)
BIOL 489L Mammalogy	(22 students, 1 instructor)
MSST 476/576 Mus Studies (Larson) Spring/Fall	(22 students, 2 instructor)
MSST 476/576 Mus Studies (Traxler) Fall	(18 students, 1 instructor)
NTSC 262L – Life Science Spring/Fall	(47 students, 2 instructor)
UNM Biology graduate student orientation	(25 students, 1 instructor)

COURSES TAUGHT BY MSB PERSONNEL

A. Faculty/Collection Managers

CURATOR **- Cook, J. A.**

BIOL course number	*Title*	*Number of Students*	
BIOL 400 U 007	Senior Honors Thesis	Spring	1
BIOL 461L U 001	Intro To Tropical Biology	Spring	11
BIOL 499 U 007	Undergraduate Problems	Spring	4
BIOL 502 M 006	T: Phylogenomics	Spring	3
BIOL 502 M 054	T: Adv Tropical Field Biology	Spring	3
BIOL 551 M 007	Research Problems	Spring	2
BIOL 599 M 007	Masters Thesis	Spring	3
BIOL 699 P 007	Dissertation	Spring	5
BIOL 400 U 007	Senior Honors Thesis	Fall	1
BIOL 489L U 001	Mammalogy	Fall	22
BIOL 499 U 007	Undergraduate Problems	Fall	1
BIOL 502 M 054	T: Evolutionary Genomics	Fall	3
BIOL 551 M 007	Research Problems	Fall	3
BIOL 599 M 007	Masters Thesis	Fall	3
BIOL 699 P 007	Dissertation	Fall	3

Teaching Assistantships

Bell, KC

Biol 461L/561L Tropical Biology	Fall	14

Liphardt, S

BIOL 489L Mammalogy	Fall	22

COLLECTION MANAGEMENT

Visitors (539 total)

K-12 schools and educational groups: 287 students, 24 teachers from 11 schools.

Jefferson Middle school	(88 students, 5 teachers)
Montessori on the Rio Grande	(10 students, 3 teachers)
Alchesay High School, Whiteriver, AZ	(11 students, 1 teachers)
Salam Academy	(18 students, 2 teachers)
Amy Biehl High School	(60 students)
Cuba High School	(40 students, 4 teachers)

Monte Vista Elementary	(22 students, 2 teachers)
El Dorado High School	(38 students, 2 teachers)
Early College Academy	(1 teacher)
Albuquerque Academy	(1 teacher)
RET	(3 teachers)

Visiting researchers: 63 from 14 institutions or departments

UNM Dept of Anthropology	(12)
UNM Dept of Biology	(22)
UNM Dept of Art	(2)
University of Nebraska-Kearney	(4)
University of Nebraska-Omaha	(1)
USGS	(2)
Prescott College	(2)
Oklahoma State University, Health Sciences	(1)
University of Montana	(2)
CIBNOR, La Paz, Mexico	(2)
USDA	(2)
New Mexico Museum of Natural History/Science	(1)
New Mexico State University	(2)
University of Sydney, Australia	(1)
Other	(7)

Other visitors: 189

UNM IMSD Program	(2)
UNM Maxwell museum	(2)
UNM Libraries	(1)
UNM KUNM	(1)
UNM STEM tour	(30)
UNM Research Day Open House	(100)
Capital University of Economics, Bejing, China	(1)
USGS	(5)
Philmont Scout Ranch museum	(2)
Bernalillo Co. Master Naturalists Program	(25)
Albuquerque Biopark docents	(17)
Universidad Nacional Autonoma de Mexico	(1)
Universidad Nacional Autonoma de Yucutan	(1)
Instituto Tecnico Superior Tantoyuca	(1)
Instituto Tecnico Superior de Pira Rica	(1)
Other	(14)

Graduate students working in or using collections through loans (31)

Chloe Courtney	UNM Art
Lara Goldmann	UNM Art
Cyler Conrad	UNM Anthropology

Asia Alsgaard	UNM Anthropology
Clayton Meredith	UNM Anthropology

James Degnan (Prof, Math and Stats) and Huan Jiang, PhD candidate

Eden Franz	UNM Anthropology
Jana Valesca Meyer	UNM Anthropology
Jamie Fowler Diaz	UNM Anthropology
Schuyler Liphardt	UNM Biology
Bryan McLean	UNM Biology
Kayce Bell	UNM Biology
Jocie Colella	UNM Biology
Catalina Tome	UNM Biology
Melissa Pardi	UNM Biology
Brittany Coe	UNM Biology
Richard Ramirez	UNM Biology
Marie Westover	UNM Biology
Carlos Carrion	UNM Biology
Jessica Weber	UNM Biology
Donavan Jackson	UNM Biology
Amanda Jones	UNM Biology
Diana Kredja	UNM Biology
Dejeanne Doublett	NMSU
Grace Igwe	NMSU
Hannah Kim Frank	Stanford University
Emily Weidner	University of Montana
Nathanael Herrera	University of Montana
Natasha Vitek	Florida Museum Nat Hist
Mirjam van Dalum	UiT Norges arktiske universitet Norway
Natali Hurtado Miranda	Universidad de la Republica, Uruguay
Carola Canon	Universidad de Concepción, Chile

Carlos Carrion, PhD Candidate working on the
Systematics of Myotid Bats of Ecuador

LOANS

71 loans of 3,414 specimens (1,547 skin, skel or skin clips, 1,018 frozen tissues and 849 mammal parasites) to 28 institutions.

AWARDS, GRANTS, AND CONTRACTS (TO MSB CURATOR OR STAFF)

1. Cook, JA - Initiated the James S. Findley Student Endowment Fund $17,500

2. Cook, JA, JL Dunnum, ML Campbell - CSBR:Natural History: Upgrade and transfer of the Museum of Southwestern Biology's Division of Genomic Resources frozen tissue collection to nitrogen vapor storage. (NSF1561342) 5/1/16-4/30/2019 $499,712

3. Cook, JA, JL Dunnum, ML Campbell - Mod 3: Geo-referencing of the United States Geological Survey (USGS) Arid Lands Field Station specimen data. Barcoding the Division of Genomic ResourcesbUSGS tissue samples. $48,500

4. Cook, JA, JL Dunnum - BLM Rio Puerco mammal studies (El Malpais) $38,972

5. Cook, JA, KC Bell - USDA ARS—Genomes of Helminths, USDA ARS $39,300

6. Dunnum, JL – USFWS. Improved archiving of Mexican Wolf Specimens in the MSB. 2015-2016. $10,000
7. Dunnum, JL - USFWS. Improved archiving of Mexican wolf specimens in the MSB. 2016-2021. $75,000

PUBLICATIONS (BY MSB CURATOR, CM OR OTHER PAID STAFF)

Journal Articles

1. Arai, Satoru, Hae Ji Kang, Se Hun Gu, Satoshi D. Ohdachi, Joseph A. Cook, Liudmila N. Yashina, Keiko Tanaka-Taya et al. "Genetic Diversity of Artybash Virus in the Laxmann's Shrew (*Sorex caecutiens*)." *Vector-Borne and Zoonotic Diseases* 16, no. 7 (2016): 468-475.
2. Arai, Satoru, Satoshi Taniguchi, Keita Aoki, Yasuhiro Yoshikawa, Shigeru Kyuwa, Keiko Tanaka-Taya, Joseph S. Masangkay et al. "Molecular phylogeny of a genetically divergent hantavirus harbored by the Geoffroy's rousette (*Rousettus amplexicaudatus*), a frugivorous bat species in the Philippines." *Infection, Genetics and Evolution* 45 (2016): 26-32.
3. Bell, Kayce C., Kendall L. Calhoun, Eric P. Hoberg, John R. Demboski, and Joseph A. Cook. "Temporal and spatial mosaics: deep host association and shallow geographic drivers shape genetic structure in a widespread pinworm, Rauschtineria eutamii (Nematoda: Oxyuridae)." *Biological Journal of the Linnean Society* 119, no. 2 (2016): 397-413.
4. Cook, Joseph A., Stephen E. Greiman, Salvatore J. Agosta, Robert P. Anderson, Brian S. Arbogast, Robert J. Baker, Walter Boeger et al. "Transformational Principles for NEON Sampling of Mammalian Parasites and Pathogens: A Response to Springer and Colleagues." *BioScience* (2016): biw123.
5. Cook, Joseph, Eileen Lacey, Steffi Ickert-Bond, Eric Hoberg, Kurt E. Galbreath, Kayce C. Bell, Stephen E. Greiman, Bryan S. McLean, and Scott Edwards. "From museum cases to the classroom: Emerging opportunities for specimen-based education." *Archives of Zoological Museum of Moscow State University* 54 (2016): 787-799.
6. Cook, Joseph A., Bryan S. McLean, Donavan J. Jackson, Jocelyn P. Colella, Stephen E. Greiman, Vasyl V. Tkach, Thomas S. Jung, and Jonathan L. Dunnum. "First record of the Holarctic least shrew (*Sorex minutissimus*) and associated helminths from Canada: new light on northern Pleistocene refugia." *Canadian Journal of Zoology* 94, no. 5 (2016): 367-372.
7. Hope, Andrew G., Jason L. Malaney, Kayce C. Bell, Fernando Salazar-Miralles, Andreas S. Chavez, Brian R. Barber, and Joseph A. Cook. "Revision of widespread red squirrels (genus: *Tamiasciurus*) highlights the complexity of speciation within North American forests." *Molecular phylogenetics and evolution* 100 (2016): 170-182.
8. Kim, S., Cho, Y.S., Kim, H.M., Chung, O., Kim, H., Jho, S., Seomun, H., Kim, J., Bang, W.Y., Kim, C., An, J., Bae, C.H., Bhak, Y., Jeon, S., Yoon, H., Kim, Y., Jun, J., Lee, H., Cho, S., Uphyrkina, O., Kostyria, A., Goodrich, J., Miquelle, D., Roelke, M., Lewis, J., Yurchenko, A., Bankevich, A., Cho, J., Lee, S., Edwards, J.S., Weber, J.A., Cook, J., Kim, S., Lee, H., Manica, A., Lee, I., O'Brien, S.J., Bhak, J., Yeo, J.H. Comparison of carnivore, omnivore, and herbivore mammalian genomes with a new leopard assembly. *Genome Biology* 17:211 (2016).
9. McLean, Bryan S., Donavan J. Jackson, and Joseph A. Cook. "Rapid divergence and gene flow at high latitudes shape the history of Holarctic ground squirrels (*Urocitellus*)." *Molecular phylogenetics and evolution* 102 (2016): 174-188.

10. Yuan, Hao, Jiamei Jiang, Francisco Agustín Jiménez, Eric P. Hoberg, Joseph A. Cook, Kurt E. Galbreath, and Chenhong Li. "Target gene enrichment in the cyclophyllidean cestodes, the most diverse group of tapeworms." *Molecular ecology resources* 16, no. 5 (2016): 1095-1106.

Technical Reports

Annual Report, Division of Mammals, Museum of Southwestern Biology
Annual Director's Report, Museum of Southwestern Biology

Publications Based on MSB Specimens/Data (OTHER THAN THOSE REPORTED ABOVE)

1. Alhajeri, Bader H., John J. Schenk, and Scott J. Steppan. "Ecomorphological diversification following continental colonization in muroid rodents (Rodentia: Muroidea)." *Biological Journal of the Linnean Society* 117, no. 3 (2016): 463-481.
2. Ammerman, Loren K., Dana N. Lee, and Russell S. Pfau. "Patterns of genetic divergence among *Myotis californicus*, *M. ciliolabrum*, and *M. leibii* based on amplified fragment length polymorphism." *Acta Chiropterologica* 18, no. 2 (2016): 337-347.
3. Armién, Blas, Paulo Lazaro Ortiz, Publio Gonzalez, Alberto Cumbrera, Alina Rivero, Mario Avila, Aníbal G. Armién, Frederick Koster, and Gregory Glass. "Spatial-Temporal Distribution of Hantavirus Rodent-Borne Infection by *Oligoryzomys fulvescens* in the Agua Buena Region-Panama." *PLoS Negl Trop Dis* 10, no. 2 (2016): e0004460.
4. Bezerra, Alexandra M.R.. Coleções Científicas de Mamíferos do Brasil: III (– Estados Unidos da América. Bol. Soc. Bras. Mastozool 76 (2016):68-75.
5. Bogan, Michael A. and Tony R. Mollhagen. " A Resurvey of Bats at Dinosaur National Monument." In, Contributions in Natural History: A Memorial Volume in Honor of Clyde Jones. *Museum of Texas Tech*, *Special Publications 65(2016)*: 215-223.
6. Buskirk, Steven W. *Wild Mammals of Wyoming and Yellowstone National Park*. Univ of California Press, 2016.
7. Caraballo, Diego A., Ivanna H. Tomasco, Denise H. Campo, and María Susana Rossi. "Phylogenetic relationships between tuco-tucos (Ctenomys, Rodentia) of the Corrientes group and the *C. pearsoni* complex." *Mastozoología neotropical* 23, no. 1 (2016): 39-49.
8. Cason, Michelle M., Andrew P. Baltensperger, Travis L. Booms, John J. Burns, and Link E. Olson. "Revised distribution of an Alaskan endemic, the Alaska Hare (*Lepus othus*), with implications for taxonomy, biogeography, and climate change." *Arctic Science* 2, no. 2 (2016): 50-66.
9. Conrad, Cyler, Charles Higham, Masaki Eda, and Ben Marwick. "Palaeoecology and Forager Subsistence Strategies during the Pleistocene–Holocene Transition: A Reinvestigation of the Zooarchaeological Assemblage from Spirit Cave, Mae Hong Son Province, Thailand." *Asian Perspectives* 55, no. 1 (2016): 2-27.
10. Damasceno, Elis M., and Diego Astúa. "Geographic variation in cranial morphology of the Water Opossum Chironectes minimus (Didelphimorphia, Didelphidae)." *Mammalian Biology-Zeitschrift für Säugetierkunde* 81, no. 4 (2016): 380-392.

11. Díaz-Nieto, Juan F., Sharon A. Jansa, and Robert S. Voss. "DNA sequencing reveals unexpected Recent diversity and an ancient dichotomy in the American marsupial genus *Marmosops* (Didelphidae: Thylamyini)." *Zoological Journal of the Linnean Society* 176, no. 4 (2016): 914-940.
12. Díaz-Nieto, Juan F., and Robert S. Voss. "A revision of the didelphid marsupial genus Marmosops, Part 1. Species of the subgenus Sciophanes." *Bulletin of the American Museum of Natural History* (2016): 1-70.
13. Ge, Xing-Yi, Wei-Hong Yang, Hong Pan, Ji-Hua Zhou, Xi Han, Guang-Jian Zhu, James S. Desmond, Peter Daszak, Zheng-Li Shi, and Yun-Zhi Zhang. "Fugong virus, a novel hantavirus harbored by the small oriental vole (*Eothenomys eleusis*) in China." *Virology journal* 13, no. 1 (2016): 27.
14. Gibb, Gillian C., Fabien L. Condamine, Melanie Kuch, Jacob Enk, Nadia Moraes-Barros, Mariella Superina, Hendrik N. Poinar, and Frédéric Delsuc. "Shotgun mitogenomics provides a reference phylogenetic framework and timescale for living xenarthrans." *Molecular biology and evolution* 33, no. 3 (2016): 621-642.
15. Grimstead, Deanna N., Jay Quade, and Mary C. Stiner. "Isotopic Evidence for Long-Distance Mammal Procurement, Chaco Canyon, New Mexico, USA." *Geoarchaeology* 31, no. 5 (2016): 335-354.
16. Gu, Se Hun, Satoru Arai, Hon-Tsen Yu, Burton K. Lim, Hae Ji Kang, and Richard Yanagihara. "Genetic variants of Cao Bang hantavirus in the Chinese mole shrew (*Anourosorex squamipes*) and Taiwanese mole shrew (*Anourosorex yamashinai*)." *Infection, Genetics and Evolution* 40 (2016): 113-118.
17. Gu, Se Hun, Mukesh Kumar, Beata Sikorska, Janusz Hejduk, Janusz Markowski, Marcin Markowski, Paweł P. Liberski, and Richard Yanagihara. "Isolation and partial characterization of a highly divergent lineage of hantavirus from the European mole (*Talpa europaea*)." *Scientific reports* 6 (2016).
18. Harding, Larisa E., Jim Heffelfinger, David Paetkau, Esther Rubin, Jeff Dolphin, and Anis Aoude. "Genetic management and setting recovery goals for Mexican wolves (*Canis lupus baileyi*) in the wild." *Biological Conservation* 203 (2016): 151-159.
19. Harrison, Robert L. "Noninvasive identification of individual American badgers by features of their dorsal head stripes." *Western North American Naturalist* 76, no. 2 (2016): 259-261.
20. Haukisalmi, Voitto, Lotta M. Hardman, Vadim B. Fedorov, Eric P. Hoberg, and Heikki Henttonen. "Molecular systematics and Holarctic phylogeography of cestodes of the genus Anoplocephaloides Baer, 1923 ss (Cyclophyllidea, Anoplocephalidae) in lemmings (*Lemmus, Synaptomys*)." *Zoologica Scripta* 45, no. 1 (2016): 88-102.
21. Hoberg, E. P., A. A. Makarikov, V. V. Tkach, S. Meagher, T. N. Nims, R. P. Eckerlin, and K. E. Galbreath. "Insights on the host associations and geographic distribution of Hymenolepis folkertsi (Cestoda: Hymenolepididae) among rodents across temperate latitudes of North America." *Parasitology Research* 115, no. 12 (2016): 4627-4638.

22. Jayat, J. Pablo, Guillermo D'Elía, Pablo E. Ortiz, and Pablo Teta. "A new species of the rodent genus *Necromys* Ameghino (Cricetidae: Sigmodontinae: Akodontini) from the Chaco Serrano grasslands of northwestern Argentina." *Journal of Mammalogy* (2016): gyw103.

23. Kang, Hae Ji, Se Hun Gu, Joseph A. Cook, and Richard Yanagihara. "Dahonggou Creek virus, a divergent lineage of hantavirus harbored by the long-tailed mole (*Scaptonyx fusicaudus*)." *Tropical Medicine and Health* 44, no. 1 (2016): 16.

24. Keeley, William H., Marc J. Bechard, and Gail L. Garber. "Prey use and productivity of ferruginous hawks in rural and exurban New Mexico." *The Journal of Wildlife Management* 80, no. 8 (2016): 1479-1487.

25. Kierepka, E. M., and E. K. Latch. "High gene flow in the American badger overrides habitat preferences and limits broadscale genetic structure." *Molecular Ecology* 25, no. 24 (2016): 6055-6076.

26. Kingsley, Evan P., Krzysztof M. Kozak, Susanne P. Pfeifer, Dou-Shuan Yang, and Hopi E. Hoekstra. "The ultimate and proximate mechanisms driving the evolution of long tails in forest deer mice." *Evolution* (2016). DOI: 10.1111/evo.13150

27. Krasnec, Katina V., Anthony T. Papenfuss, and Robert D. Miller. "The UT family of MHC class I loci unique to non-eutherian mammals has limited polymorphism and tissue specific patterns of expression in the opossum." *BMC immunology* 17, no. 1 (2016): 43.

28. Laenen, Lies, Simon Dellicour, Valentijn Vergote, Inne Nauwelaers, Sarah De Coster, Ina Verbeeck, Bert Vanmechelen, Philippe Lemey, and Piet Maes. "Spatio-temporal analysis of Nova virus, a divergent hantavirus circulating in the European mole in Belgium." *Molecular Ecology* 25, no. 23 (2016): 5994-6008.

29. Lanzone, Cecilia, D. Cardozo, D. M. Sánchez, D. A. Martí, and R. A. Ojeda. "Chromosomal variability and evolution in the tribe Phyllotini (Rodentia, Cricetidae, Sigmodontinae)." *Mammal Research* 61, no. 4 (2016): 373-382.

30. Light, Jessica E., Marcy O. Ostroff, and David J. Hafner. "Phylogeographic assessment of the northern pygmy mouse, *Baiomys taylori*." *Journal of Mammalogy* 97, no. 4 (2016): 1081-1094.

31. Linzey, Donald W., and M. Kevin Hamed. "Distribution of the Least Weasel (*Mustela nivalis*) in the Southeastern United States." *Southeastern Naturalist* 15, no. 2 (2016): 243-258.

32. Lissovsky, Andrey A., Svetlana P. Yatsentyuk, and Deyan Ge. "Phylogeny and taxonomic reassessment of pikas *Ochotona pallasii* and *O. argentata* (Mammalia, Lagomorpha)." *Zoologica Scripta* 45, no. 6 (2016): 583-594.

33. MacFadden, Bruce J., and Robert P. Guralnick. Paleobiology Letters "Horses in the Cloud: big data exploration and mining of fossil and extant *Equus* (Mammalia: Equidae)". Paleobiology, 43(1), 2017, pp. 1–14.

34. Makarikov, Arseny A., and Eric P. Hoberg. "Broadening diversity in the Arostrilepis horrida complex: *Arostrilepis kontrimavichusi* n. sp.(Cyclophyllidea: Hymenolepididae) in the western red-backed vole *Myodes californicus* (Merriam)(Cricetidae: Arvicolinae) from temperate latitudes of the Pacific Northwest, North America." *Systematic parasitology* 93, no. 5 (2016): 467-477.

35. Malicorne, Sébastien, Cécile Vernochet, Guillaume Cornelis, Baptiste Mulot, Frédéric Delsuc, Odile Heidmann, Thierry Heidmann, and Anne Dupressoir. "Genome-Wide Screening of Retroviral Envelope Genes in the Nine-Banded Armadillo (*Dasypus novemcinctus*, Xenarthra) Reveals an Unfixed Chimeric Endogenous Betaretrovirus Using the ASCT2 Receptor." *Journal of Virology* 90, no. 18 (2016): 8132-8149.

36. Martínez, Juan José, María Leonor Sandoval, and Luz Valeria Carrizo. "Taxonomic status of large-and middle-sized *Calomys* (Cricetidae: Sigmodontinae) from the southern central Andes inferred through geometric morphometrics of the skull." *Journal of Mammalogy* 97, no. 6 (2016): 1589-1601.

37. Mazza, Rhonda, and Charlie Crisafulli. "Volcano ecology: flourishing on the flanks of Mount St. Helens." USDA , USFS Science Findings. October (2016).

38. Mollhagen, Tony R., and Michael A. Bogan. "An Inventory of Bats in Arch Canyon, San Juan County, Utah." In, Contributions in Natural History: A Memorial Volume in Honor of Clyde Jones. *Museum of Texas Tech*, *Special Publications 65(2016)*: 215-223.

39. Morrison, David A. "The Biology and Identification of the Coccidia (Apicomplexa) of Marsupials of the World.—Donald W. Duszynski." (2016): 722-724.

40. Moss, Wynne E., Mathew W. Alldredge, Kenneth A. Logan, and Jonathan N. Pauli. "Human expansion precipitates niche expansion for an opportunistic apex predator (*Puma concolor*)." *Scientific Reports* 6 (2016).

41. Nascimento, F. F., M. Oliveira-Silva, G. Veron, J. Salazar-Bravo, P. R. Gonçalves, A. Langguth, C. R. Silva, and C. R. Bonvicino. "The Evolutionary History and Genetic Diversity of Kinkajous, *Potos flavus* (Carnivora, Procyonidae)." *Journal of Mammalian Evolution* (2016): 1-13.

42. Orcutt, John D., and Samantha SB Hopkins. "Latitudinal body-mass trends in Oligo-Miocene mammals." *Paleobiology* 42, no. 4 (2016): 643-658.

43. Pardiñas, Ulyses FJ, Pablo Teta, Jorge Salazar-Bravo, Phil Myers, and Carlos A. Galliari. "A new species of arboreal rat, genus *Oecomys* (Rodentia, Cricetidae) from Chaco." *Journal of Mammalogy* 97, no. 4 (2016): 1177-1196.

44. Pavan, Silvia E., and Robert S. Voss. "A Revised Subgeneric Classification of Short-Tailed Opossums (Didelphidae: *Monodelphis*)." *American Museum Novitates* 3868 (2016): 1-44.

45. Pilatti, Patricia, and Diego Astúa. "Orbit orientation in didelphid marsupials (Didelphimorphia: Didelphidae)." *Current Zoology* (2016): zow068.

46. Puckett, Emily E., Jane Park, Matthew Combs, Michael J. Blum, Juliet E. Bryant, Adalgisa Caccone, Federico Costa et al. "Global population divergence and admixture of the brown rat (*Rattus norvegicus*)." In *Proc. R. Soc. B*, vol. 283, no. 1841, p. 20161762. The Royal Society, 2016.

47. Salazar-Bravo, Jorge, Ulyses FJ Pardiñas, Horacio Zeballos, and Pablo Teta. "Description of a New Tribe of Sigmodontine Rodents (Cricetidae: Sigmodontinae) with an Updated Summary of Valid Tribes and Their Generic Contents." *Occasional Papers, Museum of Texas Tech University* 338 (2016): 1-23.

48. Sánchez-Hernández, Cornelio, María de Lourdes Romero-Almaraz, Gary D. Schnell, Michael L. Kennedy, Troy L. Best, Robert D. Owen, and Sara B. González-Pérez. *Bats of Colima, Mexico*. Vol. 14. University of Oklahoma Press, 2016.

49. Sawyer, Yadéeh E., and Joseph A. Cook. "Phylogeographic structure in long-tailed voles (Rodentia: Arvicolinae) belies the complex Pleistocene history of isolation, divergence, and recolonization of Northwest North America's fauna." *Ecology and Evolution* 6, no. 18 (2016): 6633-6647.

50. Straková, Petra, Lucie Dufkova, Jana Širmarová, Jiří Salát, Tomáš Bartonička, Boris Klempa, Florian Pfaff et al. "Novel hantavirus identified in European bat species *Nyctalus noctula*." *Infection, Genetics and Evolution* (2016).

51. Teta, Pablo, Carola Cañón, Bruce D. Patterson, and Ulyses FJ Pardiñas. "Phylogeny of the tribe Abrotrichini (Cricetidae, Sigmodontinae): integrating morphological and molecular evidence into a new classification." *Cladistics* (2016).

52. Teta, Pablo, Jorge Pablo Jayat, and Pablo E. Ortiz. "Notes on the distribution of the genus Andalgalomys (Rodentia, Cricetidae), with the first record of *A. pearsoni* (Myers 1978) from Argentina." *Mammalia* 80, no. 6 (2016): 667-671.

53. Tirira, Diego G., M. Alejandra Camacho, Nicolás Tinoco, María Fernanda Solórzano, and Santiago F. Burneo. "Genus *Glyphonycteris* Thomas, 1896 (Mammalia: Chiroptera) in Ecuador: first confirmed record of *G. sylvestris* Thomas, 1896 and a geographical review to *G. daviesi* (Hill, 1965)[with erratum]." *Check List* 12, no. 5 (2016): 1965.

54. Tye, Simon P., Keith Geluso, and Mike R. Fugagli. 2016. Merriam's Shrew (*Sorex merriami*) in the Diet of a Mexican Spotted Owl (*Strix occidentalis lucida*) from Grant County, New Mexico. Occasional Papers of the Museum of Texas Tech University 341:1-5.

55. Willows-Munro, Sandi, Robert C. Dowler, Michael R. Jarcho, Reese B. Phillips, Howard L. Snell, Tammy R. Wilbert, and Cody W. Edwards. "Cryptic diversity in Black rats *Rattus rattus* of the Galápagos Islands, Ecuador." *Ecology and evolution* 6, no. 11 (2016): 3721-3733.

56. Witkowski, Peter T., Jan F. Drexler, René Kallies, Martina Ličková, Silvia Bokorová, Gael D. Mananga, Tomáš Szemes et al. "Phylogenetic analysis of a newfound bat-borne hantavirus supports a laurasiatherian host association for ancestral mammalian hantaviruses." *Infection, Genetics and Evolution* 41 (2016): 113-119.

Theses/Dissertations

1. Bell, Kayce. "Coevolving histories inside and out: phylogenetics, comparative parasitology, and host affinities of chipmunk sucking lice and pinworms." PhD diss. University of New Mexico, 2016.
2. Jackson, Donavan. "The molecular systematics and phylogeography of the widespread North American meadow vole (*Microtus pennsylvanicus*)". Master's thesis, University of New Mexico, 2016.
3. Jones, Amanda K. "Mammals of the Greater Gila Region." PhD diss., University of New Mexico, 2016.

4. Pardi, Melissa. "A multidimensional investigation of the niche: Geographic distributions, body size, and interspecific interactions of late Quaternary North American Canidae." PhD diss., University of New Mexico, 2016.

ACTIVITIES IN LEARNED SOCIETIES

A. Invited Talks

Cook, JA

1. "Building NEON Mammal Sample Archives". NEON/Biocollections Workshop, Boulder Colorado. 15 Nov 2016
2. "The Alexander Archipelago; One Ginormous Experiment." Keynote, Annual Meeting of the Organization for Biological Field Stations, Sitka, Alaska. 23 Sept 2016
3. "New Mexico Natural History." Master Naturalists National Conference, Albuquerque, NM 20 Sept 2016.
4. "Mexican Wolf Specimen Bank and SSP Access." Joint Meeting of the Mexican and Red Wolf Species Survival Programs, Chico Hot Springs, MT, 2 Aug 2016.
5. "Building Scientific Infrastructure for 21st Century Biodiversity Investigations." Pontificia Universidad Católica del Ecuador, Quito, 10 March 2016.
6. "Beringia: A nexus for the northern continents" UNM Geography Department, Spring Colloquium Series, 29 Jan. 2016

Contributed Talks/Posters (*presenter)

1. Greiman S.E. *, Cook J.A., Tkach V.V., Hoberg E.P., Hope A.G., Menning D.M., Sonsthagen S.A., Talbot S.L. (2016) Museum metagenomics: a novel pathway revealing gut helminth communities and microbiomes of small mammals. Poster. Evolution, Austin, TX.
2. Ochoa N.V. *, Greiman S.E., Cook J.A. (2016) Phylogeography of two Northcentral Asian shrews (Sorex tundrensis and Sorex caecutiens). Poster. American Society of Mammalogists, Minneapolis, MN. Weidner, A. S. Liphardt, J. A. Cook. 2016. Contact Dynamics among Distinctive Lineages of *Neotoma albigula* in New Mexico. SACNAS annual meeting, Anaheim, CA October.
3. Ickert-Bond, S.M. *, U. Kaden, J. A. Cook, K. Davis, P. Druckenmiller, S. Edwards, S. Fowell, A. House, E. A. Lacey, P. Patterson, and A. Van Wyhe. 2016. Museum collections bring authentic, place-based, data-driven education to students tackling pressing Arctic issues: Lessons learned from AIM-UP! and Teach GeoSTEM. Arctic Science Summit, Fairbanks, March.
4. Parada, A., E. Lessa, J. Cook. 2016. Phylogenomics of a large radiation of Neotropical rodents: untangling the intertribal relationships of Sigmodontinae. Evolution Meetings, San Antonio. June.
5. Weber, JA*, J Edwards, JL Dunnum, and JA Cook. 2016. The molecular basis of high-elevation adaptation in wild Cavies American Society of Mammalogists, 96th Annual Meeting, Minneapolis, June.
6. Cenac, Laurel*, Lizon Cenac, Ralph P. Eckerlin, Mariel L. Campbell, and Joseph A. Cook. 2016. Fleas of Beringian Shrews (*Sorex* spp.) Poster presentation at the Southwestern Association of Parasitologists, Lake Texoma, OK, April.
7. Gagliano, Elisa*, Mariel L. Campbell, Kerry L. Nicholson, and Joseph A. Cook. 2016.

Patterns of Infection of American Marten (*Martes americana*) by the Nematode Parasite *Soboliphyme baturini* in Interior Alaska. Poster presentation at the Southwestern Association of Parasitologists, Lake Texoma, OK, April.

8. Monfils, A. K. *, L. Ellwood, D. Linton, M. Phillips, J. A. Cook, J. Kerski, T. Barbaro, S. Donovan, K. Powers, L. A. Prather, and R. Guralnick. 2016. Integrating Natural History Collections into Undergraduate Education: Creating the Resources and Growing the Community. SPNHC, Germany June.
9. Barbaro, T. *, D. Bloom, J. Cook, S. Donovan, L. Ellwood, D. Linton, A. Monfils, M. Phillips, and J. Whorley. 2016. Incorporating digitized natural history collections data into the classroom. Bio Quest Conference, Raleigh, NC, June
10. Johnson, E. J. *, J. P. Colella, J. A. Cook. 2016. Geometric morphometric investigation of marten (Martes spp.) in northwestern North America. UNM Biology Department Research Day, April.
11. Ochoa, N. V. *, S. E. Greiman, and J. A. Cook. 2016. Phylogeography of Mongolian shrews. UNM Biology Department Research Day, April.
12. Arai, Satoru*, Hae Ji Kang, Se Hun Gu, Satoshi D. Ohdachi, Joseph A. Cook, Liudmila N. Yashina, Keiko Tanaka-Taya, Sergey A. Abramov, Shigeru Morikawa, Nobuhiko Okabe, Kazunori Oishi, and Richard Yanagihara. 2016. Genetic Diversity of Artybash Virus in the Laxmann's Shrew (*Sorex caecutiens*). X International Conference on HFRS, HPS and Hantaviruses. Fort Collins, CO June.
13. Pagès, M. *, Caroline Tatard, Maxime Galan, Bérénice Villegas, Joseph A. Cook, E. Fichet-Calvet, Peter T. Witkowski, Serge Morand, Nathalie Charbonnel. 2016. Immunogenetic Factors Affecting Susceptibility of Rodents to Hantaviruses at the Macroevolutionary scale : evidence from integrins and DAF genes. X International Conference on HFRS, HPS and Hantaviruses. Fort Collins, CO June.
14. Laenen, Lies*, Valentijn Vergote, Se Hun Gu, Liana E. Kafetzopoulou, Despoina Vassou, Joseph A. Cook, Dimitris Kafetzopoulos, Marc Van Ranst, Detlev H. Krüger, Richard Yanagihara, Boris Klempa, Piet Maes. 2016. Bruges Virus, A Newfound Hantavirus in the European Mole, Contradicts Host-Specificity. X International Conference on HFRS, HPS and Hantaviruses. Fort Collins, CO June.
15. Monfils, A.K*., S. Ickert-Bond, S.V. Edwards, E. Lacey, K. Bell, and J.A. Cook. 2016. RCN UBE National Conference, Washington DC January.
16. Jonathan L. Dunnum, Richard Yanagihara*, Karl M. Johnson, Blas Armien, Nyamsuren Batsaikhan, Laura Morgan and Joseph A. Cook. 2016. Biospecimen repositories and integrated databases as critical infrastructure for pathogen discovery and pathobiology research. International Congress for Tropical Medicine and Malaria, Brisbane, Australia, September 18-22, 2016.
17. Bell, K*. 25 June 2016. Disentangling lousey relationships: a phylogenomic perspective on host-parasite coevolution. American Society of Mammalogists, Minneapolis, MN.
18. Colella, JP*, T Lan, S Schuster, C Lindqvist, S Talbot, JA Cook. "A weasel-y perspective on hybridization using phylogenomics". American Society of Mammalogists, 96th Annual Meeting. Minneapolis, MN. 24 June 2016.
19. Colella, JP*, T Lan, S Schuster, S Talbot, C Lindqvist, JA Cook. Poster: Phylogenomic evidence for diversification & contact: a case study on the terrestrial meso-carnivore *Mustela erminea*. Evolution Meetings. Austin, TX. 18 June 2016.
20. Colella, JP*, T Lan, S Schuster, S Talbot, C Lindqvist, JA Cook. Poster: Weaseling

around – Molecular Evolution and gene flow among diverging North American ermine (*Mustela erminea*). Society of Molecular Biology and Evolution, Special session on genomic admixture. 18 May 2016.

21. Dianna M. Krejsa*, Sandra L. Talbot, George K. Sage, Thomas S. Jung, Joseph A. Cook. Genetic diversity and genomic structure in North American wolverines (*Gulo gulo luscus*) of Alaska and western Canada. Oral presentation, 2016 American Society of Mammalogists conference, Minneapolis, MN (25 June 2016).
22. McLean BS*, Cook JA. Pattern and process in the Pleistocene diversification of small-eared ground squirrels (*Urocitellus*). American Quaternary Association 24th Biennial Meeting, poster pres. (June 2016).
23. McLean BS*, Cook JA. Parallel ecomorphological evolution in ground-dwelling squirrels: roles of phylogeny, allometry, and integration. Evolution 2016, poster pres. (June 2016).
24. Weber, J. 2016. American Society of Mammalogists, 96th Annual Meeting, Minneapolis, MN. The molecular basis of high-elevation adaptation in wild cavies.
25. Weber, J. 2016. Society for the Study of Evolution, Annual Meeting, Austin, TX. The molecular evolution of high-altitude adaptation in Andean hummingbirds.
26. Ally M. Weidner*, Schuyler W. Liphardt, Joseph A. Cook. Contact Dynamics among Distinctive Lineages of *Neotoma albigula* in New Mexico. October 2017. SACNAS, Long Beach, California
27. Ally M. Weidner*, Schuyler W. Liphardt, Joseph A. Cook. A Closer Look into the Phylogeographic Distributions of *Neotoma albigula* in Southwestern New Mexico. August 2016. UNM Biomedical Symposium. Albuquerque, New Mexico.

Attendance at Professional Meetings

American Society of Mammalogists 96th Annual Meeting (June 2016).

Cook, JA
Dunnum, JL
Kredjsa, DM
Liphardt, S
McLean, B
Weber, J

Evolution Meetings (June 2016)

Colella, JP
McLean, B
Weber, J

Xth International Conference on HFRS and HPS and Hantaviruses.

Ft Collins, CO (31May-3 June 2016).
Liphardt, S. & JA. Cook

American Quaternary Association 24th Biennial Meeting (June 2016).

McLean, B

SACNAS, Long Beach, California (October 2017).
Weidner, AM

Service as Editor or on Editorial Board of a Journal

Cook, JA
Review Editor, Frontiers in Phylogenetics, Phylogenomics, and Systematics, 2013-2016
International Advisory Board, Revista Brasileira de Zoologia, 2008-present

Service as Officer of Professional Society/Organization

Cook, JA
Chair, Steering Committee, AIM-UP! Research Coordinating Network, 2010-2016
Board of Directors, American Society of Mammalogists, 2007-2017
Steering Committee, ARCTOS on-line museum database, 2009-present, Chair 2016
President, National Systematics Collection Alliance, 2016-present
Steering Committee, National Integrated Biocollections Alliance (NIBA), 2014-2019
NEON Reboot, Front Royal, 28-29 March 2016

Bell, KC
American Society of Mammalogists Board of Directors 2016 - present
Committee Chair, Membership Committee, American Society of Mammalogists 2016 - present

OTHER PROFESSIONAL ACTIVITIES

Presentation to General Audience in a Scholarly Capacity

PRESENTER
1. Colella, JP* & D Kresja*. "Mesocarnivores of Beringia". Bachechi Open Space Naturalist Series. Albuquerque, NM. 19 March 2016.
2. Dunnum, JL. Natural history research collections and their role in science. Bernalillo County Master Naturalists Program. Albuquerque, NM. 9 June 2016.

Scholarly Service as a Member of a Local/State/Regional/National Committee, Panel, etc.

Cook, JA
UNM Faculty Sponsor, Student Chapter of the New Mexico Wilderness Alliance (founded and advised new student conservation group) 2005-2016
UNM A&S Chairs and Directors Council 2011-2017
UNM Museum Council
UNM Museum Studies Program-- Executive Board
MS Advisor--Museum Studies--Kaylen Jones
MS Advisor--Museum Studies-Lindsey Frederich
UNM Wilderness Alliance, Faculty Sponsor
Telluride Mountain Film Festival, 29-30 Jan
Panelist, STEM Gateway Colloquum April

Dunnum, JL

American Society of Mammalogists Systematic Collections committee, 2010-present
American Society of Mammalogists Latin American Awards committee, 2015-present
Co-Chair, Arctos Database Working Group (20 institutions), 2009-present
NEON Scientific Research Collections Technical Working Group, 2013-present
MSB Space Committee

Bell, KC

Reviewer, Society of Systematic Biologists Graduate Student Research Award , 2016
UNM Biology Graduate Student Selection Committee Member, 2016
Program Committee, American Society of Mammalogists, 2013- present

McLean, B

American Society of Mammalogists Systematic Collections committee, 2013-present

Journal Referee

Bell, KC

Reviewer, Biological Journal of the Linnean Society (1 ms).

Cook, JA

NSF Panels (PFBR) & Ad hoc (Dimensions, Biodiversity) 19 proposals reviewed
Ecosphere (1 ms).
Scientific Reports (2 ms).
Frontiers of Ecology and Evolution (1 ms).
Mastozoologia Neotropical (1 ms).

ADVANCED STUDY, HONORS, AWARDS, FELLOWSHIPS, ETC.

Cook, J. A

Joseph Grinnell Award, American Society of Mammalogists

Bell, KC

Smithsonian Institution Scholarly Studies Award, the Impact of Host Hybridization on Parasitism in Western North American Chipmunks. Co-PI: Anna Phillips $20,847
Global Genome Initiative Rolling Awards $6,415

Colella, J

Joseph Gaudin Fellowship in Mammalogy, University of New Mexico. *$1750*
Caroline G Grove Summer Research Scholarship, UNM Biology Departmental Grant. *$1250*
American Society of Mammalogists Travel Award. $400
Donald Caughran Memorial Scholarship. UNM Biology Departmental Grant. *$250*

Krejsa, D

University of New Mexico Biology Department Scholarships
Joseph Gaudin Award — $500

Grove Award — $1,661
UNM, Biol Grad Student Association, GRAC Travel Award $150

Liphardt, S
Donald Caughran Memorial Scholarship. $500.
Graduate Research Allocation Committee research grant. $400.

McLean, B
ASM Fellowship, American Society of Mammalogists - $7500
Research Grant, UNM Graduate Research Allocations Committee - $400
Travel Grant, UNM Graduate Research Allocations Committee - $150

Weber, J.
Society for the Study of Evolution Travel Grant
Alvin R. and Caroline G. Grove Summer Research Scholarship
Lynn Hertel Memorial Scholarship

DONATIONS AND GIFTS RECEIVED

Virginia Rausch $5000
James Findley endowment ($17,500)
Troy Best Collection 300 specimens
Seton (Philmont Scout Ranch) Collection 400 specimens

CURRENT STAFF

Faculty/Staff

J.A. Cook, Curator
J.L. Dunnum, Collection Manager
M.A. Bogan, Emeritus Curator
J.S. Findley, Emeritus Curator
Stephen O. MacDonald, Curator II (retired)
Adrienne Raniszewski, Curatorial Assistant

Graduate students

Bell, Kayce. Completed Ph.D.. Systematics and phylogeography of chipmunk lice.

McLean, Bryan. 5th year Ph.D. student. Systematics and phylogeography of ground squirrels.

Rearick, Jolene. Completed M.S. Phylogeography and molecular evolution of freeze tolerance in *Lithobates sylvaticus*.

Jessica Weber. 6th year Ph.D student. Hypoxia tolerance and adaptive responses in Caviomorph rodents.

Colella, Jocie. 4rd year Ph.D student. Patterns of phylogeography, hybridization and diversity of mustelids (*Mustela ermine* and *Martes* spp.) across northwestern North America.

Liphardt, Schuyler. 2nd year M.S. student. Hantavirus evolution.

Jones, Amanda. Completed M.S. Mammals of the Gila River ecosystem.

Jackson, Donavan. Completed M.S. Phylogeography of the meadow vole *Microtus pennsylvanicus*.

Krejsa, Diana. 3nd year Master's student. Phylogeography and population genetics of North American wolverine (*Gulo gulo luscus*).

Carrion, Carlos. 2nd year Ph.D. student. Systematics of Neotropical *Myotis*.

Undergraduate Student Workers and Volunteers

Volunteers

Bernalillo County Master Naturalist interns
Jesse Borges
Lisa Hada

High/Middle schoolers
Amy Biehl Students (5 visits, ~12 students each time)
Caroline Pierotti (Albuquerque High)
Mark Granere (Amy Biehl)
Patrick Clark (Albuquerque Academy)
Ricky Falcon (Amy Biehl)
Serina Altamirano (Amy Biehl)
Sierra Romero (The Montessori Middle School)
Somiya Dunnum (Albuquerque High)

UNM undergrads
Chanley Clayton
Hailey Patterson
Jessica Center
Kaylen Jones
Kiara Takacs
Liza Nguyen
Loryn Phillips
Luna Bandera
Mikayla Fahey
Milena Carvalho
Monica Naranjo
Ryan Gillett
Shannen Lopez

Taylor VanDenBerg
Tiffany Kenworthy

other
Aaron Cde Baca (former UNM student)
Chrissy Viola (New Mexico Work program)
Jan Henfling (former Master Naturalist)
Nanda Ramos (Eckerd College)
Susan Stark (former UNMH employee)
Lance Robinson (Mandy's Farm)

1911 total volunteer hours (1300 hour increase over last year)!!!

Paid High school Interns (RAHSS)
Delaney Hill (Amy Biehl)
Alex Olivas (recent HS graduate)

Paid Undergrads
Ola Liota Weinbaum (work-study)
Tiffany Kenworthy
Alex Olivas (work-study)
Jairo Ulloa (work-study)
Victoria Viola
Stephanie Mladinich
Shannon O'Brien
Richard Apodaca
Lena Bolling
Ellie Johnson

Grad Students
Kayce Bell
Schuyler Liphardt

MUSEUM ASSOCIATES

Curatorial Associates
Jerry W. Dragoo, UNM Department of Biology
William Gannon, UNM Graduate Studies
David J. Schmidly, UNM Department of Biology

Research Associates
J. Scott Altenbach, UNM Department of Biology (retired), NM
Sydney Anderson, American Museum of Natural History (retired), NY
Robert J. Baker, The Museum, Texas Tech University, Lubbock, TX
Troy L. Best, Department of Biology, Auburn University (retired), AL
James H. Brown, UNM Department of Biology emeritus
Fernando Cervantes, UNAM, Mexico City, Mexico

Paul J. Cryan, Ft. Collins, CO
Natalie Dawson, University of Montana, Missoula, MT
John Demboski, Denver Museum of Science and Nature, Denver, CO
Guillermo D'Elia, Universidad de Valdivia, Chile
Eugene Fleharty, Ft. Hayes University (retired), KS
Melissa Fleming, Poulsbo, WA
Jennifer K. Frey, Las Cruces, NM
Kurt Galbeath, Northern Michigan University, Marquette, MI
Scott L. Gardner, Dept. Nematology, Curator, University Nebraska, NE
Keith Geluso, Lincoln, NE
Ken Geluso, Albuquerque, NM
David J. Hafner, New Mexico Museum Nat. History (retired)
Art Harris, University of Texas (retired), El Paso, Texas
Heikki Henttonen, Finnish Forest Research Institute, Finland
Edward J. Heske, Illinois Biological Survey, IL
Eric Hoberg, Beltsville, MD
Andrew Hope, Kansas State University, Manhattan, KS
Clyde Jones, The Museum Texas Tech University (retired), Lubbock, TX
Tom Jung, Whitehorse, Yukon
Sue Kutz, University of Calgary, Alberta
Enrique Lessa, Universidad de la Republica, Montevideo, Uruguay
Stephen MacDonald, Gila, NM
Jason Malaney, University of Nevada, Reno, NV
Michael Mares, Oklahoma University, Norman, OK
Pablo Marquet, Universidad Catolica, Santiago, Chile
Rodrigo Medillín, UNAM, Mexico City, Mexico
Tony R. Mollhagen, Lubbock, TX
Gary Morgan, New Mexico Museum Natural History, NM
Thomas J. O'Shea, Ft. Collins, CO
Eduardo Palma, Universidad Catolica, Santiago, Chile
Robert Parmenter, Valles Caldera, Jemez, NM
James L. Patton, Museum of Vertebrate Zoology (retired), Berkeley, California
Reggie Rausch, Burke Museum, University of Washington, Seattle, WA
Brett R. Riddle, University of Nevada, Las Vegas, NV
Jorge Salazar Bravo, Texas Tech University, Lubbock, TX
C. Greg Schmitt, Farmington, NM
Fred Szalay, Los Ranchos de la Rio Grande, NM
Sandy Talbot, Molecular Ecology Lab- USGS Anchorage, AK
Fernando Torres Perez, Vina del Mar, Chile
Ernie Valdez, USGS-UNM, Tijeras, NM
Alasdair Veitch, Department of Renewable Resources, Norman Wells, NWT, Canada
Jack Whitman, Ketchum, ID
Don E. Wilson, Smithsonian (retired), Washington, DC
Nyamsuren Batsaikhan, National University of Mongolia, Ulaan Baatar

Parasitology Division

1. DIVISION HIGHLIGHTS

The Division of Parasites is likely the third largest collection of parasites in the Western Hemisphere. Most of our samples are from North America and eastern Africa, though we have samples of parasites from all around the world. This last year, we initiated a large project to organize and catalogue the larval trematodes of gastropods as well as cataloging those gastropods whether or not they were infected with parasites. Most of these samples are from 3 decades of field collections by Curator Loker and a decade of field collections from Collection Manager Brant. We made great progress on the North American collections and are about 75% complete. Our STEM summer program has been a wonderful source of parasite and host material, as well as an integrative way to train students in both parasite biology and museum techniques. We have completed thus far only 2 summers, but plan to continue each summer.

2. TABLE OF COLLECTION USE

2016

Collection: growth & current size (New Specimens Cataloged/total specimens)

Currently we have **25,471** catalogued parasite records in Parasites and **21,657** catalogued host records

New additions for 2016:
355 Trematoda
297 Nematoda
171 Cestoda
5 Acanthocephala
12 Anoplura
7 acari
151 Siphonaptera

1005 new catalogued parasites
476 new catalogued Hosts

Loans Out 12

Professional Visitors to the Collections
-Research Visitors: 2
-Visiting Researchers (not here for work in the collection): 3
-Outreach Visitors/tours: 9

Collection Database Web Site Hits 4335

Outside Publications Citing MSB Specimens 6

Peer-Reviewed Publications by Staff 4

Graduate Students (using or working in collections) 2

Undergraduate Students (using or working in collections) 1

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* List Other Institutions

3. COURSES USING THE COLLECTIONS

BIOL 406, Hanelt and MSB Collections Managers, Natural History Collections and Cutorial Techniques, Spring, 16 students

BIOL 239, Hanelt, Microbiology for Health Science Majors, Spring, 200 students

STEM summer course Brant, Hanelt, undergrad Emily Sarvis, "A day in the life of a parasite: Field Parasitology and Museums, 6 students, 4 females of whom were here via international programs in South America

4. COURSES TAUGHT BY MSB PERSONNEL

Loker, E.S.
-In spring 2016 I co-taught Biology 490 Biology of Infectious Organisms with Bruce Hofkin. We had an enrollment of 81 students.
-In the fall I taught Biology 419/519 Biology of Disease Vectors and I had 63 students.
-In addition I coordinated Bio 402/502 Parasites and Hosts as a parasitology journal club/lab meeting, and the other usual teaching activities (dissertations, Problems, etc.) for my 4 graduate students.

Brant, S.V.
-BIOL 406, Natural History Collections and Curatorial Techniques, Spring, 16 students (Brant)
-STEM summer course (**Brant**, Ben Hanelt, undergraduate **Emily Sarvis**)

Faculty/Collection Managers

CURATOR

BIOL course number *Title* *Number of Students*

Biology 490 (with Hofkin)	Biology of Infectious Organisms	81
419/519	Biology of Disease Vectors	63
402/502	Parasites and Hosts	~5/semester

COLLECTION MANAGEMENT

SUMMARY OF ACTIVITY IN COLLECTIONS.

-Currently we have **25,471** catalogued parasite records in Parasites and **21,657** catalogued host records. Many of the host records were gastropod hosts from the trematode work of Loker and Brant. The other gastropods and their parasites have come from the STEM summer course we started two years ago. We teach the students how (including permitting) to collected hosts and parasites, then how to examine them in the lab, identify them, and process them for vouchering at MSB. They do all their own labeling and record input so that they will be associated through time with those specimens. It has been very successful, particularly in terms of samples added to the collection and experience for the STEM undergrads.
-The large Paramphistomidae collection by PhD student Martina Laidemitt was catalogued and linked with the resulting publication. Now this is the largest most diverse collection of African amphistome parasites.
-Hold regular meetings with Dr. Brant to discuss Parasite Division matters.
-Procured KWS export permit for release of specimens of snails and trematodes associated with our project on schistosomiasis research in Kenya. Now the KWS export permit has been finally approved, several years backlog of samples can now be brought back from Kenya and once these are catalogued, will include the worlds most accessible diverse collection of African trematodes (this also includes the collection from South Africa from Brant and Ebbs), mostly from snail host *Biomphalaria*, but several other families of snails too.
-Preparation of outreach material.
-Facilitated acquisition of needed microscope equipment.
-Talked to undergraduates in museum course about parasite division of MSB.
-We engage in several small tours of people, usually just 1-3, generally interested in parasites. We also have been involved in several phone 'interviews' with high school students working on projects – most of these recommendations have come through our American Society of Parasitologists. It is a good sign too that MSB is slowly being recognized, at least nationally. But we continue as always to improve our visibility. In all, with phone, email and in-person contact time, we spend about 5-6 work days a year

AWARDS, GRANTS, AND CONTRACTS (TO MSB CURATOR OR STAFF)

Loker, E.S. (PI) NIH grant entitled "Snail-related studies of transmission and control of schistosomiasis in Kenya", Total Award: 5 years, direct costs $1,250.000; Duration: 1 July 2012 – 30 June, 2017.

Loker, E.S. (PI) Gates SCORE grant entitled "SCORE Hot Spot Studies." Duration: 1 Jan 2016-present; ~$50,000.

Loker, E.S. (PI) COBRE: Center for Evolutionary and Theoretical Immunology. NIH, National Center for Research Resources, P30 GM110907; Total Award: 5 years, total award $5.4M total; Duration: 1 June 2014 – 1July June 2019.

Brant S.V. (PI) NSF DEB-1021427 REVSYS: Phylogenetic and Revisionary Systematics of a Diverse Clade of Avian Schistosomes. 09/01/2010 – 08/31/2016 $60,000 (annual direct cost).

PUBLICATIONS (BY MSB CURATOR, CM OR OTHER PAID STAFF)

Journal Articles

Zhang, Si-Ming, **Loker, E.S**. and Sullivan, J.T. 2016. Pathogen-associated molecular patterns activate expression of genes involved in cell proliferation, immunity and detoxification in the amebocyte-producing organ of the snail *Biomphalaria glabrata*. Developmental and Comparative Immunology 56: 25-36.

Lu, L., Zhang, S-M, Mutuku, M.W., Mkoji, G.M., and **Loker, E.S**. 2016. Relative compatibility of *Schistosoma mansoni* with *Biomphalaria sudanica* and *B. pfeifferi* from Kenya as assessed by PCR amplification of the *S. mansoni* ND5 gene in conjunction with traditional methods. Parasites & Vectors: 2016; 9:166. PubMed [journal]PMID: 27000855 PMCID: PMC4802880

Fakhar M, Ghobaditara M, **Brant SV**, Karamian M, Gohardehi S, Bastani R. 2016. Phylogenetic analysis of nasal avian schistosomes (*Trichobilharzia*) from aquatic birds in Mazandaran province, northern Iran. Parasitology International 65: 151-158. doi:10.1016/j.parint.2015.11.009.

Ebbs ET, Loker ES, Davis NE, Flores V, Veleizan A, **Brant SV**. 2016. Schistosomes with wings: how host phylogeny and ecology shape the global distribution of *Trichobilharzia querquedulae* (Schistosomatidae). International Journal of Parasitology 46:669-677. doi: 10.1016/j.ijpara.2016.04.009.

Červená B, **Brant SV**, Fairet E, Shirley MH, Petrželková KJ, Modrý D. 2016. *Schistosoma mansoni* in Gabon: Emerging or Ignored? The American Journal of Tropical Medicine and Hygiene 95: 849-851.

Devkota R, Brant SV, Loker ES. 2016. A genetically distinct *Schistosoma* from *Radix luteola* from Nepal related to *Schistosoma turkestanicum*: a phylogenetic study of schistosome and snail host. Acta Tropica 164: 45-53.

Publications Based on MSB Specimens/Data (OTHER THAN THOSE REPORTED ABOVE)

Makarikov A, Hobert, EP. 2016. Broadening diversity in the *Arostrilepis horrida* comlex: *Arostrilepis kontrimavichusi* n. sp. (Cyclophyllidea: Hymenolepididae) in the western red-backed vole, *Myodes californicus* (Merriam) (Cricetidae: Arvicolinae) from temperate latitudes of the Pacific Northwest, North America. Systematic Parasitology 93: 467-77. doi: 10.1007/s11230-016-9640-1.

Caffara M, Locke SA, Cristanini C, Davidovich N, Markavich MP, Fioravanti ML. 2016. A combined morphometric and molecular approach to identifying metacercariae of *Euclinostomum heterostomum* (Digenea: Clinostomidae). Journal of Parasitology 102: 239-248. doi: http://dx.doi.org/10.1645/15-823.

Lee L, Wallace R, Clyde V, Gendron-Fitzpatrick A, Sibley S, Stuchin M, Lauck M, O'Connar D, Makao M, Lavikainen A, Hoberg EP, Goldberg T. 2016. Definitive Hosts of *Versteria* Tapeworms (Cestoda: Taeniidae) Causing Fatal Infection in North America. Emerging Infectious Diseases 22: 4.

Rothenburger J, Hoberg EP, Wagner B. 2016. First report of *Protechinostoma mucronisertulatum* (Echinostomatidae) in a sandhill crane (*Grus canadensis)* from Saskatchewan, Canada. Comparative Parasitology 83:111-116. doi.org/10.1654/1525-2647-83.1.111.

Harkins C, Shannon R, Papes M, Schmidt-Rhaesa A, Hanelt B, Bolek MG. 2016. Using Gordiid cysts to discover the hidden diversity, potential distribution, and new species of Gordiids (Phylum Nematomorpha). Zootaxa 4088: 4. DOI: http://dx.doi.org/10.11646/zootaxa.4088.4.3.

Ernst CM, Hanelt B, Buddle CM. 2016. Parasitism of ground beetles (Coleoptera: Carabidae) by a new species of hairworm (Nematomorpha: Gordiida) in Arctic Canada. Journal of Parasitology 102: 327-335. doi: 10.1645/15-863.

ACTIVITIES IN LEARNED SOCIETIES

Invited Talks

Loker, E. S. "Schistosomiasis: Historical and Ecological perspectives on an Unconquered Neglected Tropical Disease" 6-10 March 2016, RCMI Infectious and Global Disease Symposium, San Juan Puerto Rico

Loker E. S., Brant S. V."Swimmer's Itch and Human Schistosomiasis: A search for the same solutions" Michigan Swimmer's Itch Conference, 20 June-23 June, Roscommon, Michigan.

Loker, E. S. "Human schistosomiasis: a tenacious neglected tropical disease thriving in Sub-Saharan Africa, 2016 Gerald D. Schmidt Memorial Lecture at the Rocky Mountain Conference of Parasitologists, 9 September 2016, Cedar Point Field Station, Nebraska

Loker, E. S. "Human schistosomiasis: a tenacious neglected tropical disease thriving in Sub-Saharan Africa," Presentation to the Epidemiology class at HSC, 6 September 2016,

B. Contributed Talks/Posters (*presenter, ^student, **bolded** names MSB)

Lu, L.*^, Zhang, S.M., Mutuku, M.W., Mkoji, G.M., **Loker, E.S**. Relative compatibility of S*chistosoma mansoni* with *Biomphalaria sudanica* and *B. pfeifferi* from Kenya as assessed by PCR amplification of the *S. mansoni* ND5 gene in conjunction with traditional methods. NISBRE meeting, Washington D.C. Marriott Hotel, 26-29 June 2016.

Lu, L.*^, Zhang, S.M., Mutuku, M.W., Mkoji, G.M., **Loker, E.S**. Relative compatibility of S*chistosoma mansoni* with *Biomphalaria sudanica* and *B. pfeifferi* from Kenya as assessed by PCR amplification of the *S. mansoni* ND5 gene in conjunction with traditional methods. American Society of Parasitologists meeting, Westin Hotel, Edmonton, Canada, 11-14 July 2016

Buddenborg, S.K.*^, Zhang, S, Mkoji, G.M., **Loker, E.S.** RNA-SEQ responses of field- derived specimens of the African snail B*iomphalaria pfeifferi* to infection with the human parasite, *Schistosoma*

mansoni. American Society of Parasitologists meeting, Westin Hotel, Edmonton, Canada, 11-14 July 2016

Laidemitt, M.R.*^, Mutuku, M.W., Mkoji, G.M., **Loker, E.S**. Biotic diversity and human schistosomiasis transmission in western Kenya. American Society of Parasitologists meeting, Westin Hotel, Edmonton, Canada, 11-14 July 2016

Brant, S.*, Loker*, E.S., Tkach, V., Casalins, L.^ and Flores, V. Phylogenetic placement of a schistosome from an unusual marine snail host from Argentina and a secondary switch from freshwater to marine snails. American Society of Parasitologists meeting, Westin Hotel, Edmonton, Canada, 11-14 July 2016

Sarvis, E.W.*^, Ebbs,E.T., Loker*, E.S., Tkach, V.V., Davis, N., Jouet, D., **Brant, S.V.** Cosmopolitan species or cryptic species complexes: is the arterial waterfowl schistosome, *Dentritobilharzia pulverulenta* a widespread species? American Society of Parasitologists meeting, Westin Hotel, Edmonton, Canada, 11-14 July 2016

Buddenborg, S.K.*^, Bu, L., Zhang, S.M., Mkoji, G.M. and **Loker, E.S.** Dual RNA-Seq responses of field-derived specimens of the African snail *Biomphalaria pfeifferi* to infection with the human parasite *Schistosoma mansoni* provide insight into host-parasite relationships and reproductive implications of parasitism. ASTMH 65th Annual Meeting. Atlanta Marriott Marquis and Hilton Atlanta, Atlanta, Georgia USA. November 13-17, 2016

Damien Jouet*, Libuše Kolářová, **Sara V. Brant,** Hubert Ferté & Karl Skírnisson. 2016. ORAL: The role of migratory birds on parasitic transfers between the New and the Old World (Palearctic and Nearctic regions). 12th European Multicolloquium of Parasitology Turku, Finland, July 20-24th 2016

Brant SV*, Loker ES, Tkach VT, Casalins L^, Flores VR. 2016. ORAL: Phylogenetic placement of a schistosome from an unusual marine snail host from Argentina and a secondary switch from freshwater to marine snails. American Society of Parasitologists, Edmonton Alberta Canada, 11-14 July 2016.

Sarvis EW*^, Ebbs ET^, Loker ES, Tkach VT, Davis N, Jouet D, **Brant SV.** 2016. Cosmopolitan species or cryptic species complexes: is the arterial waterfowl schistosome, *Dendritobilharzia pulverulenta* a widespread species? American Society of Parasitologists, Edmonton Alberta Canada, 11-14 July 2016.

Sarvis EW*^, Ebbs ET^, Loker ES, Tkach VT, Davis N, Jouet D, **Brant SV.** 2016. Cosmopolitan species or cryptic species complexes: is the arterial waterfowl schistosome, *Dendritobilharzia pulverulenta* a widespread species? Southwestern Association of Parasitologists, Lake Texoma, Oklahoma, 14-16 April 2016.

Laurel Cenac^, Lizon Cenac*^, Ralph Eckerlin, **Mariel L. Campbell**, and **Joseph A. Cook**. Fleas of Beringian Shrews *(Sorex* spp*.)* Poster Presented at the Annual Meeting of the Southwestern Association of Parasitologists, Lake Texoma OK April 2016.

Elisa Gagliano*^, Mariel L. Campbell, Kerry L. Nicholson, and **Joseph A. Cook**. Patterns of Infection of American Marten *(Martes americana)* by the Nematode Parasite *Soboliphyme baturini* in Interior Alaska. Poster Presented at the Annual Meeting of the Southwestern Association of Parasitologists, Lake Texoma OK April 2016.

Attendance at Professional Meetings

Loker, E. S.
-Host, NIH COBRE CETI EAC Meeting, 3-5 June, Tamiya Resort, Bernalillo
-NISBRE IDeA Meeting, Wardman Park Marriott, Washington, D.C., 26 June-29 June,
-American Society of Parasitologists meeting, Westin Hotel, Edmonton, Canada, 11-14 July 2016
-American Society for Tropical Medicine and Hygiene, 65th Annual Meeting. Atlanta Marriott Marquis and Hilton Atlanta, Atlanta, Georgia USA. November 13-17, 2016

Brant, S. V.
-Southwestern Association of Parasitologists, Lake Texoma, Oklahoma, 14-16 April 2016.
-American Society of Parasitologists, Edmonton Alberta Canada, 11-14 July 2016.

Martina Laidemitt (graduate student)
-SIRIS Meeting, Washington D.C., 2016
-American Society of Parasitologists, Edmonton Alberta Canada, 11-14 July 2016.

Emily Sarvis (undergraduate)
-Southwestern Association of Parasitologists, Lake Texoma, Oklahoma, 14-16 April 2016.
-American Society of Parasitologists, Edmonton Alberta Canada, 11-14 July 2016.

Service as Editor or on Editorial Board of a Journal
Loker, E.S. - Journal of Helminthology
Brant S. V. - Graphics Editor for Journal of Parasitology

Service as Officer of Professional Society/Organization

Brant, S. V.
-Council Member at Large, American Society of Parasitologists
-Chair, Membership Committee, American Society of Parasitologists

OTHER PROFESSIONAL ACTIVITIES

Presentation to General Audience in a Scholarly Capacity

Loker, E. S.*, Brant S. V. "Swimmer's Itch and Human Schistosomiasis: A search for the same solutions" Michigan Swimmer's Itch Conference, 20 June-23 June, Roscommon, Michigan.

Scholarly Service as a Member of a Local/State/Regional/National Committee, Panel, etc.

Loker, E.S.
-Main Campus RAC Committee
-NIH Review Panel, Infectious Diseases and Microbiology Integrated Review Group ZRG1 IDM-W (50), US China Biomedical Collaborative Research Meeting, 20-21 July 2016
-NSF CAREER Award Review
-Belgian Science Foundation proposal review

Brant, S.V.
Voting member, IACUC, Animal Care and Use Committee
Vice Chair, IACUC, Animal Care and Use Committee
Voting Member, Laboratory and Chemical Safety Committee, SRS

Journal Referee

About 15 different journals between Loker E.S. and Brant S.V.

SERVICE

Loker - I serve as a Curator of the Parasite Collection which is a role I am growing into and spending more time with, I continue to serve as the Director of CETI which is a major ongoing service activity (facilities to oversee, grant money to disperse, seminar program to oversee, External Advisory meetings to organize), I am a member of the main campus RAC committee which twice annually meets to review RAC proposals, I have been an informal consultant for matters of research administration, I serve on the Biology Department Faculty Review Committee, and I serve as a member of the Gates-funded SCORE program on schistosomiasis research.

Sara Brant
-Jefferson Middle School, Albuquerque, 60 students, Suzanne Dunnum
-Participated in Dept. of Biology Research Day open house at the MSB, March.
-UNM Recruitment Undergraduate and Graduate Student Tour, Christopher Witt
-UNM Museum Studies Tour, Loa Traxler
-UNM Honors College Seminar People and Animals UHON302-016
-Salam Academy Middle School students, Albuquerque
-Lybrook Middle School tour (grades 5-8) organized by SEPA, Ashlee Begaye UNM
-Eldorado High School tour (grades 11-12), Lesha Harenburg
-Markesha Oliver, UNM biochemistry major, came for interview of UNM resources project for her English class
- Cross of Hope Elementary School, Joy Thornhill
-Phone interview with Lily Ramsey, high school student Francis Howell North High ***School***, Missouri, several times to encourage her interest in Parasitology
-Guest lecture for Dept Bio Mammalogy course, "Zoonotic Diseases"

CURRENT STAFF

Faculty/Staff
Dr. Eric S. Loker
Dr. Sara V. Brant

Graduate students
Ms. Erika T. Ebbs
Ms. Martina Laidemitt

Undergraduate Student Workers and Volunteers
Ms. Emily Sarvis

MUSEUM ASSOCIATES

Curatorial Associates
NONE

Research Associates
NONE