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2009 Annual Report

Thomas F. Turner

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2009 Annual Report

Museum of Southwestern Biology

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1 September 2010

**Museum of Southwestern Biology
Annual Report for 2009**

Table of Contents

MSB Director's Summary	3
Division of Amphibians and Reptiles	14
Division of Arthropods	25
Division of Birds	32
Division of Fishes	43
Division of Genomic Resources	59
Herbarium	77
Division of Mammals	86
Natural Heritage New Mexico	106
Division of Parasites	117
U.S. Geological Survey	122

Museum of Southwestern Biology Annual Report for 2009

MSB Director's Summary – Thomas F. Turner, Director and Curator of Fishes

As of December 31st 2009, I completed two and one-half years as Director of the Museum of Southwestern Biology (MSB) and almost 12 years as Curator of Fishes. During my tenure as director, the MSB has adopted a more cohesive operational model among its 10 Divisions, as demonstrated by several major cross-divisional initiatives that are underway or planned (details provided below). Reports from individual divisions below reflect uniformly high curatorial and academic standards of the museum staff. The security of the MSB as a repository appears stronger now than when the collections were housed in Castetter Hall, and UNM as a whole has recognized the value of museums through the development of collections policy and formation of a university-wide Museum Council. However, specimen security, adequate and sufficient housing for collections, and space accommodation for future collections growth remain a major concern at the MSB. Divestment in higher education in New Mexico, which began in 2007 and became more severe in 2009, also is a threat to the security of the collections. Divestment is likely to have negative impacts on care and preservation of natural history specimens in the long term, despite the fact that UNM has ostensibly made a commitment to these specimens in perpetuity. Furthermore, divestment comes at a time when climate change and other anthropogenic disturbances are highly likely to affect natural resource management and the broader economy of New Mexico. Investment rather than divestment in natural history collections is paramount to provide a historical database to assess future changes and their effects on natural resources.

The Mission of the MSB

The MSB is a unit within the Department of Biology, and its mission is to document, act as a repository for, and interpret specimens and data that represent biological diversity in order to increase and disseminate knowledge of our natural environment. The MSB is dedicated to advancing knowledge in, and service to, the scientific fields of organismal biology, ecology, systematics, public health, and natural history and applying our resources and expertise to the service of UNM, the state of New Mexico, and to the wider regional, national, and international scientific communities. The mission of the MSB fits well into the broader mission of the UNM College of Arts and Sciences, that is, to create new knowledge through research, to broadly disseminate existing and new knowledge to students, and to train students in the evaluation and application of ideas to issues important to society at the local, state, national, and international levels.

The MSB performs educational, training, service, and curatorial roles that magnify the teaching, scholarship, and outreach missions of Biology and the College of Arts and Sciences at UNM. MSB collections of more than four million objects are worldwide in scope but many Divisions focus on the ever-changing environments in the southwestern United States. There are major collections of all vertebrate groups, invertebrates,

vascular plants, and frozen tissues. Nearly all specimen records and field data are captured electronically and many are geo-referenced and disseminated via the world-wide-web and other media. Curatorial standards and practices for the MSB are consistent with “best practices” outlined by the American Association for Museums (<http://www.aam-us.org/aboutmuseums/standards/index.cfm>). Full details are specified in the MSB Collection Policy (<http://msb.unm.edu/policy.html>).

MSB University-Wide Activities in 2009

UNM Museum Policy Approval Process Completed -. In December 2009 (effective January 2010) The UNM Regents approved policy 6410 entitled “Museums and Collections” in the University Business Policies and Procedures Manual. This policy recognizes the responsibilities and roles of University of New Mexico (UNM) museums and collections “to increase knowledge, understanding, and appreciation of the physical, cultural, and biological world by collecting, maintaining, researching, and interpreting material objects and the contextual data associated with them”. The policy clearly defines obligations of Curatorial staff, UNM Regents, the UNM President and Provost, and Cognizant Unit Heads (i.e., Deans) for adequate housing, care, dissemination and interpretation of these objects in perpetuity. It also defines standards for making these objects accessible and available to the scientific community while preserving the integrity and quality of the specimens through active stewardship. MSB Policy is consistent with this more general guiding document.

Progress on a UNM Museum Studies Program. The MSB, in collaboration with the Maxwell Museum of Anthropology [lead], the Meteorite Museum, and the UNM Art Museums, continued to make progress on development of a graduate (MS-granting) museum studies program. Program and curriculum forms have been reviewed by the UNM Registrar, the Office of Graduate Studies, and the A&S curriculum committee. The Fine Arts curriculum committee is reviewing and will provide comments in fall semester 2010. Our plan is to submit for consideration by the UNM Faculty Senate in Fall 2010. The College of Arts and Sciences has contributed significant resources including a new faculty position in addition to the new Director to coordinate this effort.

MSB Productivity in support of UNM’s Mission

In 2009, the MSB made substantive contributions to the education, research, teaching, and service mission of the University of New Mexico. A 5-year compilation of metrics shows that 2009 was a record year for performance in terms of scientific productivity (published papers by MSB staff, papers by outside researchers that are supported by MSB specimens), students trained, and grant dollars in force. The metrics in the table below were counted from Divisional reports over the last five years. A description and context for each metric is listed below the table and specific details about metrics can be gleaned from Divisional reports for 2009.

Table 1. Metrics tracked over the last five years in the Museum of Southwestern Biology. These metrics were chosen by consensus at a museum-wide retreat in 2007. Numbers are compiled from divisional reports (reports for 2009 are included in this document, other annual reports are available upon request). Similar metrics are presented in the 10-year review of the MSB (also available upon request) prepared as part of the Department of Biology's self study for decadal review.

Metric	2005	2006	2007	2008	2009	Total Last Five Years
1. Collection growth (Specimens Cataloged)	174203	180545	392509	389144	136248	1272649
2. Loans Out	122	124	122	125	128	621
3. Professional Visitors to the Collections	761	637	795	795	953	3941
4. Collection Database Web Site Hits	51068	57099	NR	51287	319745	479199
5. RFIs Answered in Person	557	1316	1167	1196	1355	5591
6. Outside Publications Citing MSB Specimens	68	42	53	60	68	291
7. Peer-Reviewed Publications by Divisional Staff	60	62	48	54	79	303
8. Technical Reports	35	35	37	30	24	161
9. UNM Courses using the Collection	19	25	23	22	25	114
10. UNM Courses taught by Divisional Staff	19	23	21	22	24	109
11. Graduate Students	34	34	36	35	51	
12. Graduate Theses/Dissertations	2	5	8	8	4	27
13. Undergraduate Students	57	54	54	54	91	
14. No. Grants/Contracts in Force	75	98	87	98	94	
15. Grants In Force/Total Costs	\$6,992,011	\$3,892,602	\$9,825,425	\$9,444,626	\$11,239,035	
16. Grants in Force/ F&A	\$690,185	\$723,372	\$1,186,838	\$1,449,793	\$2,141,328	

NR – not reported

Metric Descriptions

(1) Collection growth reported in number of specimens-. is a measure of growth and curatorial activity in the museum. The MSB exhibited a decline in the number of specimens cataloged compared to 2008. Years 2007 and 2008 were marked by all-out efforts to integrate several major orphaned collections as detailed above, and these projects were either completed or nearing completion in 2009.

(2) Number of specimen loans made to outside researchers and institutions-. These are specimens or groups of specimens loaned in support of ongoing research that is outside the campus community at UNM. Researchers are responsible to return loans in accordance with the terms of specimen use laid out when the request for the loan is made.

A loan constitutes the total amount of specimens, data, or ancillary material sent to a researcher or institution. This metric, which is one measure of collection visibility and utility, increased slightly in 2009 indicating increased use of museum materials by outside researchers.

(3) Professional Visitors to the Collections- This metric includes visiting scientists, seminar speakers, taxonomic professionals seeking to verify collection records or study morphological and/or molecular variability of organisms. It does not include members of the UNM Biology Department.

(4) Collection database web hits- This metric is nearly impossible to track accurately because of wide electronic dissemination of MSB specimen and locality data. Major databases supported by the MSB are Arctos, the New Mexico Biodiversity Collections Consortium (NMBCC), and conservation databases of the New Mexico Natural Heritage Program. More broadly, MSB data are served by a number of outside entities including the Global Biodiversity Information Facility (GBIF). The wide dispersion of web hits suggests the impact of MSB specimens and records on the web will continue to increase at an exponential rate in the near term.

(5) Requests for information (RFIs) answered in person - Natural history collections staff also perform important advisory functions as indicated by the number of requests for information. Such requests come from academic and government scientists, natural resource management agency personnel, and/or the general public. The MSB serves as a clearing house for knowledge and expertise in the natural history of the southwestern United States. In 2009, the number of RFIs increased 13%.

(6) Publications by scientists outside of the MSB - Curatorial management does have direct impact on scholarly production through the provision of specimens and data to other researchers. In 2009, 68 publications were supported in part through materials provided by the MSB through loans and data sharing. This contribution is frequently overlooked when compiling statistics of various units, but in effect, more than doubles the scholarly contributions of the MSB as a whole. The time allocated to curatorial efforts produces scholarly contributions outside the normal reward system offered to university faculty and research staff.

(7) Publications by museum staff- This metric includes all publications in bona fide outlets such as books, journals, compendia, and other publications. Gray literature and quasi-public reports (e.g., technical reports, agency reports – see below) are not included. There may be some overlap among divisions as curatorial staff often co-author manuscripts and these will be counted twice in overall totals. In 2009, publications in a single year reached an all-time high for the MSB.

(8) Technical reports by museum staff include reports to agencies in fulfillment of contract deliverables. Many of these reports hold primary data upon which critical management decisions are made, including endangered species status, listing decisions, biological opinions and other documents. In 2009, the number of technical reports is

down slightly (from 30 to 24), perhaps because many new grants and contracts for MSB staff do not require such reports. They may also be under-reported because such reports are not prominently featured in tenure and promotion support files.

(9) UNM courses using specimens, data, electronic archives and other resources provided by the MSB.

(10) UNM courses provided by museum staff include lecture courses taught by faculty curators and associate curators of the MSB. It also includes laboratory teaching by graduate students affiliated with the MSB.

(11) Number of graduate students mentored by MSB staff per year includes graduate students who are formally trained in curatorial practices and standards of field data collection, specimen preservation, field protocols that are consistent with institutional animal care guidelines, directly by faculty and staff of the MSB. It does not include graduate enrollment in formal courses. Graduate student participation in MSB activities is at a 5-year high (nearly doubling in 2009), which reflects the drawing power of natural history and the MSB for graduate recruitment in Biology and A&S.

(12) Number of graduate theses/dissertations is the total per year completed by graduate students mentored by MSB staff as primary advisor or co-advisor. This number fluctuates depending on overall graduate enrollments within the Biology Department.

(13) Number of undergraduate students trained in the MSB includes undergraduate students that are employed under the Federal Work-Study program or from externally funded research grants and contracts, and special education programs like Undergraduate Research Mentoring projects like UNO and UMEB. This number has nearly doubled in 2009 as a result of MSB-centered undergraduate educational programs, increased grant activity for curation and integration of orphaned collections (e.g., Fishes, Mammals, USGS), and ramping up of museum-based programs in Birds and Arthropods. A new project funded by NSF in 2010 (RCN-AIM UP!) is likely to increase opportunities for undergraduate involvement in museum activities, and expand use of museum materials in the classroom. Occasionally undergraduate students volunteer to assist with curatorial tasks.

(14) Number of grants and contracts in force includes all active grants and contracts that are available to specimen-based research and are being conducted by MSB staff. This number varies little from year to year, but overall funding has steadily increased with inclusion of new curatorial staff (Miller and Witt) and units (Division of Parasitology), along with sustained granting activity from other units.

(15) Total dollar amount of all grants and contracts in force is simply the sum value of all grants in force. Yearly expenditures are expected to be far less than totals.

(16) Total amount of Facilities and Administration (F&A) funds from grants/contracts in force is likewise the sum of estimated F&A return to UNM. Yearly expenditures are expected to be far less than totals.

2009 – A Snapshot of Activities in the MSB

- ***Curation and integration of major federal, state, and “orphaned” university collections*** into the MSB is ongoing, resulting in the addition of roughly 140,000 specimens, data, and electronic records in 2009. Externally sponsored curation activities to integrate these collections are occurring in the Division of Fishes where two major collections representing major New Mexico waterways are being fully curated and integrated with funding from the New Mexico Department of Game and Fish and the US Fish and Wildlife Service. The Division of Mammals continued integration of University of Illinois collections in 2009 sponsored by the National Science Foundation. Integration of the USGS collections, sponsored by the USGS and the MSB, into the Divisions of Amphibians and Reptiles (100% complete), Birds (100% complete), Fishes (95% complete), and Mammals (32% complete) is nearly complete. The USGS collections are projected to be fully integrated into MSB collections by the end of calendar year 2010.
- ***MSB Travel to Washington DC*** to meet with the US Department of Agriculture and the New Mexico congressional delegation to discuss relocation of the US National Parasite Collection to the MSB. The collection is currently housed at the USDA in a completely inadequate facility to ensure long-term security of the collections. The MSB proposed to make the collection a cornerstone of an integrative research and education program in host-parasite interactions. MSB Director Turner and Curator of Mammals Cook made presentations and aided in negotiations with agencies. UNM President David Schmidly was involved directly in negotiations with USDA and Smithsonian Officials.
- ***The Department of Biology/MSB hired a part-time building management assistant*** who has significant duties in CERIA (roughly 10 hours per week). Kevin Judd, the new hire, has helped with installation of insect cases on a recently funded NSF collection improvement grant to the Division of Arthropods, and other crucial infrastructure projects in the MSB.
- ***An NSF-sponsored CAREER grant was awarded*** to Curator of Arthropods, Kelly Miller. The Faculty Early Career Development (CAREER) Program is a National Science Foundation-wide activity that offers its most prestigious awards in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations. Dr. Miller’s CAREER award is the third to be awarded to UNM Biology, the second to be awarded to a faculty curator in the MSB in the history of the award competition.

- ***Building Management-*** In 2009, the MSB conducted critical repairs of second floor leak associated with flooding of the men's bathroom, and completed migration of security system from C-Cure to Lobocard with the assistance of the OVPR, the UNM Research Park, and Lobocard staff. The cost of these repairs was borne entirely by the MSB, despite the threat to the security of dry archives and other irreplaceable specimens and materials.
- ***Sponsored and participated in intra- and extramural education and outreach activities*** by routinely conducting tours for K-12 education, and a variety of UNM courses. The MSB played an important role in organizing Biology's contribution to "Darwin Day" activities in celebration of naturalist Charles Darwin's 200th birthday (coincidentally, President Abraham Lincoln's 200th birthday). MSB personnel were directly involved in organizing and planning workshops in professional societies detailed in the body of divisional reports below.
- ***Served as UNM's primary representative to the Colorado Plateau Cooperative Ecosystems Study Unit.*** This group includes federal and state partners and is designed to facilitate contracts and grants between partners. There is an important role for museums as repositories for natural history and archaeological studies on federal lands on the Colorado Plateau. A 5-year renewal of the federal charter for this group was recently signed and UNM remains a member in good standing. More information can be found on the group's web site <http://www.cefn.sau.edu/Orgs/CPCESU/>. The CPCEU facilitates awards, grants, and contracts to the departments of Anthropology, Architecture, Biology, Economics, the Maxwell Museum of Anthropology, and the MSB.
- ***Submitted a federal priority request for renovation of CERIA 125*** to alleviate fluid storage space shortfalls, comply with State and UNM Fire Codes, and provide for collection space for the newly created Division of Parasitology. This request was prepared in conjunction with members of the UNM Museum Council.

Major Initiatives of the MSB

At our annual retreats and at a number of MSB executive committee meetings throughout the year, we identified a number of goals, programs and key resources we will strive to accomplish over the next five years. They are:

1. Activate and grow an internationally recognized repository and research infrastructure for host-parasite interactions: In response to continued and unprecedented environmental change and the ongoing emergence and resurgence of infectious diseases, we have initiated the new Division of Parasitology in the Museum of Southwestern Biology. National and international research agendas aimed at elucidating the dynamic linkages between hosts, parasites, environmental change and human health will be pursued, leveraging existing strengths, strengthening intra-university relationships. We envision the Division of Parasitology along with other Divisions at the MSB as an international resource for systematics, taxonomy, identification, ecological and epidemiological research in parasitology and hosts and will diversify and leverage

UNM's continued leadership in these research arenas. The new Division of Parasitology represents the development of new capacity to address current and emerging challenges to science and society. As a recognized leader in collections-based research and biodiversity informatics, the MSB is uniquely positioned to bridge existing gaps between collection-based research and environmental and biomedical science: resources of the MSB have been critical for policy makers, natural resource managers, and government and business leaders because they support investigations and decisions related to human health, climate change, conservation, and land management. Moreover, the Division of Parasitology will move UNM to the leading edge of efforts to understand and combat emerging infectious diseases by facilitating efforts to assess the complex and dynamic linkages between hosts and parasites in a changing world. The Division of Parasitology was established in January 2008 with a substantial donation of specimens from the Rausch collection and ongoing research initiatives at UNM (e.g., Beringian Coevolution Project, Center for Evolutionary and Theoretical Immunology)

2. Develop and launch an MSB-centered Conservation Unit: a special role for Natural Heritage New Mexico. A second major area for growth in the MSB addresses a critical need for historical data in conservation of endangered species and ecosystems and natural resource management. We seek to develop a **Conservation Division**, which is a program charged with maximizing the visibility and utility of our extensive specimen-based databases and to enhance development of a number of initiatives at the state and federal level involved with conservation issues. There are major policy issues at stake. For example, the development of alternative energy has potentially significant impact on native plants and animals. Scoping and siting new wind and solar energy projects will depend on distributional and historical data of plants and animals. Thus, we envision the Conservation Division as a centralized, core resource that serves the UNM community at large but is based in the MSB. We will seek to obtain funding, perhaps through the UNM Foundation for a Faculty Curator and a database/collection manager for the Conservation Division.

The full-time I/T systems administrator we propose below will forge critical links between the Conservation Division and other Divisions of the MSB. One challenge is to implement and connect database systems into a seamless server for conservation and management data that will be accessible by local, state, and federal resource managers. Our plan is to leverage this full time museum-wide position through programmatic grant proposals like the proposed NSF IGERT grant.

3. Work to develop and establish integrated online database systems for all Divisions of the MSB. This will require substantial planning and collaboration among divisions and success will depend heavily on a new I/T systems administrative hire. This goal emerges naturally from the previous goal of establishing a formal informatics program in the MSB.

4. Further develop and support our undergraduate training program afforded by NSF-funded UnO - Undergraduate Research Mentoring Program. Our progress so far has been excellent, 17 undergraduate students are currently paired with faculty mentors and attending special seminars designed to help them succeed and

graduate. Fifteen students from the first and second cohorts have now graduated and are either enrolled in graduate school or are graduate-school bound, serving in the Peace Corps, or are natural resource management professionals. Details about students, research projects, and faculty mentors can be found at <http://msb.unm.edu/UnO/education.html>.

5. Refine, further develop, and resubmit a museum-centered interdisciplinary graduate training program through development of an NSF-IGERT proposal: In 2009, we assembled a team of faculty researchers across campus who are interested in developing a museum-centered graduate training proposal aimed at documenting and understanding how abiotic and biotic systems change from molecular to ecosystem scales. There are three major underlying research areas: (i) identifying and understanding relationships of environmental change and host-pathogen interactions focusing both on human and wildlife diseases (ii) using museum collections to uncover evolutionary and ecological change in biota that results from landscape and water use and global climate change in the American Southwest over decadal time scales and (iii) developing informatics and modeling approaches to both create and use integrated relational databases that link specimens, environmental, molecular and geographic information.

We are continuing to develop and hone our MSB-IGERT program so that it will prepare students to meet substantial environmental challenges and for the job market by providing a strong grounding in their respective disciplines but also by providing a culture and infrastructure to allow them to tackle environmental and biotic changes in novel, integrative, and multidisciplinary ways. Most importantly, through our program, students will be equipped to bring time series data to bear on evaluating and predicting responses to environmental change over decadal time scales. Use of natural history collection specimens, data and materials will undoubtedly motivate new uses and ways of integrating databases in a reciprocally illuminating process that is likely to spark renewed interest in resources available in natural history collections.

6. Continue working to revitalize the museum studies program at UNM through MSB collaborations with other UNM Museums (e.g., Maxwell, Meteorite, and UNM Art Museums). The College of Arts & Sciences has recently hired a new director in the UNM Maxwell museum who is charged with revitalizing the Museum Studies program at UNM. The College has contributed significant resources including a new faculty position in addition to the new Director to coordinate this effort.

Major Challenges to Growth and Development of the MSB

We face a number of challenges to implementation of our goals that mainly revolve around a general lack of resources for staffing and operational budgets. We address the following challenges below, and propose some solutions:

1. We Lack Critical Information Technology Support: The MSB is sorely lacking information technology support, and it is our top priority to staff an IT Technologist/Systems Administrator position to help develop, grow, and maintain our

overtaxed cyber-infrastructure (Over 300,000 web hits and data downloads in 2009). At present, our database management plan is **reactive** rather than **proactive**; we deal with problems involving data security, data backup/management, systems maintenance, IT innovation, trouble shooting viruses/worms, purchasing hardware and software in highly piecemeal fashion using private contractors that vary tremendously in quality and service.

IT/Systems Administrator rationale and proposed solution: So much of the potential and promise for development of the MSB relies on enhancing our visibility and accessibility through electronic media such as the world-wide-web. We have enormous potential to provide integrated databases that could serve as tools to address questions of great societal import regarding emergence of pathogens and natural resource abundance and distribution. Our progress in this area has been seriously hampered by lack of personnel in computer systems administration. At minimum, we will seek to hire one full-time IT/ Systems Administrator to manage and implement database and server systems. Our plan is to leverage this position through programmatic grant proposals like the proposed NSF IGERT grant, and UNM legislative priorities like relocation and integration of the US National Parasite collection.

2. Critical Limitations on Fluid Collection Space: Since the 2003 occupation of the renovated old UNM bookstore by the Museum of Southwestern Biology (MSB), all of the MSB divisions have acquired additional collections not originally factored into the estimated growth figures of 1998-99 when designing collection storage space for the Museum. Especially for invertebrates and vertebrates there have been unanticipated acquisitions of specimens. Important additions to the MSB collections include a large backlog of ethanol-preserved New Mexico insect collections taken from pitfall sampling and an increasing number of collections from South America and Africa since the hire of the Curator of Arthropods. There is also the Rausch Collections of Parasites that form the core of the Division of Parasitology. All of these collections increase the importance of the MSB as a regional, national, and international resource for scientific research in ecology, systematics, molecular systematics, population studies, and emerging disease research. Currently, there are rooms/areas within the Museum facility that have been identified as potential collections space for the Museum. These areas, if minimally renovated, would make a big difference in specimen access and if important collections could be accepted (or not) by the MSB. ***The UNM Fire Marshal has mandated new collection space for fluid-preserved materials in the MSB, which makes this a health and safety issue. We are currently in negotiations with the New Mexico State Fire Marshal to implement renovation of space.***

Proposed Solution: CERIA 125 conversion from classroom space to fluid collection space: To alleviate shortfalls of fluid collections space, we propose a two phase plan. For **Phase I**, we propose that Room 125, a classroom on the lower level of CERIA Building 83, be used as a temporary storage area for select collections currently housed in the main fluid collection room, Room 145. These select collections include: large containers holding large specimens of fishes, reptiles, and mammals that are blocking the exit pathways, 165 boxes of a newly acquired collection of fishes from the New Mexico Department of Game and Fish in the main hallway of lower floor of CERIA Building 83,

and jars of specimens that must be removed from select mobile carriages so that these units can be retrofitted for pull out tank shelves. Once these collections are stored in Room 125, the reconstruction of Room 145 can begin. This phase will add 45 roll out shelves, manufactured to hold stainless steel tanks (“coffins”) for large specimens of vertebrates, to the lowest shelf spaces on 3 of the mobile carriages currently holding collections specimens in jars. A stationary unit of roll out shelves and linear shelving will also be built along the south wall in the back of Room 145. **Phase II** construction will involve the complete reconstruction of Room 125 to accommodate fluid-preserved specimens. This reconstruction will involve bringing the room up to code for storage of specimens in 70% ethanol. The room is already equipped with an emergency sprinkler system. With other infrastructure in place, the renovation of the floor, walls, and HVAC system can be done in a cost effective manner.

3. Operating Budgets for Collection Care/Improvement: The operational budget for the Museum of Southwestern Biology is \$48,000 for collections care, curation of new material, databasing, etc. This money is allocated to divisions at the beginning of the state fiscal year. There is considerable disparity among divisions in operating funds. Among the best supported divisions are Mammals, the Herbarium, Fishes, and Amphibians and Reptiles. Budget increases in these divisions have usually been negotiated as part of grant proposal packages that have a large curatorial component. The divisions of Arthropods and Birds are inadequately supported with operating budgets that are \$2000 and \$3000, respectively, for the entire year (not including a 1% university-imposed tax to support computerization of contract and grant accounting, etc.). Both divisions are headed up by new, highly motivated curators who are preparing research grants, and we plan to request budget increases commensurate with scholarly and curatorial activity in these divisions as a part of grant proposal packages. In general, total allocations to the MSB have remained static and have not kept pace with inflation over the last five years despite rising costs of curation, shipping, and electronic infrastructure and maintenance and additional regulatory requirements from federal, state, and UNM agencies.

4. Uncompensated Duties for MSB Faculty Curators – In December 2007, the entire faculty of the Biology Department ratified a document entitled “Codifying Responsibilities for MSB Curators” which lays out the expectations and duties of faculty curators in the MSB. In 2010, UNM Regents approved policy 6410. These actions constitute important recognition that curators have duties that exceed the normal responsibilities of UNM Biology Department Faculty members. MSB Director Turner has met with the chairman of Biology and the Dean of Arts and Sciences to consider reallocation of duties and summer compensation to rectify this situation. The codification of curator duties document also requires that each faculty curator meet the general expectations of the MSB laid out there and in UNM Policy 6410. Curators are to be assessed each year by the Director in a letter to the Biology Department Chair that indicates whether faculty curators meet these standards. ***We propose that faculty curators receive summer compensation of 1/9 the total value of their nine-month contracts in summer to acknowledge and support curatorial development and duties.***

DIVISIONAL REPORTS 2009

DIVISION OF AMPHIBIANS AND REPTILES

1. DIVISION HIGHLIGHTS

During 2009, the collection has increased by 2,453 specimens to a total of 89,055 specimens. This annual increase in holdings is comparable to that of other years. This year's specimens came from a large donation of tortoises from a monitoring program at the Arizona Game and Fish Department and the cataloguing of Caribbean material from Associate Curator, Dr. Steven Poe. In addition, several divisional excursions to different parts of New Mexico have produced over 200 specimens, which include a new county record of a tree frog.

Although scientists and members of the general public have requested information from our division in similar rates to previous years, the website of the division continues to see an increase in traffic. This is most likely due to a continually growing visibility of the collection because of data shared via collaborative projects. Specimens and their associated data have resulted in at least 12 new publications. In addition to automated data responses, staff at the division handled over 100 information requests via email and phone and hosted 14 visitors.

Tours of the collection, lending of teaching specimens and projects with local agencies were the division's main outreach activities in 2009. The collection manager has given tours of the collection to nearly 150 people and gave several public presentations on New Mexico's amphibians and reptiles to diverse audiences. We have also continued to work closely with the New Mexico Department of Game and Fish through participation on committees dedicated to recovery of individual species. We continued working on a project with the City of Albuquerque that focuses on Urban Biological Diversity. The project provided opportunities for five undergraduate students to work in biological research.

2. TABLE OF COLLECTION USE

Collection Growth	2,453
Loans	11
Research Visitors ¹	14
Outreach Visitors ¹	140
Information Requests Answered	109
Direct Website Access ² ("Hits")	9,392
Indirect Collection Access ³ ("Hits")	88,364
Downloads of Division Documents	1,723
New Publications Citing MSB Herpetological Specimens	12

¹Research Visitors are those visiting the collection as part of research activities,
Outreach visitors are those visiting as part of tours.

²Direct Website access represents access to our Division's webpages.

³Indirect Collection Access represents access to data associated with our
specimens via other websites such as HERPNET, INRAM, GBIF, etc.

3. COURSES USING THE COLLECTIONS

BIOL 204, Animal Form and Function, Spring and Fall semesters, 365 students

BIOL 386, General Vertebrate Zoology, Spring and Fall semesters, 70 students

BIOL 488, Herpetology, Fall semester, 19 students

4. COURSES TAUGHT BY MSB PERSONNEL

A. Faculty/Collection Managers

Poe, S.

Fall BIOL 488 – Herpetology, 19 students

Snell, H.L.

Spring BIOL 379 – Conservation Biology, 61 students.
 BIOL 699 – Dissertation, 2 students
 BIOL 551 – Research Problems, 1 student

Fall BIOL 400 – Senior Honors Thesis, 1 student
 BIOL 551 – Research Problems, 1 student
 BIOL 599 – Master's thesis, 1 student
 BIOL 699 – Dissertation, 2 students

B. Graduate Students

Latella, I.M.

 BIOL 124, Biology – Health Sciences Lab, spring, 65
 BIOL 202, Genetics Lab, fall, 70

Ryan, M.J.

 BIOL 467, Tropical Biology, spring, 19

Schaad, E.W.

 BIOL 488, Herpetology Lab, fall, 19

Timmons, H.L.

 BIOL 247, Anatomy and Physiology Lab, spring, 94 (3 sections)

5. COLLECTION MANAGEMENT

During 2009, 2,453 new specimens were added to the main collection for a total of 89,055 specimens. This increase in number of specimens is similar to increases in other years. Most specimens came from a large donation of tortoises by the Arizona Game and Fish Department and the collections of Associate Curator, Dr. Steven Poe from several Caribbean islands. Divisional trips to parts of New Mexico have produced over 200 specimens. During one of the trips, we have found a new county record of a tree frog.

Staff at the division participated in several projects, including our continuing collaboration with New Mexico's Department of Game and Fish on threatened and endangered species. Publications resulting from projects include descriptions of new species and extensions of known ranges of species' distributions.

6. AWARDS, GRANTS, AND CONTRACTS

\$41,892. Development of a Wildlife Conservation Plan for the City of Albuquerque. **H.L. Snell** and T. Lowrey. City of Albuquerque. August 2007 – July 2010.

\$120,000. Adaptation, exaptation, and colonization in solitary island lizards. S. Poe. National Science Foundation #350277. June 2009 – May 2012.

7. PUBLICATIONS

A. Books, Book Chapters, Edited Volumes

None.

B. Journal Articles

Bateman H.L., A. Chung-Maccoubrey, **H.L. Snell**, and D.M. Finch. Abundance and species richness of snakes along the Middle Rio Grande riparian forest in New Mexico. *Herpetological Conservation and Biology* 4(1):1-8.

Benavides, E., R. Baum, H. M. Snell, **H. L. Snell**, and J. W. Sites, Jr. Island biogeography of Galápagos lava lizards (Tropiduridae: *Microlophus*): species diversity and colonization of the archipelago. *Evolution* 63(6), 1606 - 1626.

Costantini, D, G. Dell'Omo, S. P. De Filippis, C. Marquez, **H. L. Snell**, H. M. Snell, W. Tapia, G. Brambilla, and G. Gentile. Temporal and spatial covariation of gender and oxidative stress in Galápagos land iguana *Conolophus subcristatus*. *Physiological and Biochemical Zoology* 82(5): 430 - 437.

Gentile, G., A. Fabiana, C. Marquez, **H. L. Snell**, H. M. Snell, W. Tapia, and V.

Sbordonia. An overlooked pink species of land iguana in the Galápagos. Proceedings of the National Academy of Sciences 106(2), 507-511.

Gentile, G. and **H. L. Snell**. *Conolophus marthae* sp.nov. (Squamata, Iguanidae), a new species of land iguana from the Galápagos archipelago. Zootaxa 2201: 1–10.

Hibbitts, T.J. **C.W. Painter**, and A.T. Holycross. 2009. Ecology of a population of the narrow headed Gartersnake (*Thamnophis rufipunctatus*) in New Mexico; catastrophic decline of a river specialist. Southwestern Naturalist 54(4):461-467.

Poe, S, I.M. Latella, M.J. Ryan and E.W. Schaad. 2009. A new species of *Anolis* from Panama. Phyllomedusa 8:81-87.

Poe, S., J. Velasco, K. Miyata, E. E. Williams. Descriptions of two Nomen Nudum Species of *Anolis* lizard from Northwestern South America. Breviora 516:1-16

Steinfartz, S., S. Glaberman, D. Lanterbecq, M. Russell, S. Rosa, T. Hanley, C. Marquez, **H. L. Snell**, H. M. Snell, G. Gentile, G. Dell'Olmo, A. M. Powell, and A. Caccone. Progressive colonization and restricted gene flow shape island-dependent population structure in Galápagos marine iguanas (*Amblyrhynchus cristatus*). BMC Evolutionary Biology 2009 (9):297 – 314. (<http://www.biomedcentral.com/1471-2148/9/297>)

Stuart, J.N. and Ward, J.P. 2009. *Trachemys gaigeae* (Hartweg 1939) - Big Bend Slider, Mexican Plateau Slider, Jicotea de la Meseta Mexicana. In: Rhodin, A.G.J., Pritchard, P.C.H., van Dijk, P.P., Saumure, R.A., Buhlmann, K.A., Iverson, J.B., and Mittermeier, R.A. (Eds.). Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. Chelonian Research Monographs No. 5, pp. 031.1-031.12, <http://www.iucn-tftsg.org/cbftt/>.

C. Web-Based

None.

D. Technical Reports

Snell, H.L. and T. K. Lowrey. 2008 Progress Report – Preliminary Biological Diversity Survey & Monitoring Project. Submitted to City of Albuquerque

E. Theses/Dissertations Completed

None.

F. Work In Progress

Phillips, R. B., D. A. Wiedenfeld, and **H. L. Snell** Current status of alien vertebrates in the Galápagos Islands: their distribution, ecological impacts, and taxonomic trends.

Phillips, R.B., R. C. Dowler, C. W. Edwards, and **H. L. Snell**. Effect of area and isolation on incidence of alien rodents in the Galapagos Islands.

Phillips, R. B., C. W. Edwards, R. C. Dowler, **J. T. Giermakowski** and **H. L. Snell**. Modeling the intra-archipelago distribution of alien rodents in the Galapagos Islands: conservation implications and applications.

Ryan, M.J., K.R. Lips & **J.T. Giermakowski**. 2010. A new species of *Pristimantis* (Anura: Terrana: Strabomantinae) from lower Central America. Journal of Herpetology. (in press).

Ryan, M.J., J.M. Savage, K.R. Lips, & **J.T. Giermakowski**. 2010 A new species of *Craugastor* (Anura: Craugastoridae) of the *rugulosus* species series from west-central Panama. Copeia (accepted).

Schaad, E.W. and **S. Poe**, Patterns of ecomorphological convergence among mainland and island *Anolis* lizards. Evolution (accepted).

Ryan, M.J., N.J. Blea, **I.M. Latella** & M.A. Kull. *Leptodactylus savagei* (Smokey Jungle Frog) Antipredator defense. Natural History Note. Herpetological Review.

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

Adalsteinsson, S., W. Branch, S. Trape, L. Vitt, and S. Hedges. 2009. Molecular phylogeny, classification, and biogeography of snakes of the Family Leptotyphlopidae (Reptilia, Squamata). Zootaxa **2244**:1-50.

Cunningham, H., L. Rissler, and J. Apodaca. 2009. Competition at the range boundary in the slimy salamander: using reciprocal transplants for studies on the role of biotic interactions in spatial distributions. Journal of Animal Ecology **78**:52-62.

Enderson, E., A. Quijada-Mascareñas, D. Turner, P. Rosen, and R. Bezy. 2009. The herpetofauna of Sonora, Mexico, with comparisons to adjoining states. Check List **5**:632-672.

Leaché, A., M. Koo, C. Spencer, T. Papenfuss, R. Fisher, and J. McGuire. 2009. Quantifying ecological, morphological, and genetic variation to delimit species in the coast horned lizard species complex (*Phrynosoma*). Proceedings of the National Academy of Sciences **106**:12418.

Luxbacher, A., and J. Knouft. 2009. Assessing concurrent patterns of environmental niche and morphological evolution among species of horned lizards (Phrynosoma). *Journal of Evolutionary Biology* **22**:1669-1678.

Pineda, E., and J. Lobo. 2009. Assessing the accuracy of species distribution models to predict amphibian species richness patterns. *Journal of Animal Ecology* **78**:182-190.

Poe, S, I.M. Latella, M.J. Ryan and E.W. Schaad. 2009. A new species of *Anolis* from Panama. *Phyllomedusa* **8**:81-87.

Pyron, R., and F. Burbrink. 2009. Can the Tropical Conservatism Hypothesis explain temperate species richness patterns? An inverse latitudinal biodiversity gradient in the New World snake tribe Lampropeltini. *Global Ecology and Biogeography* **18**:406-415.

Pyron, R., and F. Burbrink. 2009. Lineage diversification in a widespread species: roles for niche divergence and conservatism in the common. *Molecular Ecology* **18**:3443-3457.

Rödger, D., A. Kwet, and S. Löttersb. 2009. Translating natural history into geographic space: a macroecological perspective on the North American Slider, *Trachemys scripta* (Reptilia, Cryptodira, Emydidae). *Journal of Natural History* **43**:2525-2536.

Rödger, D., and S. Lötters. 2009. Potential Distribution of the Alien Invasive Brown Tree Snake, *Boiga irregularis* (Reptilia: Colubridae). *Pacific Science* **64**:11-22.

Vieites, D. 2009. Reconstruction of the climate envelopes of salamanders and their evolution through time. *Proceedings of the National Academy of Sciences* **106**:19715.

8. ACTIVITIES IN LEARNED SOCIETIES

A. Invited/Plenary Talks and/or Seminars

None.

B. Contributed Talks/Posters (*presenter)

The Mechanism of Confusion: How Varying Goals may Impact the Relative Merits of Restoration Ecology Projects. Bateman, H.L.* and **H. L. Snell**. 19th Conference of the Society for Ecological Restoration International. Perth, Australia. August.

Improving models of distribution for amphibians and reptiles of New Mexico. J.T. Giermakowski* and H. L. Snell. **Oral presentation. New Mexico and Arizona Chapters of The Wildlife Society Annual Meeting, Gallup, NM. February.**

Where species could be: statewide models of distribution for amphibians and reptiles of New Mexico. **J.T. Giermakowski* and H. L. Snell**. Oral presentation. Southwestern Partners in Amphibian and Reptile Conservation, St. George, UT. September.

Traits promoting invasive success in *Anolis* lizards. **I.M. Latella***, **S. Poe**, **J.T. Giermakowski**. 2009 *Anolis* symposium at Harvard University, Cambridge, MA. October.

Traits promoting naturalization success in *Anolis* lizards: A comparison of morphological, environmental, anthropomorphic, and phylogenetic models. **Latella, I.M.** Poster presentation. American Society of Ichthyologists and Herpetologists. Portland, OR. June.

Patterns of ecomorphological convergence among mainland and island *Anolis* lizards **Schaad, E.W.** Poster presentation. American Society of Ichthyologists and Herpetologists. Portland, OR. June.

Patterns of ecomorphological convergence among mainland and island *Anolis* lizards. **Schaad, E.W.** Oral presentation. *Anolis* symposium at Harvard University, Cambridge, MA. October.

Anolis lizards as model colonizers. **Poe, S.** American Society for the Study of Amphibians and Reptiles, Portland, OR. June.

Anolis lizards as model colonizers. **Poe, S.** 2009 *Anolis* symposium at Harvard University, Cambridge, MA. October.

Elevation of the subspecies *Anolis humilis* to species status. Blea, N.J., **S. Poe & M.J. Ryan**. 2009 *Anolis* symposium at Harvard University, Cambridge, MA. October.

C. Attendance at Professional Meetings

J.T. Giermakowski

New Mexico/Arizona Chapters of The Wildlife Society, Gallup, NM. February.

Southwestern Partners in Amphibian and Reptile Conservation, St. George, UT. September.

H.L. Snell

New Mexico/Arizona Chapters of The Wildlife Society, Gallup, NM. February.

Southwestern Partners in Amphibian and Reptile Conservation, St. George, UT. September.

D. Service as Editor or on Editorial Board of a Journal

C.W. Painter, Natural History Notes Section Co-Editor (Amphibians) for Herpetological Review

H.L. Snell, Museum of Southwestern Biology Publications Series

E. Service as Officer of Professional Society/Organization

None.

9. OTHER PROFESSIONAL ACTIVITIES

A. Presentation to General Audience in a Scholarly Capacity

J.T. Giermakowski

Amphibians and Reptiles of New Mexico. Presentation to the leaders of Boy Scouts of America, Albuquerque, NM. October.

Local amphibians and reptiles. Presentation to the Bosque Academy Summer Camp Program, Albuquerque, NM. July.

Discovery weekend: amphibians and reptiles. Presentation to the public at Ute Lake State Park, Logan, NM. July.

C.W. Painter

Invited speaker to New Mexico Herpetological Society; Radio-tracking King Cobras in the Western Ghats of SW India

Invited speaker to New Mexico Herpetological Society; Commercial Trade of Amphibians and Reptiles in New Mexico

H.L. Snell

Evolution and Conservation in the Galapagos: A Window to Worldwide Patterns? General Public & Members/Pajarito Environmental Education/Earth Day Celebration, Los Alamos, NM. April.

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

None.

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

H.L. Snell.

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

Member of New Mexico Department of Game and Fish Species Recovery Team for Grey-banded Kingsnakes. New Mexico Department of Game & Fish

Conservation Fellow of the Saint Louis Zoo. St Louis Zoological Society

Member of the General Assembly. Charles Darwin Foundation

J.T. Giermakowski.

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

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

Collection Manager Representative to the Museum of Southwestern Biology Executive Committee.

R.B. Phillips

Member of The New Mexico Aquatic Invasive Species Advisory Committee

D. Journal Referee

H.L. Snell. *Frontiers in Ecology and the Environment* (1), *Journal of Heredity* (1)

R.B. Phillips. *The Southwestern Naturalist* (1).

S. Poe. *Journal of Herpetology* (1), *Phyllomedusa* (1)

E. Hosting Professional Colloquia and Groups

None.

10. SERVICE

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

None.

B. Public Service

H.L. Snell

Work with Environmental Health Division on Urban Biodiversity, Albuquerque, NM

Work with Whitfield Wildlife Conservation Area, Belen, NM

Mapping Trails & Natural Resource Distributions, Manzano Mountains, Mountainair Ranger District, Cibola National Forest, Valencia & Torrance Counties

Member NM Department of Game & Fish Species Recovery Board, Santa Fe & Albuquerque, NM

R.B. Phillips

Judge for High School and Middle School Science and Fairs.

11. ADVANCED STUDY, HONORS, AWARDS, FELLOWSHIPS, ETC.

C.W. Painter

Wildlife Professional of the Year Award from New Mexico Wildlife Society.

M.J. Ryan

GRAC research award; Grove Scholarship, Tinker Foundation Field Research Grant

E.W. Schaad

GRAC research award; Spring 2009

H.L. Snell

Faculty Senate President, UNM

12. DONATIONS AND GIFTS RECEIVED

Donation of 2009 issues of the Southwestern Naturalist and Texas Journal of Science.

13. CURRENT STAFF

A. Faculty/Staff

Snell, H.L. Professor and Curator

Degenhardt, W.D., Curator and Professor Emeritus
Poe, S., Assistant Professor and Curatorial Associate

Giermakowski, J.T. Collection Manager

Schaad, E.W. Graduate Research Assistant (Spring)
Wright, N.A. Graduate Research Assistant (Fall)

B. Graduate students

Giermakowski, J.T., Ph.D./Snell
Gray, L.N., M.S./Poe
Latella, I.M., Ph.D./Snell and Poe
McInnes, T.L., M.S./Snell
Pederson, N., M.S./Snell
Phillips, R.B., Ph.D./Snell
Ryan, M.J., Ph.D./Poe
Schaad, E., Ph.D./Poe
Timmons, H., M.S./Snell

C. Undergraduate Student Workers and Volunteers

Chour, Jobette. Student worker.
Gabriel Joachim. High school intern and volunteer.
McInnes, T.L. Volunteer.
Wilson, Cassandra. Volunteer.

14. MUSEUM ASSOCIATES

A. Curatorial Associates

Painter, C.W., New Mexico Dept. of Game & Fish
Stuart, J.N., New Mexico Dept. of Game & Fish

B. Research Associates

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

DIVISION OF ARTHROPODS

1. DIVISION HIGHLIGHTS

The Division of Arthropods received a large NSF Biological Research Collections, Collections Improvement Grant for \$500,000, 2009-2012. We used part of those funds to purchase 40 new insect cabinets and specimen drawers, enough to fill out our compactor space in the collection room, and to provide specimen storage for years to come. Other funds from that grant are being used to purchase additional needed supplies and equipment, and to employ undergraduate and graduate museum technicians and research assistants. The Division also received a research grant from the National Park Service, \$120,000, to conduct comparative inventory research for arthropods at White Sands National Monument (USA), and Cuatrociénegas Protected Area (Mexico) to discover new and endemic species of arthropods associated with Chihuahuan Desert gypsum environments. Continued funding from the curator's NSF grants *Survey of the Aquatic Insects of Northern Venezuela with an emphasis on Coleoptera* (\$500,000, Miller, coPI) and *CAREER: Phylogenetic Revisions of South American Water Beetles (Coleoptera: Adephegata: Hydradepegata): A Model for Teaching Systematic Biology* (\$675,000, Miller, PI) has provided additional resources, funds and personnel that have greatly enhanced the MSBA. Insect collecting field campaigns by MSBA personnel in the past year included Costa Rica, Bolivia, Panama, Cameroon, Mexico and locally in Arizona, New Mexico and other areas of the United States.

2. TABLE OF COLLECTION USE

Specimens Accessioned	Loans (outgoing)	Loans (incoming)	Visitors	Information Requests	Publications Citing MSB Specimens
9,000	8	36	260	300	12

3. COURSES USING THE COLLECTION

BIOL. & HONORS 324L, Natural History of the Southwest, 12 students

BIOL 485/585, Entomology, 16 students

BIOL 402/502, Topics in Entomology

4. COURSES TAUGHT BY MSB PERSONNEL

A. Faculty/Collection Managers

Miller, K.B.

BIOL 485/585, Entomology, 16 students

BIOL 203, Ecology and Evolution, 220 students

BIOL 402/502, 17 students

5. COLLECTION MANAGEMENT

We continued with the accessioning of old collection donations, including the curation of thousands of specimens. We purchased a bar-code reader and developed bar-code labels that will be placed on newly accessioned specimens.

Heidi Hopkins has borrowed ~2500 specimens of *Arenivaga* from 18 institutions and private collectors.

Karen Wetherill has borrowed 308 specimens in Eucerini from EPPWS, New Mexico State University, 80 specimens in Eucerini from the Biology Department, New Mexico State University, 107 specimens in Eucerini from USDA Bee Laboratories, Logan UT, and 1999 specimens of Eucerini from The American Museum of Natural History, NY. Wetherill also donated an additional 77 specimens of bees to the American Museum of Natural History.

In the alcohol collection we cleared out a backlog of several thousand specimens, mostly from ecological projects. During the summer undergraduates Emily Hodson and Elizabeth Montano worked with volunteer Ben Gutzler to curate many of these specimens and to shift the jars in the collection room to accommodate the new material.

6. AWARDS, GRANTS, AND CONTRACTS

NSF CAREER #DEB 0845984 (**K.B. Miller**, PI). *Phylogenetic Revisions of South American Water Beetles (Coleoptera: Adephaga: Hydradeephaga): A Model for Teaching Systematic Biology* (\$675,000, F&A \$201,447).

NSF Systematic Biology and Biodiversity Inventories Grant #DEB-0816904 (A.E.Z. Short, PI; K.B. Miller, Co-PI). *Survey of the Aquatic Insects of Northern Venezuela with an emphasis on Coleoptera*. (\$453,444, F&A \$77,175).

US National Park Service, *Joint Research on the Endemism of White Sands National Monument and Cuatrociénegas Protected Area: Arthropods*. **K.B. Miller and D.C. Lightfoot**. 01/10-05/12 (\$120,000, F&A \$44,614).

USGS/BRD contract order #06FTSA0059. *Continuation of long-term monitoring of ground-active arthropods at Bandelier National Monument*. **S.L. Brantley and D.C. Lightfoot**. 07/06-06/07 (\$5000, F&A \$0).

Universidad Autonoma de Mexico / University of New Mexico. **Ana Davidson**. *Separate and combined effects of prairie-dogs and cattle on a desert grassland in northern Mexico*. Ground-arthropod and grasshopper component managed by **D.C. Lightfoot** and **S.L. Brantley**. 08/07-08/08 (\$5000, F&A \$0).

7. PUBLICATIONS

A. Books, Book Chapters, Edited Volumes

B. Journal Articles

Bousquet, Y., Heffern, D.J., Bouchard, P., & **E.H. Nearn**s. 2009. Catalogue of family-group names in Cerambycidae (Coleoptera). *Zootaxa*, 2321: 1-80.

Nearns, E.H., Swift, I.P., & L.J. Joly. 2009. First record of *Curus chemsaki* Nearns & Ray, 2006 (Coleoptera: Cerambycidae: Cerambycinae: Curiini) in Colombia. *Insecta Mundi*, 0103: 1-2.

Nearns, E.H. & K.B. Miller. A new species of *Plectromerus* Haldeman from Central America and description of the female of *Plectromerus dezayasi* Nearns & Branham, 2008 (Coleoptera: Cerambycidae: Cerambycinae: Plectromerini). *ZooKeys*, 24: 55-62.

Wappes, J.E., Ledezma Arias, J. & **E.H. Nearns**. 2009. Coleoptera holotypes in Museo de Historia Natural, Noel Kempff Mercado, Universidad Autonoma “Gabriel René Moreno,” Santa Cruz de la Sierra, Bolivia. *Insecta Mundi*, 0081: 1-8.

Giorgi, J.A., Vandenberg, N.J., McHugh, J.V., Forrester, J.A., Slipinski, S.A., **Miller, K.B.**, Shapiro, L.R., & M.F. Whiting. 2009. The evolution of food preferences in Coccinellidae. *Biological Control*, 51: 215-231.

Miller, K.B., Gibson, J.R. & Y. Alarie. 2009. North American Stygobiontic diving beetles (Coleoptera: Dytiscidae: Hydroporinae) with description of *Ereboporus naturaconservatus* Miller, Gibson and Alarie, new genus and species, from Texas, U.S.A. *The Coleopterists Bulletin*, 63(2): 191-202.

Miller, K.B., Bergsten, J., & M.F. Whiting. 2009. Phylogeny and classification of the tribe Hydaticini (Coleoptera: Dytiscidae): partition choice for Bayesian analysis with multiple nuclear and mitochondrial protein-coding genes. *Zoologica Scripta*, 1-25.

Miller, K.B. 2009. On the systematics of Noteridae (Coleoptera: Adephaga: Hydradephaga): Phylogeny, description of a new tribe, genus and species, and survey of female genital morphology. *Systematics and Biodiversity*, 7(2): 191–214.

Miller, K.B. 2009. Genus- and family-group names in the order Embioptera (Insecta). *Zootaxa*, 2055: 1-34.

Cameron, S.L., Sullivan, J., Song, H., **Miller, K.B.**, & M.F. Whiting. 2009. A mitochondrial genome phylogeny of the Neuropterida (lace-wings, alderflies and snakeflies) and their relationship to the other holometabolous insect orders. *Zoologica Scripta*, 1-16.

C. Web-Based

None.

D. Technical Reports

Brantley, S.L. and D.C. Lightfoot 2009. Long-term studies of ground-dwelling arthropod biodiversity at Bandelier National Monument. Submitted to USGS, Jemez Mountains Field Station.

E. Theses/Dissertations Completed

McIntyre, J.L. 12/2009. Dissertation: Habitat features, mammal interactions, and recovery approaches important to a rare New Mexican butterfly.

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

Swift, I.P., Bezark, L.G., **Nearns, E.H.**, Solís, A. & F.T. Hovore, F.T. Checklist of the Cerambycidae (Coleoptera) of Costa Rica. *Insecta Mundi*

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

8. ACTIVITIES IN LEARNED SOCIETIES

A. Invited/Plenary Talks and/or Seminars

B. Contributed Talks/Posters (*presenter)

Brantley, S.L.*, A.L. Swann, **D.C. Lightfoot** and **J. Bettinelli**. 8/2009. Ground-dwelling arthropods and environmental factors in two semi-arid habitats: data from 1992-2004. Albuquerque, Ecological Society of America, poster presentation.

Davidson, A.D.*, E. Ponce, **S.L. Brantley**, J Cruzado, E.L. Fredrickson, R. Sierra, R. List, **D.C. Lightfoot** and G. Ceballos. 8/2009. Interactive effects of native and exotic herbivores: Prairie dogs and cattle cause rapid changes to a grassland community. Albuquerque, Ecological Society of America, oral presentation.

Nearns, E.H.*, K.B. Miller, I.P. Swift, T.L. Grzymala, & A.J. Tafoya. 2/2009. On the longhorned beetles of the world: a phylogeny based on molecular data. Student Competition Presentation; SWB-ESA, Stillwater, OK.

Lightfoot, D.C.* and **A.D. Davidson**. 8/2009. Influences of native prairie dogs and domestic cattle on native grasshopper assemblages in a desert grassland. Ecological Society of America, Annual National Meeting, Albuquerque, NM.

Tafoya, A.J.* 12/2009. On predacious diving beetles (Dytiscidae): Phylogenetic analysis of relationships among members of the genera *Hygrotus* Stephens and *Coelambus* Thomson using molecular data. Indianapolis, Entomological Society of America, oral presentation.

Tafoya, A.J.* 10/2009. A Progress Report: Searching for Subterranean Arthropods in New Mexico. Las Cruces, Alliance for Minority Participation Conference, oral presentation.

Tafoya, A.J.* 5/2009 An Introduction to Research: Searching for subterranean arthropods in and around the Roswell Basin. Albuquerque, Undergraduate Research Presentations, Earth and Planetary Department, oral presentation.

Wetherill, K.R. * 8/2009. "Flower predictability across two mountains and two deserts" Ecological Society of America oral presentation.

Wetherill, K.R. * 11/2009. "Bees of the Bosque: What can they tell us about our restoration efforts?" Festival of the Cranes, Socorro, New Mexico, poster presentation.

C. Attendance at Professional Meetings

Tafoya, A.J. Entomological Society of America, Indianapolis, Indiana, 12/2009.

Wetherill, K.W. Ecological Society of America, Albuquerque, New Mexico, 8/2009.

Nearns, E.H. Entomological Society of America, Southwestern Branch meeting, Stillwater, Oklahoma, 2/2009

Grzymala, T.G. Entomological Society of America, Southwestern Branch meeting, Stillwater, Oklahoma, 2/2009

D. Service as Editor or on Editorial Board of a Journal

Nearns, E.H. Editorial board (appointed), the Coleopterists Bulletin, The Coleopterists Society

Lightfoot, D.C. Associate Editor (entomology and ecology) Western North American Naturalist.

Miller, K.B. Coleoptera subject editor, Proceedings of the Entomological Society of Washington.

E. Service as Officer of Professional Society/Organization

9. OTHER PROFESSIONAL ACTIVITIES

A. Presentation to General Audience in a Scholarly Capacity

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

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

D. Journal Referee

Wetherill, K.R. 2009. Reviewed paper for Western North American Naturalist.

Nearns, E.H. 2009. Reviews for Insecta Mundi, Journal of Natural History, Revista Brasileira de Entomologia, Southeastern Naturalist, ZooKeys, Zootaxa.

Lightfoot, D.C. 2009. Reviewed Oecologia manuscript.

Miller, K.B. Reviews for Cladistics, Coleopterists Society, Zootaxa, Molecular Phylogenetics and Evolution, Proceedings of the Entomological Society of Washington.

E. Hosting Professional Colleagues and Groups

10. SERVICE

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

B. Public Service

Wetherill, K. and Hopkins, H. 2009. Presentation on entomology at Albuquerque middle school after school science program.

Lightfoot, D.C. 2009. Served as entomologist for the Rio Grande Nature Center State Park BioBlitz, Albuquerque, NM.

11. ADVANCED STUDY, HONORS, AWARDS, FELLOWSHIPS

Nearns, E.H. J.G. Edwards Prize: Best Published Master's Thesis, The Coleopterists Society (\$300).

Nearns, E.H. Center for Systematic Entomology Research Grant, Gainesville, FL (\$500).

Nearns, E.H. Graduate Research Allocation Committee Travel Grant, Dept. of Biology, UNM (\$150)

Nearns, E.H. Graduate and Professional Student Association Travel Grant, UNM (\$396)

Nearns, E.H. Second Place, Student Competition Presentation, SWB-ESA, Stillwater, OK

Tafoya, A.J., Best Oral Presentation, Alliance for Minority Participation (AMP) Research Conference, New Mexico State University (\$100)

Tafoya, A.J., Harry and Mabel Leonard Research Fellowship, Department of Earth and Planetary Sciences, University of New Mexico (\$2,000)

Tafoya, A.J., James Drew Pfeiffer Memorial Scholarship, Department of Earth and Planetary Sciences, University of New Mexico (\$350)

Tafoya, A.J., Harry and Mabel Leonard Scholarship, Department of Earth and Planetary Sciences, University of New Mexico (\$550)

Tafoya, A.J., AMP Undergraduate Research Scholarship, University of New Mexico (\$3500)

Zalar, R.L. Cocalina Memorial Scholarship, University of New Mexico (\$500)

12. DONATIONS AND GIFTS RECEIVED

13. CURRENT STAFF

A. Faculty/Staff

Kelly Miller, Assistant Professor, Curator
Manuel Molles, Professor Emeritus, Curator Emeritus
Clifford Crawford, Professor Emeritus, Curator Emeritus
Sandra Brantley, Research Assoc. Professor, Senior Collection Manager
David Lightfoot, Research Assoc. Professor, Senior Collection Manager

B. Graduate Students

Julieta Bettinelli, Ph.D. student
Lauren Cleavall, Master's student
Karen Gaines, Ph.D. candidate
Heidi Hopkins, Ph.D. student
Nathan Lord, Ph.D. student
Eugenio Nearn, Ph.D. candidate
Traci Grzymala, Master's student
Tom Kennedy, Ph.D. candidate
Julie McIntyre, Ph.D. candidate
Michael Medrano, Ph.D. candidate
Karen Wetherill, Ph.D. student

C. Undergraduate Student Workers and Volunteers

Sharyn Davidson, volunteer
Eoghan Doyle, volunteer
Sergio Douglas, undergraduate
William Edelman, undergraduate
Alicia Hodson, undergraduate
Emily Hodson, undergraduate
Zachary Phillips, volunteer
April Tafoya, undergraduate
Nicole Telles, undergraduate
Rebecca Zalar, undergraduate
Catherine Geisik, undergraduate
Erin Fenton, undergraduate

14. MUSEUM ASSOCIATES

A. Research Associates

Ana Davidson, postdoctoral fellow, UNM and UNAM
Eric Metzler, Ohio State University, retired
Ernest Valdez, USGS

DIVISION OF BIRDS

1. DIVISION HIGHLIGHTS

- We welcomed 4 new graduate students to the bird lab: Natalie Wright, Shane DuBay, Libby Beckman, and Phred Benham.
- Two feature articles in the Albuquerque Journal: (1) The connections between the MSB Bird Division and Aldo Leopold, and (2) The evolution of hummingbird genome size, highlighting the MSB Bird research program.
- Ten field expeditions in Peru that collected over 1500 specimens.
- 12 scientific papers published
- Entire Division participated in American Ornithologists' Union meetings in Philadelphia
- Field work in Southwestern US: Guadalupe Mts, Organ Mts, Peloncillo Mts, Chiricahua Mts, Zuni Mts
- Initiated Sandhill Crane Surveys along the Rio Grande Valley for the Sunzia Transmission Line Project.
- 1st Bird Curatorial Methods Course offered

2. TABLE OF COLLECTION USE

Collection Growth (specimens cataloged): 569

Loans (outgoing): 3 from dry collections; 9 tissue loans

Loans (incoming): 0 for dry collections; 4 tissue loans received.

Visitors: 53

Information Requests: 58

Publications Citing MSB Bird Specimens: 6

3. COURSES USING THE COLLECTIONS (3)

BIOL 486L Ornithology: Fall Semester, 16 students

BIOL. 386, General Vertebrate Zoology: Spring and Fall semester, 36 students per semester

BIOL 402/502, Avian Scientific Specimen Preparation: Spring Semester, 3 students

Biology 502, Museum Curatorial Methods Fall Semester, 6 students

4. COURSES TAUGHT BY MSB PERSONNEL

A. Faculty/Collection Managers (9)

Johnson, A. B. and C. C. Witt: Spring: BIOL 402/502: Avian Scientific Specimen Preparation, 3 enrolled students, 5 participants

C.C. Witt: Spring: Biology 502: Molecular Systematics Discussion (4 students)

C.C. Witt: Spring: Biology 517: Basic Graduate Evolution (15 students)

C.C. Witt & A. B. Johnson: Fall: Biology 502: Museum Curatorial Methods (6 students)

C.C. Witt: Fall: Biology 502: Molecular Systematics Discussion (5 students)

C.C. Witt: Spring: Biology 300: Evolution (48 students)

C.C. Witt & B. O. Wolf: Fall: Biology 486L: Ornithology (16 students)

C.C. Witt: Spring: GUEST LECTURE: Tropical Biology

B.O. Wolf: Plant and Animal Structure and Function, Biol. 204L, 188 students

5. COLLECTION MANAGEMENT

This year we continued field work in Peru. Our field work included work three at sites in Cusco in February-March, collecting data from new sites and new taxa to fill in sampling gaps for our blood data and phylogeographic sampling. In November, Chris Witt went to Apurimac with colleague Kevin McCracken of the University of Alaska Fairbanks to collect samples for projects in which they have a mutual interest. They also scouted sites for our larger expedition, which started in December and lasted through the new year.

We offered a Curatorial Methods course, which trained our ornithology students in our methods of bird curation at the MSB. We covered all aspects of obtaining and preparing specimens, including permit and IACUC protocols, field methods, and specimen preparation.

United States field work this year took us to all corners of New Mexico. We received specimens from 25 accessions this year. We now track individual batches of specimens that are received together as accessions. We had a tremendous windfall of specimens from wildlife rehabilitators in the state, with whom we maintain an excellent relationship. These include: The Wildlife Center (Española), Wildlife Rescue, Inc. (Albuquerque) and Shirley Kendall (Corrales). Other major accessions included frozen pheasants received from the Kalij Conservatory and one import from Peru (remains to be catalogued, so not included in total numbers listed above).

We added two state specimens to our collection this year: A Long-billed Murrelet salvaged from the Carlsbad area which represented the first state record for that species and the second record of the family Alcidae (the first record of an alcid, an Ancient Murrelet, is also in our collection), The second was of a Vaux's Swift collected in the Peloncillo Mountains. This species has been reported for years from the western half of the state, but had never been satisfactorily documented until 2009.

6. AWARDS, GRANTS, AND CONTRACTS

Phred Benham: Chapman Memorial Fund Grant, \$2200; Student Membership Grant, Cooper Ornithological Society.

Shane Dubay: Chapman Memorial Fund Grant \$2200.

Michael Lelevier: Chapman Memorial Fund Grant, \$2200.

WITT, C. C. Bird surveys on the Rio Grande for the Sunzia Transmission Line Project; PI – C. C. Witt; Environmental Planning Group, Phoenix, AZ; \$170,000.

Witt, C. C. The Phylogenetic and Biogeographic History of High Altitude Adaptation in Hummingbirds: Selection on Hemoglobin Proteins as a Function of Oxygen Supply and Demand; (2) J. A. McGuire, (written and carried out by Christopher C. Witt); (3) National Science Foundation DEB-0543556; (4) No-cost extension awarded in 2009 (~\$100,000 remaining). [Award to University of California-Berkeley].

Wolf, B. O. Desert Tortoises as walking tree rings: evaluating the effects of climate and resource variability on tortoise growth and survival using stable isotopes. Ian Murray, Ph.D. Candidate, CO-PI, Arizona Game and Fish Department, 9/2008-9/2010, \$59,543.

Wolf, B. O. 2008-2009 Use of wildlife water developments by the bird and bat community on the KOFA National Wildlife Refuge, Arizona. Arizona Game and Fish Department, 4/1/2008-2/1/2009, \$74,999.

Wolf, B. O. 2007-2009 Linking nutrient flux in a desert food web to the allocation dynamics in lizards: combining stable isotopes and ecological stoichiometry. Doctoral Dissertation Improvement Grant, R. Warne CO-PI, National Science Foundation, DEB-0710128, 6/15/2007- 5/31/2009, \$11,987.

7. PUBLICATIONS

A. Books, Book Chapters, Edited Volumes

none

B. Journal Articles (10)

Sartor O. Williams III John Kirk Townsend: Collector of Audubon's Western Birds and Mammals. *The Auk* 126(2):468-469.

Williams, S. O. III, S. A. King, S. M. Fetting, J. R. Oldenettel, and J. E. Parmeter. 2009. A Sungrebe (*Heliornis fulica*) in New Mexico: a first for the United States. *North American Birds* 63: 4-9.

JJ Kirchman, **CC Witt**, JA McGuire, GR Graves DNA from a 100-year-old holotype confirms the validity of a potentially extinct hummingbird species *Biology Letters*, 2009

Witt, C. C., & D. F. Lane. 2009. Range extensions for two rare high-Andean birds in central Perú. *Cotinga* 31:90-94.

Rebecca T. Kimball, Edward L. Braun, F. Keith Barker, Rauri C.K. Bowie, Michael J. Braun, Jena L. Chojnowski, Shannon J. Hackett, Kin-Lan Han, John Harshman, Victoria

Heimer-Torres, Wallace Holznagel, Christopher J. Huddleston, Ben D. Marks, Kathleen J. Migliaj, William S. Moore, Sushma Reddy, Frederick H. Sheldon, Jordan V. Smith, **Christopher C. Witt** and Tamaki Yuri

A well-tested set of primers to amplify regions spread across the avian genome.

Molecular Phylogenetics and Evolution

Volume 50, Issue 3, March 2009, Pages 654-660

TR Gregory, CB Andrews, JA McGuire, **CC Witt**. The smallest avian genomes are found in hummingbirds. *Proceedings of the Royal Society of London B* 276, 3753–3757 (2009).

Jimmy A. McGuire, **Christopher C. Witt**, J. V. Remsen Jr, R. Dudley and Douglas L. Altshuler. A higher-level taxonomy for hummingbirds *Journal of Ornithology* 150: 155-165

Merkord, C. L., T. Mark, D. Susanibar, **A. B. Johnson, & C. C. Witt**. 2009. Avifaunal survey of the Rio Chipaota Valley in the Cordillera Azul region, San Martín, Perú. *Ornitologia Neotropical* 20(4):535-552.

McKechnie, A. E. and **B. O. Wolf**. (2009) Climate change increases the likelihood of catastrophic avian mortality events during extreme heat waves. *Biology Letters* doi:10.1098/rsbl.2009.0702.

Engel, S., H. M. Lease, N. G. McDowell, A. H. Corbett and **B. O. Wolf**. (2009) The use of tunable diode laser spectroscopy to measure $d^{13}C$ of animal breath for studies of animal physiology and ecology. *Rapid Communications in Mass Spectroscopy* 23:1281-1286.

C. Web-Based (2)

Capparella, A. P., & **C. C. Witt**. 2009. Pardusco (*Nephelornis oneilli*). In *Neotropical Birds Online* (T. S. Schulenberg, Editor). Ithaca: Cornell Lab of Ornithology; http://neotropical.birds.cornell.edu/portal/species/overview?p_p_spp=34094.

Dubay, S. G., and C. C. Witt. 2009. Pied-crested Tit-Tyrant (*Anairetes reguloides*). In *Neotropical Birds Online* (T. S. Schulenberg, Editor). Ithaca: Cornell Lab of Ornithology; http://neotropical.birds.cornell.edu/portal/species/overview?p_p_spp=422121.

D. Technical Reports

None

E. Theses/Dissertations Completed

None

F. Work In Progress (partial list)

Dickerman, R. W. Great-Horned Owl. *in* Raptors of New Mexico, Jean-Luc Cartron, ed. in Press, University of New Mexico Press.

Dickerman, R. W., A. B. Johnson, and J. D. Ligon. Elf Owl. *in* Raptors of New Mexico, Jean-Luc Cartron, ed. in Press; projected publication date: August 16 2010, University of New Mexico Press.

Dickerman, R. W. 1950's Tabasco, *and* A zip trip (collecting redwings in Central America in 1968). *In* Moments of Discovery: Natural History Narratives from Mexico and Central America (Kevin Winker, ed.). Published Jan 2010. University of Florida Press.

Dickerman, R. W. Notes of the Elf Owls of western Texas, adjacent Coahuila, and southeastern New Mexico. Western Birds target journal.
Williams, S. O. III, P. Mehlhop and D. A. Zimmerman, Birds of New Mexico.

G. Publications/Reports Based on MSB Bird Division Specimens/Data (8)

Young, Bruce E., Irma Franke, Pilar A. Hernandez, Sebastian K. Herzog, Lily Paniagua, Carolina Tovar, and Thomas Valqui
Using Spatial Models to Predict Areas of Endemism and Gaps in the Protection of Andean Slope Birds
The Auk 126(3):554-565. 2009

Witt, C. C., & D. F. Lane. 2009. Range extensions for two rare high-Andean birds in central Perú. *Cotinga* 31:90-94.

Rebecca T. Kimball, Edward L. Braun, F. Keith Barker, Rauri C.K. Bowie, Michael J. Braun, Jena L. Chojnowski, Shannon J. Hackett, Kin-Lan Han, John Harshman, Victoria Heimer-Torres, Wallace Holznagel, Christopher J. Huddleston, Ben D. Marks, Kathleen J. Migliai, William S. Moore, Sushma Reddy, Frederick H. Sheldon, Jordan V. Smith, **Christopher C. Witt** and Tamaki Yuri
A well-tested set of primers to amplify regions spread across the avian genome. **Molecular Phylogenetics and Evolution**
Volume 50, Issue 3, March 2009, Pages 654-660

TR Gregory, CB Andrews, JA McGuire, **CC Witt.** The smallest avian genomes are found in hummingbirds. Proceedings of the Royal Society of London B 276, 3753–3757 (2009).

Stoeckle M. & K. Winker A Global Snapshot of Avian Tissue Collections: State of the Enterprise The Auk 126(3):684-687. 2009

SV Brant, ES Loker Molecular Systematics of the Avian Schistosome Genus Trichobilharzia (Trematoda: Schistosomatidae) in North America. Journal of Parasitology 95(4):941-963. 2009

Jimmy A. McGuire, **Christopher C. Witt**, J. V. Remsen Jr, R. Dudley and Douglas L. Altshuler. A higher-level taxonomy for hummingbirds *Journal of Ornithology* 150: 155-165

Merkord, C. L., T. Mark, D. Susanibar, **A. B. Johnson**, & **C. C. Witt**. 2009. Avifaunal survey of the Rio Chipaota Valley in the Cordillera Azul region, San Martín, Perú. *Ornitologia Neotropical* 20(4):535-552.

ACTIVITIES IN LEARNED SOCIETIES

A. Invited/Plenary Talks and/or Seminars (5)

Witt, C. C. Hummingbird Evolution into the Andes. C. C. Witt. New Mexico State University, February 2009.

Witt, C. C. Darwin's Hummingbirds. C. C. Witt. UNM Darwin Day Symposium, February 2009.

Witt, C. C. How small birds adapt to extreme environments. C. C. Witt. Sigma Xi UNM Chapter, October 2009.

Witt, C. C. High-Altitude Adaptation in Andean Birds. C. C. Witt. UNM Department Seminar, November 2009.

Wolf, B. O. Avian mortality during heat waves and drought: the role of climate change and extreme events, Desert Dynamics Conference, Arizona State University, Tempe, AZ.

B. Contributed Talks/Posters (8)

Willliams, S. O. III 2009. Changes in latitude, changes in attitude: global warming and the changing distribution and status of New Mexico's birds.. New Mexico Ornithological Society Meeting, Los Alamos, NM.

Johnson, A. B., C. J. Schmitt, C. C. Witt 2009. The Preparation of a Scientific Bird Specimen: What Happens to the Dead Birds I Donate to the Museum? New Mexico Ornithological Society Meeting, Los Alamos, NM. *Included a presentation by ABJ followed by a demonstration of prepping specimens by ABJ and CJS.*

Witt, C. C. Evolution of genome size in hummingbirds. American Ornithologists' Union Meeting, August 2009, Philadelphia, PA.

Whalen, D., M. Lucero, and C. C. Witt. Avian Malaria in the Tropical Andes. Research Day 2009 Poster.

Avian mortality during heat waves and drought: the role of climate change and extreme events. *Wolf, B. O. and A. E. McKechnie, 94th ESA Annual Meeting, Albuquerque, NM, August 2-7.

Avian mortality during heat waves and drought: the role of climate change and extreme events. *Wolf, B. O. and A. E. McKechnie, 79th Annual Meeting of the Cooper Ornithological Society, Tucson, AZ, April 16-18.

Exploring the nutritional ecology of the ornate box turtle in New Mexico via stable isotope analyses, *Murray, I. W. and B. O. Wolf, Society of Integrative and Comparative Biology Annual Meeting, Boston, MA, January 3-7.

Is avian migration in the American Southwest timed to the bloom of columnar cacti?, *Engel, S., Hyde, T. and B. O. Wolf, Society of Integrative and Comparative Biology Annual Meeting, Boston, MA, January 3-7.

C. Attendance at Professional Meetings

Johnson, A. B.

New Mexico Ornithological Society Meeting Los Alamos, NM

127th Meeting of the American Ornithologists' Union, Philadelphia, PA, USA.

Witt, C. C.

127th Meeting of the American Ornithologists' Union, Philadelphia, PA, USA.

Wolf, B. O.

New Mexico Ornithological Society Meeting Los Alamos, NM

Williams, S. O. III

New Mexico Ornithological Society Meeting Los Alamos, NM

Schmitt, C. J.

New Mexico Ornithological Society Meeting Los Alamos, NM

Wright, N. A.

127th Meeting of the American Ornithologists' Union, Philadelphia, PA, USA.

Wolf, B. O.

94th ESA Annual Meeting, Albuquerque, NM, August 2-7.

79th Annual Meeting of the Cooper Ornithological Society, Tucson, AZ, April 16-18.

Society of Integrative and Comparative Biology Annual Meeting, Boston, MA, January 3-7.

D. Service as Editor or on Editorial Board of a Journal

Williams, S. O. III
New Mexico Editor, North American Birds (USA).
Editor, New Mexico Ornithological Society Field Notes

Wolf, B. O.
Associate Editor, Oecologia (USA)

E. Service as Officer of Professional Society/Organization

None.

9. OTHER PROFESSIONAL ACTIVITIES

A. Colloquium Presentations

None.

B. Presentation to General Audience in a Scholarly Capacity

Williams, S. O. III. Climate change and birds in New Mexico. Central New Mexico [Albuquerque] Audubon Society. Oct 2009.

Williams, S. O. III. Climate change and birds in New Mexico. Mesilla Valley [Las Cruces] Audubon Society. Oct 2009.

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

None.

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

Witt, C. C. Reviewer for Guidelines for the Use of Wild Birds in Research (Ornithological Council, 2009).

Wolf, B. O. Tenure review committee for faculty at ASU and NMSU

E. Journal Referee

Johnson, A. B.
Journal of Field Ornithology
Auk

Williams, S. O. III
Witt, C. C.
The Auk (2)
Ornitologia Colombiana (1)
Cotinga (2)
Genome Research (2)
Ornitologia Neotropical (2)

Wolf, B.O.
Auk (2)
Oecologia (2)
Journal Morphology (1)
Ecology (1)
Comparative biochemistry and physiology (1)
Bioscience (1)

10. SERVICE

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

B. Public Service

Williams, S.O. III
Secretary of the New Mexico Bird Records Committee
New Mexico Coordinator of the North American Breeding Bird Survey (BBS)

Wolf, B.O.
Institutional Animal Care and Use Committee
Department of Biology Grad Policy Committee

Witt, C. C.
Faculty Mentor to UNM Birding Club (18 active members, monthly meetings, field trip to Rio Grande Nature Center).

Mentor for Albuquerque Academy Intern, Nicole Gatewood, April-May 2009.

Two articles in Albuquerque Journal, one on the front page, one on the front of Metro Section. One on the MSB Bird collection and connection to Aldo Leopold, one featuring my research on hummingbird genome size evolution (focusing on the smallest endotherm genome ever measured that came from a Black-chinned Hummingbird in my backyard in Albuquerque).

11. ADVANCED STUDY, HONORS, AWARDS, FELLOWSHIPS, ETC.

None

12. DONATIONS AND GIFTS RECEIVED

Robert W. Dickerman: One half year of Andy's salary (\$22,500).

Richard Carruthers: \$250

13. CURRENT STAFF

A. Faculty/Staff

Christopher C. Witt, Curator of Birds

Andrew B. Johnson, Collection Manager

Blair O. Wolf, Associate Curator

B. Graduate students

Michael Lelevier, Ph.D Student

Natalie Wright, Ph.D Student

Elizabeth Beckman, Ph.D Student

Phred Benham, Masters' Student

Shane DuBay, Masters' Student

C. Undergraduate Student Workers and Volunteers

Student Workers, REU students, and paid undergraduates:

Dora Susanibar, Undergraduate worker (PERU)

Jano Nuñez, Undergraduate worker (PERU)

Alessandra Quiñonez, Undergraduate worker (Peru)

Sheila Figueroa, Undergraduate worker (Peru)

Jonathan Schmitt

Monica Lucero

Sarah Sheldon

Sara Swiderek

Geneva Williams

Douglas Whalen

Matthew Jones

Bethany Abrahamson

Jessica Smith

Diego Duran

Justin Schmidt

William Talbot

Raymond VanBuskirk

Michael Hilchey

Matthew Graus

Jason C. Long

Matthew Baumann

Kobie Boslough

14. MUSEUM ASSOCIATES

A. Curatorial Associates

Robert W. Dickerman
John P. Hubbard

B. Research Associates

Sartor O. Williams, III
Hira A. Walker
C. Gregory Schmitt
Donna C. Schmitt
Mary Alice Root
J. David Ligon

DIVISION OF FISHES

1. DIVISION HIGHLIGHTS

Currently, the MSB Division of Fishes has **76,777** catalogued lots of fishes (3,844,500 specimens). In 2009 3,196 lots of fishes (100,517 specimens) were cataloged and integrated into the main collections. Over 400 collections (2,976 specimens) of Wyoming Department of Game and Fish collections have been fully incorporated. Beginning in 2007, integration of the New Mexico Department of Game and Fish State Reference Collections and associated data continued throughout 2009. When incorporated, this collection will add an estimated 9,000 lots of historically significant records to the MSB fish collection.

Dr. Thomas F. Turner, Curator, was promoted to the rank of Professor of Biology.

Dr. Stephen T. Ross, Curator Emeritus was awarded the C. A. Schultz Conservation Award, given to individuals who have demonstrated excellence in the fields of ichthyology, fisheries or aquatic ecology in terms of activities that promote conservation, sound taxonomy and/or public awareness of Mississippi's aquatic resources. Dr. Ross retired as Professor of Biological Sciences and Curator of Fishes at the University of Southern Mississippi prior to accepting the position of MSB Fishes Curator Emeritus and UNM Adjunct Professor of Biology in 2004.

\$701,687 in grants and contracts was available for ichthyological and aquatic studies as well as funding curatorial efforts undertaken by MSB Division of Fishes faculty, staff, students, and associates during 2009.

Outreach Summary: Tours of collections and lab were conducted for the incoming 2009 UNM Biology graduate students and one elementary school group. In February, Dr. Thomas F. Turner organized the MSB component of the Darwin Day celebrations sponsored by the UNM Department of Biology. This event was open to the public and included guided and self-guided tours of the museum collections, refreshments, and MSB curatorial staff to answer questions and explain the various applications of museum collections to biological research. In May, Dr. Turner organized, moderated, and presented at a workshop entitled "Genetic analysis for fisheries management" for the Western Division of the American Fisheries Society in Albuquerque. Drs. Megan J. Osborne and Wade D. Wilson, and graduate student Trevor Krabbenhoft also gave presentations at the workshop. In July, Dr. Turner gave a presentation promoting the University of New Mexico's Undergraduate Opportunities Program (UNO) to the American Association for Advancement of Science and the National Science Foundation, in Washington DC. During the summer months, Dr. Ayesha S. Burdett lectured GK12 students on aquatic invertebrate collections, identification, and ecology at the Rio Grande Nature Center and mesocosm experimental site at the Sevilleta National Wildlife Refuge, NM. Research associate, Dr. Robert K. Dudley, continues in his role as technical and scientific advisor for the conservation and management of threatened and endangered

native fishes for the New Mexico Department of Game and Fish, US Army Corps of Engineers, US Bureau of Reclamation, and the US Fish and Wildlife Service.

2. TABLE OF COLLECTION USE

Collection Growth	Loans-out ¹	Loans-in ²	Visitors- number & days ³	Information Requests ⁴	Publications Citing MSB Specimens ⁵
100,517	23	7	46/82	42	3

¹Specimen loans, return of loans, gifts, exchanges, and tissue (consumptive) transfers

²Loans, gifts or tissue transfers from other institutions

³research, accessing specimens, or info exchange (not tour groups)/number of visitor days

⁴emails, letters, telephone calls (not tour groups or website "hits")

⁵publications in peer review journals

3. COURSES USING THE COLLECTIONS

- MSET. 515 Natural Science Education Course for Teachers, 12 students
- BIOL. 386L General Vertebrate Zoology Lab-2 sections, Fall 2009, 32 students
- BIOL. 487 Ichthyology, Spring 2009, 14 students
- BIOL. 204L Plant and Animal Form and Function, Spring 2009, 30 students
- Putnam Science Carnival, 28 Feb 2009 Natural History Collections display by USGS Fort Collins Science Center, ca. 800-1000 elementary school students

4. COURSES TAUGHT BY MSB PERSONNEL

A. Faculty/Collection Managers/Research Associates

Turner, T. F.

- BIOL. 386 General Vertebrate Zoology, Fall 2009, 32 students
- BIOL. 386L General Vertebrate Zoology Lab-2 sections, Fall 2009, 32 students
- BIOL. 400 Senior Honors Thesis, Fall and Spring 2009, 3 students
- BIOL. 402 Ecology and Evolution of Fishes, Spring 2009, 6 students
- BIOL. 487 Ichthyology, Spring 2009, 14 students
- BIOL. 499 Undergraduate Problems, Fall 2009, 2 students
- BIOL. 502 Ecology and Evolution of Fishes, Spring 2009, 3 students
- BIOL. 551 Research Problems, Fall and Spring 2009, 4 students
- BIOL. 599 Masters Thesis, Fall 2009, 1 student
- BIOL. 651 Advanced Field Biology, Fall 2009, 1 student
- BIOL. 699 Dissertation, Spring 2009, 2 students

B. Graduate Students

Krabbenhoft, T.J.

- BIOL. 487L Ichthyology, Spring 2009, 14 students

5. COLLECTION MANAGEMENT

Eighteen accessions of specimens were received during 2009. Contributors included U.S. Fish and Wildlife Service-NM/TX Fish and Wildlife Conservation Office, New Mexico Department of Game and Fish, the Wyoming Department of Game and Fish, Albuquerque BioPark Research Aquaria, and American Southwest Ichthyological Researchers.

Four undergraduate students and three graduate students were employed as Curatorial, Research and Project Assistants for 2009. The undergraduate students were responsible for processing (curation and data entry) collections received from several ongoing, large scale projects in the San Juan, Gila, and Pecos Rivers in New Mexico; the Powder, Green, and Snake Rivers in Wyoming. They successfully integrated 1,400 lots (66,175 specimens) of Gila River 1982-1989 collections. The graduate student Research Assistant, Trevor J. Krabbenhoft, was responsible for all georeferencing, editing, validation, and cleaning of subsets of MSB fish locality data. Over one-third of the MSB fishes localities are now georeferenced and in ArcView (i.e., 14,030 out of a total of 32,178 locality records). The graduate student Project Assistants, Scott Nacke and Shilpa Kalagara, organized the pdf files of W.J. Koster field notes by year and NM county then linked these files to the MSB Division of Fishes website. New Mexico fish biologists and ichthyologists have often required access to these valuable field notes, which cover the collecting and observation notes of William J. Koster from 1939 to 1956. See: <http://www.msb.unm.edu/fishes/introduction.html>

6. AWARDS, GRANTS, AND CONTRACTS

Curatorial services at the Museum of Southwestern Biology for the San Juan River Recovery Implementation Program Collections. US Bureau of Reclamation, Upper Colorado Regional Office. PI Alexandra M. Snyder and Co-PI Thomas F. Turner. Total award: \$152,891. 1 Aug 2005 to 30 Sep 2010. **Annual expenditure \$26,578**

*New Mexico Share-with-Wildlife Program: Baseline genetic data for the threatened Pecos bluntnose shiner (*Notropis simus pecosensis*).* PI Megan J. Osborne and Co-PI Thomas F. Turner. New Mexico Department of Game and Fish. Total award: \$24,000 1 Jul 2006 to 30 Jun 2009. **Annual expenditure \$8,000**

*Assessment of Diversity at the Major Histocompatibility Complex in the Rio Grande Silvery Minnow (*Hybognathus amarus*).* PI Megan J. Osborne and Co-PI Thomas F. Turner. US Fish & Wildlife Service. Total award: \$100,000 21 Sep 2006 to 1 Jan 2009. **Annual expenditure \$33,000**

Effects of nutrient availability on periphyton growth and diversity in the Middle Rio Grande: top-down and bottom-up factors. PI Rebecca J. Bixby and Co-PI Ayesha S. Burdett. US Bureau of Reclamation. Total award: \$126,077. 1 Jul 2007 – 30 Jul 2010. **Annual expenditure \$42,026** (Not included in total for MSB fishes.)

Community responses to river drying in an arid-land ecosystem: a field and experimental study. PI Thomas F. Turner. National Science Foundation. Total award: \$345,000. 15 Aug 2007 to 1 Aug 2010. **Annual expenditure \$115,000.**

Assessment and monitoring of Rio Grande silvery minnow genetics. US Bureau of Reclamation, Middle Rio Grande ESA Collaborative Program PI: Thomas F. Turner and Co-PI: Megan J. Osborne. Total Award: \$772,000 (contingent on annual renewals) 1 Oct 2007 to 30 Sep 2012. **Annual expenditure \$160,000**

Survey of Aquatic Community Structure and Food Web Constituents at the Bosque del Apache National Wildlife Refuge. PI Ayesha S. Burdett and Co-PI Thomas F. Turner. Tetra Tech, Inc. 1 Aug 2008 to 30 Dec 2009 Total award: \$33,769; **Annual expenditure \$33,769**

*Conservation genetics of *Pantosteus discobolus yarrowii*, Zuni bluehead sucker.* PI Thomas F. Turner. New Mexico Department of Game and Fish. Total award: \$15,340. 1 Aug 2008 to 30 Jun 2009. **Annual expenditure \$15,340**

Accession and integration of the New Mexico Dept. of Game and Fish collections in the Museum of Southwestern Biology, Division of Fishes, University of New Mexico. NM Dept. Game and Fish, Santa Fe. PI Alexandra M. Snyder and Co-PI Thomas F. Turner. Total award: \$60,000. 21 Oct 2008 to 30 Jun 2011. **Annual expenditure \$20,000**

Curation of USFWS NM Fish and Wildlife Conservation Office Reference Collections of Fishes. PI Alexandra M. Snyder and Co-PI Thomas F. Turner. U.S. Fish & Wildlife Service, NM/TX Fish and Wildlife Conservation Office. Total award: \$130,000. 9 Jan 2009 to 1 Oct 2013. **Annual expenditure \$26,000**

Genetic Status of Arkansas River Shiner and Evaluation of Hybridization Among Cyprinids. PI Megan J. Osborne and Co-PI Thomas F. Turner, New Mexico Department of Game and Fish. Total Award: \$8,000. 30 Aug 2009 to 30 Jun 2010. **Annual expenditure \$8,000**

*Baseline Genetic Studies of the Chihuahua Chub (*Giia nigrescens*).* PI Megan J. Osborne and Co-PI Thomas F. Turner, New Mexico Department of Game and Fish. Total Award: \$6000. 30 Aug 2009 to 30 Jun 2010. **Annual expenditure \$6,000**

7. PUBLICATIONS

A. Books, Book Chapters, Edited Volumes: NONE

B. Journal Articles

Burdett, A.S. and Watts, R. J. 2009. Modifying living space: An experimental study of the influences of vegetation on aquatic invertebrate community structure. *Hydrobiologia*. 618: 161-173

Dodds W.K., Bouska W.W., Eitzmann J.L., **Pilger T.J.**, Pitts K.L., Riley A.J., Schloesser J.T., Thornbrugh D.J. 2009. Eutrophication of US Freshwaters: Analysis of Potential Economic Damages. *Environmental Science & Technology* 43: 12-19.

Heise R. J., R. B. Bringolf, R. Patterson, W. G. Cope, and **S.T. Ross**. 2009. Plasma vitellogenin and estradiol concentrations in adult Gulf sturgeon from the Pascagoula River drainage, Mississippi. *Transactions of the American Fisheries Society* 138:1028-1035.

- Kennedy T.L.**, Horth L.A., Carr D.E. 2009. The effects of nitrate loading on the invasive macrophyte *Hydrilla verticillata* and two common, native macrophytes in Florida. *Aquatic Botany* 91: 253-256.
- Kennedy T.L.**, Gutzler D.S., Leung R.L. 2009. Predicting future threats to the long-term survival of Gila trout using a high-resolution simulation of climate change. *CLIMATIC CHANGE* 94: 503-515.
- Krabbenhoft T.J.**, Collyer M.L., Quattro J.M. 2009. Differing evolutionary patterns underlie convergence on elongate morphology in endemic fishes of Lake Waccamaw, North Carolina. *Biological Journal of the Linnean Society* 98: 636-645.
- Krabbenhoft T.J.**, Rohde F.C., Quattro J.M. 2009. Threatened fishes of the world: *Fundulus waccamensis* (Hubbs and Raney, 1946) (Fundulidae). *Environmental Biology of Fishes* 84: 173-174.
- McPhee, M.V., and **T. F. Turner**. 2009. Genealogical diversity suggests multiple introductions of white sucker (*Catostomus commersonii*) into the Rio Grande, New Mexico. *Southwestern Naturalist* 54:486-493.
- Moyer, G. R., R. A. Remington, and **T. F. Turner**. 2009. Incongruent gene trees, complex evolutionary processes, and the phylogeny of a group of North American minnows (*Hybognathus* Agassiz 1855). *Molecular Phylogenetics and Evolution* 50: 514-525.
- Renshaw M.A., Carson E.W., Hanna A.H., Rexroad C.E., **Krabbenhoft T.J.**, Gold J.R. (2009) Microsatellite markers for species of the genus *Dionda* (Cyprinidae) from the American southwest. *Conservation Genetics* 10: 1569-1575.
- Ross, S T.**, W. T. Slack, R. J. Heise, M. A. Dugo, H. Rogillio, B. R. Bowen, P. Mickle, and R. W. Heard. 2009. Estuarine and coastal habitat use of Gulf sturgeon (*Acipenser oxyrinchus desotoi*) in the north-central Gulf of Mexico. *Estuaries and Coasts* 32:360-374.
- Turner, T. F., M.J. Osborne**, T. E. Dowling, M. V. McPhee, R. E. Broughton, and J. R. Gold. 2009. Microsatellite markers for the endangered razorback sucker, *Xyrauchen texanus*, are widely applicable to genetic studies of other catostomine fishes *Conservation Genetics* 10: 551-553.
- Snelson, Jr. F.F., **Krabbenhoft T.J.**, Quattro J.M. 2009. *Elassoma gilberti*: A new species of pygmy sunfish (Elassomatidae) from Florida and Georgia. *Bulletin of the Florida Museum of Natural History* 48(4):119-144.
- Wilson, W. D., and **Turner T.F.** 2009. Phylogenetic analysis of the Pacific salmon and trout (*Oncorhynchus*: Salmonidae) based on mtDNA ND4 sequences: a closer look at the highly fragmented inland species. *Molecular Phylogenetics and Evolution* 52: 406-415.

C. Web-Based: NONE

D. Technical Reports

Bixby, R.J. and A.S. Burdett. 2009. Effects of nutrient availability on periphyton growth and diversity in the Middle Rio Grande: top-down and bottom-up factors. Report to the Middle Rio Grande Endangered Species Act Collaborative Program, USBR Albuquerque NM. 60 pp.

Brandenburg, W. H. and Farrington M. A., 2009. Colorado pikeminnow and razorback sucker larval fish survey in the San Juan River during 2008. Report to the San Juan River Recovery Implementation Program and the US Fish and Wildlife Service. 60 pp.

Burdett, A.S. and T.F. Turner. 2009. Community responses to river drying in an arid-land ecosystem: a field and experimental study. Report to National Science Foundation, Washington, D.C. 20 pp.

Dudley, R.K. and S.P. Platania. 2009. Rio Grande silvery minnow (*Hybognathus amarus*) population monitoring monthly trip reports and analyses. Three reports to the Middle Rio Grande Endangered Species Act Collaborative Program and the US Bureau of Reclamation, Albuquerque, NM. 3 @ 30 pp.

Platania, S.P. and R.K. Dudley. 2009. Spatial spawning periodicity of Rio Grande silvery minnow during 2009. Report to the Middle Rio Grande Endangered Species Act Collaborative Program and the US Bureau of Reclamation, Albuquerque, NM. 33 pp.

Platania, S.P., R.K. Dudley, W.H. Brandenburg, and M.A. Farrington. 2009. Development of Rio Grande silvery minnow monitoring protocols for use by The Pueblo of Santa Ana. Report to Department of Natural Resources, The Pueblo of Santa Ana, Santa Ana Pueblo, NM. 151 pp.

Osborne, M. J. and Turner, T. F. 2009. Baseline genetic survey of the threatened Pecos bluntnose shiner (*Notropis simus pecosensis*). Report to New Mexico Department of Game and Fish, Santa Fe, NM. 31 pp.

Osborne, M.J. and T.F. Turner 2009. Genetic monitoring of the Rio Grande silvery minnow: genetic status of wild and captive stocks in 2009. Report to Middle Rio Grande Endangered Species Act Collaborative Program, USBR Albuquerque NM. 30 pp.

Osborne, MJ and TF Turner. 2009. Collaborative Research and Monitoring: Evaluation of the Rio Grande Silvery Minnow Health in Relation to Changes in Water Quality, Pathogens and Other Environmental Stressors: Multi-locus Major Histocompatibility Complex Class IIb and Parasite Diversity in the Rio Grande Silvery Minnow. Report to US Fish and Wildlife Service, Albuquerque NM. 43 pp.

Snyder, A.M. 2009. Accession and curation of fish collections received from the USFWS New Mexico Fish and Wildlife Conservation Office by the University of New Mexico, Museum of Southwestern Biology. Contract 201819G905. Annual Report to USFWS, Albuquerque NM. 172 pp.

Snyder, A.M. and D.L. Propst. 2009. Accession and integration of New Mexico Dept. Game and Fish State Reference Collections of fishes by the University of New Mexico, Museum of Southwestern Biology. T-39-1. Annual Report to Conservation Services, NMDGF, Santa Fe NM. 4 pp.

Snyder, A.M. 2009. Curation of the 2008 San Juan River collections of fishes, University of New Mexico, Museum of Southwestern Biology. Agreement 05-FG-40-2411. Annual Report to San Juan River Basin Recovery Implementation Program, US Bureau of Reclamation, UT. 25 pp.

Turner, T. F. and W. D. Wilson. 2009. Conservation genetics of Zuni bluehead sucker (*Catostomus discobolus yarrowi*) in New Mexico. Final Report to the Conservation Services Division, New Mexico Department of Game and Fish, Santa Fe, NM 18 pp.

Turner, T.F. R.J. Bixby, and A. S. Burdett. 2009. Monitoring of aquatic food resources in support of the Channel Realignment Project at the Bosque del Apache Wildlife Refuge. Report to Tetratex, Inc. Albuquerque, NM 24 pp.

E. Theses/Dissertations Completed

Thomas L. Kennedy, Ph.D. Thesis: The effects of stream discharge and channelization on the macroinvertebrate community in a semi-arid landscape.

Wade D. Wilson, Ph.D. Thesis: Salmonid evolution illuminated: geographical genetics, immunity and parasitism.

F. Works In Progress

Burdett, A.S. and T.F. Turner. Temporal community dynamics in a dryland river (Rio Grande, New Mexico). Marine and Freshwater Research.

Fencl, J.S., A.S. Burdett and T.F. Turner. Comparison of aquatic invertebrate sampling methods in the Middle Rio Grande. Journal of the North American Benthological Society.

Israel, J. A., K. M. Fisch, **T. F. Turner**, R. S. Waples, P. W. Hedrick, and M. L. Nobriga. Artificial propagation in native fish conservation in the western US: an assessment of its role in the preservation of Central Valley Chinook salmon, delta smelt, and green sturgeon. San Francisco Estuary & Watershed Science. **In press.**

Osborne, M. J., S. Davenport, C. W. Hoagstrom, and **T. F. Turner**. Genetic

effective size tracks abundance in a threatened Great Plains fish, Pecos bluntnose shiner. *Molecular Ecology*. **In press.**

Osborne, M.J. and T. F. Turner. Genetic monitoring in a threatened freshwater fish, Pecos bluntnose shiner. *Molecular Ecology*. **In press.**

Munroe, T.A. and **T.J. Krabbenhoft.** Two unusually large pre-transitional tonguefish larvae (Pleuronectiformes: Cynoglossidae: *Symphurus*) collected in Oceanic waters near the Galapagos Islands. *Bulletin of Marine Science*. **Accepted.**

Pilger, T.J., K.B. Gido, and D.L. Propst. Diet and trophic niche overlap of native and nonnative fishes in the Gila River, USA: implications for native fish conservation.

Ross, S. T. and W. J. Matthews. Evolution and ecology of North American freshwater fish assemblages, Volume 1. *In: North American Freshwater Fishes: Ecology, Evolution, and Behavior*. B. M. Burr and M. L. Warren (eds.). Johns Hopkins University Press. **Accepted.**

Ross, S.T. Native fishes. *In: Mississippi Encyclopedia*. C.R. Wilson (ed). University Press of Mississippi. **In Press.**

Ross, S.T. Ecology of North American Freshwater Fishes. Textbook. University of California Press. **In preparation.**

Stevens, M.M., **A.S. Burdett**, E.M. Mudford, S. Helliwell, G. Doran. The acute toxicity of fipronil to two non-target invertebrates associated with mosquito breeding sites in Australia. *Acta Tropica*.

Turner, T. F., M. L. Collyer, and T. J. Krabbenhoft. A general hypothesis-testing framework for stable isotope ratios in ecological studies. *Ecology*. **In press.**

Turner, T. F., T. J. Krabbenhoft, and A. S. Burdett. Reproductive timing and fish community structure in an arid-land river system. *In: Gido and Jackson, Eds. Community Ecology of Stream Fishes*. American Fisheries Society. **In press.**

Turner, T. F., and M. S. Edwards. Spatial and temporal variation in aquatic food web structure in the Rio Grande assessed with stable carbon and nitrogen isotopes. *Journal of the North American Benthological Society*.

Wilson, W. D., and **T. F. Turner.** Comparative and functional analysis of the MHC DAB locus in salmonid fishes. *Molecular Ecology Resources*.

Wilson, W.D. and **T.F. Turner.** Comparative analysis of the MHC DAB in *Oncorhynchus*: Functional patterns in the peptide binding pockets. *Molecular Biology and Evolution*.

Wilson, W.D. and **T.F. Turner**. Twelve microsatellite markers from the salmonid trematode *Crepidostomum farionis* (Trematoda: Allocreadiidae). Molecular Ecology Notes.

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

Lusk, J.D. 2009. USFWS Environmental Contaminants Program. Tissue collection from Colorado pikeminnow of the San Juan River and from archived specimens stored at the Museum of Southwestern Biology. Submitted to the Upper Colorado River Endangered Fish Recovery Program and San Juan River Recovery Implementation Program. 32pp.

8. ACTIVITIES IN LEARNED SOCIETIES

A. Invited/Plenary Talks and/or Seminars

Turner, T. F., T. J. Krabbenhoft, M.L. Collyer, and M.S. Edwards. 2009. Effects of river regulation on Rio Grande fish communities revealed by stable isotope analysis of historical and contemporary samples. *Invited Contribution: Toward a Sustainable Future for the Middle Rio Grande Ecosystem*. Ecological Society of America, 94th Annual Meeting Albuquerque NM August 2009.

Brunner, S., J. A. Cook, **T. F. Turner**, and W. Gannon. 2009. URM-UnO-UNM: that spells student success! *Invited Contribution: Transforming Undergraduate Education in Biology: Mobilizing the Community for Change*. American Association for Advancement of Science and National Science Foundation, Washington DC, 15-18 July, 2009. Turner presented.

B. Contributed Talks/Posters

Bixby, R. J. and A. S. Burdett. Nutrient and water quality influences on algal biomass and community composition in an aridland river. Ecological Society of America 94th Annual Meeting, Albuquerque NM August 2009.

Bishara, R. K., C. A. Love, E. L. Johnson, A. S. Burdett, and T. F. Turner. Aquatic invertebrate ecology in the Rio Grande, New Mexico: a comprehensive undergraduate training program. Desert Fishes Council 41st Annual Meeting, Death Valley National Park, CA November 2009.

Burdett, A. S. and **T. F. Turner**. A study of temporal dynamics in a dryland river: the middle Rio Grande, New Mexico. International Society for River Science 1st Annual Meeting, St. Pete Beach, FL July 2009.

Burdett, A.S. and R.J. Bixby. Bottom-up and top-down effects on algal community dynamics in an aridland river: the Middle Rio Grande, New Mexico. Ecological Society of America 94th Annual Meeting, Albuquerque NM August 2009

Diver, T. A., M. J. Osborne, and T. F. Turner. Patterns of genetic diversity in *Notropis girardi* in the Canadian River and Pecos River, New Mexico. Desert Fishes Council 41st Annual Meeting, Death Valley National Park, CA November 2009.

Awarded Best Undergraduate Student Poster Presentation

Fencel, J. S., A. S. Burdett, T. F. Turner. Comparison of invertebrate sampling methods in the Middle Rio Grande.

- North American Benthological Society, 57th Annual Meeting Grand Rapids, MI May 2009
- UNM Department of Biology 18th Annual Research Day Albuquerque, NM April 2009

Awarded Best Undergraduate student Poster Presentation

- Ecological Society of America, 94th Annual Meeting Albuquerque, NM August 2009

Gido, K.B., D.L. Propst, Y.M. Paroz, and **T.J. Pilger**. Nonnative removal and food web interactions in the Gila River, New Mexico. Desert Fishes Council 41st Annual Meeting, Death Valley National Park, CA November 2009.

Krabbenhof, T. J., S. P. Platania, and T. F. Turner. Reproductive phenology of fishes of the middle Rio Grande, New Mexico. Desert Fishes Council 41st Annual Meeting, Death Valley National Park, CA November 2009.

M. J. Osborne, T. A. Diver and T.F.Turner. Patterns of Genetic Diversity in a Community of Freshwater Fish (Family Cyprinidae) in the Pecos River, New Mexico. Western Division American Fisheries Society Meeting, Albuquerque, NM. May 2009

M. J. Osborne and T.F.Turner. Collaborative research and monitoring: Multi-locus major histocompatibility complex class IIB and parasite diversity in the Rio Grande silvery minnow. American Society of Ichthyologists and Herpetologists, Portland, OR July 2009

T.J. Pilger, K.B. Gido, D.L. Propst. Effects of nonnative species on food web structure and variability in the Gila River drainage, New Mexico.

- North American Benthological Society, 57th Annual Meeting Grand Rapids, MI May 2009.
- Desert Fishes Council 41st Annual Meeting, Death Valley National Park, CA November 2009.

M. K. Tellez, A. S. Burdett, T.F. Turner. Allometric relationships between linear body dimensions and dry mass for some freshwater macroinvertebrates in the Middle Rio Grande, NM.

- Ecological Society of America, 94th Annual Meeting Albuquerque, NM. August 2009.
- UNM Department of Biology 18th Annual Research Day Albuquerque, NM. April 2009

M. K. Tellez, A. S. Burdett, T.F. Turner. Length-mass relationships for freshwater macroinvertebrates of the Middle Rio Grande, NM. North American Benthological Society 57th Annual Meeting Grand Rapids, MI. May 2009

Turner, T. F., D. Alò, and W. J. Matthews. Phylogeography of the orangebelly darter (*Etheostoma radiosum*). American Society of Ichthyologists and Herpetologists. Portland OR July 2009.

C. Attendance at Professional Meetings

A.S. Burdett

- First Triennial Symposium for the International Society of River Science. St Pete Beach, FL July 2009
- 94th Annual Meeting of the Ecological Society of America. Albuquerque, NM August 2009

T.J. Krabbenhoft

- Desert Fishes Council 41th Annual Meeting Death Valley, CA November 2009

M.J. Osborne

- American Fisheries Society (Western Chapter), Albuquerque NM May 2009
- American Society of Ichthyologists and Herpetologists, Portland OR July 2009

T.J. Pilger

- Desert Fishes Council 41th Annual Meeting Death Valley, CA. November 2009
- North American Benthological Society, Grand Rapids, MI. June 2009

S.T. Ross

- American Society of Ichthyologists and Herpetologists, Portland OR July 2009

A.M. Snyder

- Desert Fishes Council 41th Annual Meeting. Death Valley, CA. November 2009

T.F. Turner

- American Fisheries Society (Western Chapter), Albuquerque NM May 2009
- American Society of Ichthyologists and Herpetologists, Portland OR July 2009
- Workshop: Transforming Undergraduate Education in Biology: Mobilizing the Community for Change, Washington DC July, 2009
- Ecological Society of America, Albuquerque, NM May 2009
- Desert Fishes Council 41th Annual Meeting Death Valley, CA November 2009

D. Service as Editor or on Editorial Board of a Journal

T.F. Turner

- 2008 - 2011 Contributing Editor, Aquatic Biology, Springer Scientific Publishers

E. Service as Officer of Professional Society/Organization

T.F. Turner

- Member, Education and Human Resources Committee, American Society of Ichthyologists and Herpetologists, 2009-2012, Appointed Position

S.T. Ross

- Chair, Endowment and Finance Committee, American Society of Ichthyologists and Herpetologists, 2007-2009.
- Member, Executive Committee, American Society of Ichthyologists and Herpetologists, 2007-2009.
- Member, Long Range Planning and Policy Committee, American Society of Ichthyologists and Herpetologists, 2007-2009.
- Member, Nominating Committee, American Society of Ichthyologists and Herpetologists 2009-2010

9. OTHER PROFESSIONAL ACTIVITIES

A. Presentation to General Audience in a Scholarly Capacity

R.K. Dudley and S.P. Platania. Monitoring long-term population trends of Rio Grande silvery minnow 1993-2009. Festival of the Cranes at the Bosque del Apache National Wildlife Refuge. San Antonio NM November 2009.

R.K. Dudley. Rio Grande silvery minnow data sets for PVA. US Bureau of Reclamation, Area Office Albuquerque, NM April 2009.

M.A. Farrington. Results of 2008 larval Colorado pikeminnow (*Ptychocheilus lucius*) and 2008 larval razorback sucker (*Xyrauchen texanus*) surveys. Presented to San Juan River Basin Recovery Implementation Program, Biology Committee, Civic Center, Farmington, New Mexico, February 2009.

T.F. Turner. Conservation and management of genetic resources in the federally endangered Rio Grande silvery minnow. Department of Marine Science, Host: Professor Dennis Hedgecock, University Southern California, 13 January 2009

T.F. Turner. Lessons from long-term demographic and genetic monitoring of an endangered species. Department of Biological Sciences, Host: Dr. Arthur Benke, University of Alabama, 5 March 2009.

T.F. Turner. The intersection of population ecology and genetics in Rio Grande silvery minnow conservation and management. Host: Dr. Scott Collins, Sevilleta LTER, 18 June 2009.

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

W.H. Brandenburg. San Juan River larval razorback sucker survey 1999-2008. Presented to San Juan River Basin Recovery Implementation Program Fish and Habitat Workshop. USFWS Environmental Service Office, Albuquerque, New Mexico 7-8 Apr 2009.

M.A. Farrington. San Juan River Colorado pikeminnow survey 1995-2008. Presented to San Juan River Basin Recovery Implementation Program Fish and Habitat Workshop. USFWS Environmental Service Office, Albuquerque, New Mexico 28-29 Apr 2009.

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

R.K. Dudley

- Technical Advisor, Recovery Team for Rio Grande silvery minnow (*Hybognathus amarus*), US Fish and Wildlife Service.
- Technical Advisor, Middle Rio Grande Endangered Species Act Collaborative Program, PVA Biology Group.

M. A. Farrington

- Member, Advisory Committee for Restoration of roundtail (*Gila robusta*) and Gila chub (*Gila nigra*).

T.J. Krabbenhoft

- Member, Publication Reimbursement Committee, Department of Biology, University of New Mexico.

M.J. Osborne

- Member, Rio Grande silvery minnow (*Hybognathus amarus*) Propagation and Genetics Workgroup. US Fish and Wildlife Service, Albuquerque NM.
- Member, Population viability analysis of Rio Grande silvery minnow (*Hybognathus amarus*) US Fish and Wildlife Service, Albuquerque NM.
- Technical Reviewer, Pecos bluntnose shiner (*Notropis jemezianus*) 5-year review, US Fish and Wildlife Service, Albuquerque NM.

S.P. Platania

- Member, Committee on Endangered and Threatened Fish Species, American Fisheries Society.

S.T. Ross

- Member, Peer Review Panel, San Juan River Basin Recovery Implementation Program.

T.F. Turner

- PhD Dissertation Outside reviewer, Griffith University, Brisbane Australia National Science Foundation, – 1 proposal
- Member, Recovery Team for Rio Grande silvery minnow (*Hybognathus amarus*), US Fish and Wildlife Service.
- Gila Trout Recovery Team Member, US Fish and Wildlife Service
- Rio Grande silvery minnow Genetics and Propagation Workgroup Member, Middle Rio Grande Endangered Species Collaborative Program
- Stoye Award Committee (Best Student Paper Competition), Chair, Genetics, Development, and Morphology (GDM), American Society of Ichthyologists and Herpetologists Annual Meeting

D. Journal Referee

T.J. Krabbenhoft, Aquatic Biology (1), Environmental Biology of Fishes (1), Oecologia (1), Zootaxa (1)

M.J. Osborne, Aquatic Biology (1)

S.T. Ross, Review of Book Proposal for Springer Publishers (1), Estuaries and Coasts (1)

T.F. Turner, Aquatic Biology (3), Limnology and Oceanography (1), Transactions of the American Fisheries Society (1)

E. Hosting Professional Colloquia and Groups: NONE**10. SERVICE**

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

T.J. Krabbenhoft

- Presenter: *Emerging technologies: genomics approaches to fisheries management*. In Workshop Genetic analysis for fisheries management. Western Division of American Fisheries Society Annual Meeting, Albuquerque, NM. May 2009.

M.J. Osborne

- Presenter: Workshop Genetic analysis for Fisheries Management Western Division of the American Fisheries Society, Albuquerque, NM. May 2009.
- Co-organizer: *Pecos River Symposium* Western Division of the American Fisheries Society, Albuquerque, NM. May 2009.

T.F. Turner

- Organizer and Presenter: Workshop Genetic analysis for fisheries management. Western Division of the American Fisheries Society, Albuquerque, NM. May 2009.

B. Public Service

A.S. Burdett

- Aquatic invertebrate collection, identification, and ecology. Rio Grande Nature Center GK12 students, Albuquerque NM. 21 February 2009
- Fish and invertebrate ecology, mesocosm experimental site at the Sevilleta National Wildlife Refuge. GK12 students, Albuquerque NM. 1 July 2009
- Database Management System Ad Hoc Work Group, Middle Rio Grande Endangered Species Collaborative Program. April 2008 – present
- San Acacia Reach Ad Hoc Work Group, Middle Rio Grande Endangered Species Collaborative Program. September 2009 – present

R.K. Dudley

- Technical and scientific advisory role for the conservation and management of threatened and endangered native fishes for the New Mexico Department of Game and Fish, US Army Corps of Engineers, US. Bureau of Reclamation, and the US Fish and Wildlife Service. 1999 - present

A.M. Snyder

- Tutorial in Preservation of Fish Specimens and Capture of Data for Museum Collections. USFWS Mora National Fish Hatchery and Technology Center, Mora NM. June 2009
- Local Organizing Committee: American Fisheries Society, Early Life History of Fishes 2010 Conference, Santa Fe, NM. Raised \$3,500 in conference support. Fall 2009

T.F. Turner

- MSB Director and Chair of MSB Executive Committee
- Biology Department Space Committee
- UNM Biology Research Day 2009 – Judge, Oral Presentations.
- College of Arts & Sciences (A&S) Council of Chairs and Directors
- College of A&S Ad-Hoc Communications Committee

- College of A&S Student Access Committee
- Chair UNM Science Museum Collection Management Subcommittee
- UNM Museum Studies Committee
- UNM Representative to the Colorado Plateau Cooperative Ecosystems Study Unit
- Co-Organizer: Museum of Southwestern Biology Open House – UNM Biology Darwin Day Celebration, February 2009.

11. ADVANCED STUDY, HONORS, AWARDS, FELLOWSHIPS, ETC.

Diver, T. A., M. J. Osborne, and T. F. Turner. 2009. Patterns of genetic diversity in *Notropis girardi* in the Canadian River and Pecos River, New Mexico. Desert Fishes Council 41st Annual Meeting, Death Valley National Park, CA November 2009.

Awarded Best Undergraduate Student Poster Presentation

Fencl, J. S., A. S. Burdett, T. F. Turner. Comparison of invertebrate sampling methods in the Middle Rio Grande. UNM Department of Biology 18th Annual Research Day Albuquerque, NM April 2009 *Awarded Best Undergraduate student Poster Presentation*

Krabbenhoft T.J. Hertel Scholarship, Department of Biology, University of New Mexico. \$2000

Krabbenhoft T.J. Crawford Scholarship, Department of Biology, University of New Mexico. \$1000

12. DONATIONS AND GIFTS RECEIVED

Library of James S. Findley, Ph.D. Curator Emeritus, MSB Division of Mammals. 98 books on fishes of Indo-West Pacific, various authors.

13. CURRENT STAFF

A. Faculty/Staff

Ayesha S. Burdett, Postdoctoral Research Associate
 Megan J. Osborne, Research Assistant Professor
 Steven P. Platania, Associate Curator of Fishes
 Stephen T. Ross, Curator Emeritus and UNM Adjunct Professor of Biology
 Alexandra M. Snyder, Collections Manager
 Thomas F. Turner, Curator of Fishes and MSB Director

B. Graduate students

Thomas L. Kennedy, Ph.D. candidate
 Trevor J. Krabbenhoft, Ph.D. candidate and Museum Research Assistant
 Sierra Netz, M.Sci. student
 Tyler J. Pilger, Ph.D. student
 Wade D. Wilson, Ph.D. candidate
 Steven D. Scholle, M.Sci. student
 D. Scott Nacke, Art Ph.D. student and Museum Project Assistant
 Hemishilpa Kalagara, Engineering Ph.D. student and Museum Project Assistant

C. Undergraduate Students

Stephani L. Clark, MSB Curatorial Assistant

Chanel S. Jim, MSB Curatorial Assistant
Kaitlin M. Hulsbos, MSB Curatorial Assistant
Cynthia Rivera, MSB Curatorial Assistant
Corey A. Love, MSB Curatorial Assistant
Lia K. Hulsbos, MSB Curatorial Assistant
Thomas F. Turner and Megan J. Osborne Student Mentorship
Tracy Diver, Turner Lab Research Assistant
Alana Sharp, Turner Lab Research Assistant
Jesse Trujillo, Turner Lab Research Assistant
Thomas F. Turner and Ayesha S. Burdett Student Mentorship
Monica K. Tellez, UNO student
Jane S. Fencl, REU student and undergraduate research assistant
Nathan Daves-Brody, undergraduate research assistant
Corey A. Love, undergraduate research assistant
Raphael K. Bishara, UNO student
Erica L. Johnson, REU student
Jennifer Kraus, undergraduate research assistant

14. MUSEUM ASSOCIATES

A. Curatorial Associates

David L. Propst, Ph.D. New Mexico Dept. of Game and Fish, Santa Fe

B. Research Associates

W. Howard Brandenburg, American SW Ichthyological Research, Albuquerque
James E. Brooks, US Fish and Wildlife Service, Albuquerque
Astrid Kodric-Brown, Ph.D. University of New Mexico, Albuquerque
Brooks M. Burr, Ph.D. Southern Illinois University, Carbondale
Michael Collyer, Ph.D. Stephen F. Austin State University, Nacogdoches
Robert K. Dudley, Ph. D. American SW Ichthyological Researchers, Albuquerque
Michael A. Farrington, American SW Ichthyological Researchers, Albuquerque
Keith B. Gido, Kansas State University, Manhattan KS
Norman Mercado Silva, Ph.D. University of Arizona, Tucson

DIVISION OF GENOMIC RESOURCES

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 and other individuals and institutions worldwide for which archival agreements are extant. The DGR frozen tissue collection is taxonomically broad and contains multiple tissue samples from over 200,000 specimens, including Mammals, Birds, Reptiles and Fishes. The collection is ranked as one of the largest collections of its kind worldwide. In total, 6,500 new NK numbers were issued to researchers for the year from the division of Genomic Resources. We processed 32 outgoing loans containing 806 individual specimens to 10 states, 2 foreign countries, including 15 tissue loans for UNM students. Approximately 16,000 new samples were added to the collection.

2. TABLE OF COLLECTION USE

Collection Growth (Specimens catalogued)	Outgoing Loans (loans/ specimen)	Incoming Loans (loans/ specimen)	Visitors	Responses to Information Requests/db visits	Publications 2009 Citing MSB Specimens from DGR Loans
16,000/2277	32/805	0/0	100	100/90,868	43

3. COURSES USING THE COLLECTIONS.

See Mammal and Bird Division reports for specific activity.

4. COURSES TAUGHT BY MSB PERSONNEL

A. Faculty/Collection Managers

See Mammal Division Report, Joseph Cook for specific activity.

B. Graduate Students

See Mammal Division Report, Joseph Cook for specific activity

5. COLLECTION MANAGEMENT

This year, the DGR collection manager focused on loan processing, specimen archiving, maintaining the publication database, database record cleaning, and equipment maintenance. Publications resulting from all DGR tissue loans to date have been entered into the ARCTOS database, and associated links to GenBank have been accomplished.

Lack of space and failing equipment was a big issue for the division this year.

Specimens added to DGR collection:

EID Earclips- 6,500 specimens.

Pumas- 620 specimens

Texas-50 specimens

Valles Caldera National Preserve- 60 Elk and others

Alaska -1,500 specimens

Birds -1,000 specimens

Mammalogy Class-215 specimens

Pikas-426

Freezer Space:

In 2009 we lost 3 freezers, and were only able to replace two of them, leaving our backup freezer full of specimens. Although we did some creative space improvement by removing specimens that were no longer useful and arranging several large loans, we still remain space challenged.

Specimens removed from the collection:

EID: Urine/Feces-4,672 specimens, finished-sent to Johns Hopkins for analysis.

CDC-Oral Swabs-11,577 specimens, pulled out, awaiting shipping.

Current Projects Generating Specimens for DGR:

Beringian Coevolution Project-NSF

Mexican wolf reintroduction-USFWS

Mongolian Vertebrate Parasite Project-NSF

Panama Hantavirus-ICIDR NIH

Panama Climate Change Project-STRI/Gorgas

Bighorn Sheep Reintroduction Program-NMGF

James Lackey Collection

ISLES

Kurt Galbreath-Ochotona Project

Mongolia

Western U.S.

Mammalogy Class

Texas-Hice

Valles Caldera National Preserve

Cook-graduate students-Frogs, Pumas, Bears

Peru Birds-Witt

EID-extra blood will be archived

TAMU Bison-to be archived

Mammal & Bird Prep Room

List of MSB specimens added to ARCTOS for 2009: 5,597

Count	Scientific_Name
3	<i>Accipiter cooperii</i>
6	<i>Accipiter striatus</i>
33	<i>Agelaius phoeniceus</i>
1	<i>Aimophila ruficeps</i>
1	<i>Amazona leucocephala</i>
1	<i>Ammospermophilus harrisi</i>
1	<i>Amphispiza belli</i>
1	<i>Amphispiza bilineata</i>
1	<i>Aphelocoma californica</i>
32	<i>Apodemus agrarius</i>
12	<i>Apodemus flavicollis</i>
36	<i>Apodemus uralensis</i>
2	<i>Archilochus alexandri</i>
2	<i>Ardea herodias</i>
1	<i>Asio flammeus</i>
1	<i>Asio otus</i>
2	<i>Asio otus tuftsi</i>
1	<i>Athene cunicularia</i>
1	<i>Auriparus flaviceps</i>
1	<i>Baeolophus bicolor</i>
1	<i>Baeolophus ridgwayi</i>
1	<i>Bassariscus astutus</i>
4	<i>Bombycilla cedrorum</i>
1	<i>Branta canadensis</i>
43	<i>Bubo virginianus</i>
7	<i>Buteo jamaicensis</i>
1	<i>Buteo jamaicensis calurus</i>
2	<i>Buteo jamaicensis fuertesi</i>
1	<i>Buteo jamaicensis harlani</i>
3	<i>Buteo regalis</i>
4	<i>Buteo swainsoni</i>
8	<i>Calcarius lapponicus</i>
40	<i>Calcarius ornatus</i>
2	<i>Calcarius pictus</i>
1	<i>Callipepla gambeli</i>
2	<i>Callipepla gambelii</i>
1	<i>Callipepla squamata</i>
3	<i>Calypte anna</i>
1	<i>Campylorhynchus brunneicapillus</i>
13	<i>Canis latrans</i>
84	<i>Canis lupus</i>
118	<i>Canis lupus baileyi</i>
2	<i>Cardellina rubrifrons</i>
1	<i>Cardellina rubrifrons</i>

3	<i>Carduelis pinus</i>
2	<i>Carduelis psaltria</i>
1	<i>Carduelis tristis</i>
7	<i>Carpodacus cassinii</i>
3	<i>Carpodacus mexicanus</i>
1	<i>Carpodacus mexicanus frontalis</i>
4	<i>Castor canadensis</i>
3	<i>Cathartes aura</i>
6	<i>Catharus guttatus</i>
1	<i>Catharus ustulatus</i>
2	<i>Centurus uropygialis</i>
2	<i>Certhia americana</i>
1	<i>Certhia americana albescens</i>
56	<i>Cervus elaphus</i>
2	<i>Ceryle alcyon</i>
5	<i>Chaetodipus intermedius</i>
2	<i>Chaetodipus penicillatus</i>
1	<i>Chaetodipus penicillatus eremicus</i>
3	<i>Chondestes grammacus</i>
13	<i>Chordeiles minor</i>
1	<i>Chordeiles minor henryi</i>
1	<i>Chrysolophus amherstiae</i>
5	<i>Circus cyaneus</i>
3	<i>Coccothraustes vespertinus montanus</i>
1	<i>Coccyzus americanus occidentalis</i>
17	<i>Colaptes auratus</i>
1	<i>Columbina inca</i>
1	<i>Contopus cooperi</i>
7	<i>Corvus brachyrhynchos</i>
3	<i>Corvus brachyrhynchos hesperis</i>
4	<i>Corvus corax</i>
2	<i>Corynorhinus townsendii</i>
2	<i>Cratogeomys castanops</i>
1	<i>Cricetulus migratorius</i>
1	<i>Crotophaga sulcirostris</i>
1	<i>Cryptotis parva</i>
3	<i>Cyanocitta stelleri</i>
23	<i>Cynomys gunnisoni</i>
3	<i>Cyrtonyx montezumae</i>
1	<i>Dendragapus obscurus</i>
3	<i>Dendroica coronata auduboni</i>
5	<i>Dendroica graciae</i>
1	<i>Dendroica nigrescens</i>
3	<i>Dendroica townsendi</i>
1	<i>Dipodomys agilis agilis</i>
1	<i>Dipodomys agilis perplexus</i>

1	<i>Dipodomys elator</i>
13	<i>Dipodomys merriami</i>
1	<i>Dipodomys ordii</i>
2	<i>Dipodomys ordii chapmani</i>
1	<i>Dipodomys ordii largus</i>
1	<i>Dipodomys ordii longipes</i>
1	<i>Dipodomys spectabilis</i>
1	<i>Dryomys nitedula</i>
1	<i>Dumetella carolinensis</i>
1	<i>Egretta thula</i>
1	<i>Empidonax hammondi</i>
1	<i>Empidonax hammondi</i>
1	<i>Empidonax oberholseri</i>
3	<i>Empidonax occidentalis</i>
1	<i>Empidonax wrightii</i>
1	<i>Eptesicus fuscus</i>
4	<i>Equus caballus</i>
2	<i>Eremophila alpestris</i>
5	<i>Erethizon dorsatum</i>
1	<i>Eugenes fulgens</i>
2	<i>Falco columbarius</i>
1	<i>Falco columbarius columbarius</i>
4	<i>Falco mexicanus</i>
6	<i>Falco peregrinus</i>
1	<i>Falco sparverius</i>
2	<i>Fulica americana</i>
2	<i>Gallus lafayettii</i>
1	<i>Gallus varius</i>
1	<i>Gavia immer</i>
4	<i>Geococcyx californianus</i>
1	<i>Geomys personatus maritimus</i>
1	<i>Geothlypis trichas</i>
1	<i>Glaucidium gnoma</i>
29	<i>Glaucomys sabrinus</i>
2	<i>Glaucomys sabrinus lascivus</i>
3	<i>Glaucomys volans texensis</i>
1	<i>Grus canadensis</i>
14	<i>Gulo gulo</i>
1	<i>Himantopus mexicanus</i>
2	<i>Icteria virens</i>
2	<i>Icterus bullockii</i>
1	<i>Ictinia mississippiensis</i>
1	<i>Ictinia mississippiensis</i>
3	<i>Junco hyemalis</i>
1	<i>Junco hyemalis caniceps</i>
1	<i>Junco hyemalis dorsalis</i>

2	<i>Junco hyemalis mearnsi</i>
1	<i>Lanius ludovicianus</i>
127	<i>Lemmus trimucronatus</i>
1	<i>Lepus europaeus</i>
1	<i>Lepus townsendii</i>
1	<i>Limnodromus scolopaceus</i>
2	<i>Lophura leucomelanos</i>
3	<i>Loxia curvirostra</i>
1	<i>Loxia leucoptera</i>
1	<i>Lynx rufus</i>
1	<i>Macronus flavicollis</i>
1	<i>Marmota monax</i>
8	<i>Martes</i>
1036	<i>Martes americana</i>
152	<i>Martes caurina</i>
59	<i>Martes pennanti</i>
2	<i>Megascops kennicottii</i>
1	<i>Melanerpes formicivorus</i>
1	<i>Melanerpes uropygialis</i>
2	<i>Meleagris gallopavo merriami</i>
3	<i>Melospiza lincolni</i>
42	<i>Microtus</i>
97	<i>Microtus longicaudus</i>
11	<i>Microtus mogollonensis</i>
164	<i>Microtus montanus</i>
4	<i>Microtus oeconomus</i>
112	<i>Microtus pennsylvanicus</i>
2	<i>Molothrus ater</i>
5	<i>Mus musculus</i>
82	<i>Mustela erminea</i>
6	<i>Mustela frenata</i>
1	<i>Mustela nivalis</i>
5	<i>Mustela putorius</i>
3	<i>Myadestes townsendi</i>
1	<i>Myiarchus cinerascens</i>
1	<i>Myiarchus tuberculifer</i>
176	<i>Myodes gapperi</i>
38	<i>Myodes glareolus</i>
458	<i>Myodes rutilus</i>
1	<i>Myotis ciliolabrum</i>
3	<i>Myotis yumanensis</i>
7	<i>Neotoma albigula</i>
2	<i>Neotoma cinerea</i>
16	<i>Neotoma mexicana</i>
5	<i>Neotoma mexicana scopulorum</i>
2	<i>Neotoma stephensi</i>

83	<i>Neovison vison</i>
1	<i>Nucifraga columbiana</i>
2	<i>Nycticorax nycticorax</i>
4	<i>Odocoileus hemionus</i>
3	<i>Ondatra zibethicus</i>
1	<i>Onychomys</i>
1	<i>Oporornis formosus</i>
1	<i>Oporornis tolmiei</i>
1	<i>Oreoscoptes montanus</i>
1	<i>Oryx gazella</i>
17	<i>Oryzomys palustris</i>
5	<i>Otus flammeolus</i>
1	<i>Pandion haliaetus</i>
2	<i>Parabuteo unicinctus</i>
2	<i>Passer domesticus</i>
2	<i>Passerella iliaca</i>
1	<i>Passerina amoena</i>
2	<i>Passerina caerulea</i>
1	<i>Passerina ciris</i>
1	<i>Passerina versicolor dickeyae</i>
1	<i>Pelecanus occidentalis</i>
1	<i>Perognathus amplus</i>
1	<i>Perognathus flavescens apache</i>
3	<i>Perognathus flavus</i>
4	<i>Perognathus flavus flavus</i>
1	<i>Perognathus longimembris</i>
2	<i>Perognathus parvus</i>
113	<i>Peromyscus</i>
38	<i>Peromyscus boylii</i>
5	<i>Peromyscus boylii rowleyi</i>
1	<i>Peromyscus crinitus</i>
2	<i>Peromyscus eremicus</i>
182	<i>Peromyscus keeni</i>
2	<i>Peromyscus leucopus</i>
593	<i>Peromyscus maniculatus</i>
1	<i>Peromyscus maniculatus rufinus</i>
32	<i>Peromyscus nasutus</i>
32	<i>Peromyscus truei</i>
1	<i>Peromyscus truei truei</i>
2	<i>Phalaenoptilus nuttalli</i>
4	<i>Phalaenoptilus nuttallii</i>
6	<i>Phenacomys intermedius</i>
4	<i>Phenacomys ungava</i>
1	<i>Phoenicopterus ruber</i>
4	<i>Pica hudsonia</i>
1	<i>Picoides dorsalis</i>

1	<i>Picoides pubescens</i>
1	<i>Picoides tridactylus</i>
4	<i>Picoides villosus</i>
4	<i>Pipilo chlorurus</i>
2	<i>Pipilo fuscus</i>
3	<i>Pipilo maculatus</i>
1	<i>Piranga flava</i>
9	<i>Piranga ludoviciana</i>
1	<i>Piranga rubra cooperi</i>
3	<i>Podilymbus podiceps</i>
8	<i>Poecile gambeli</i>
1	<i>Poecile hudsonica</i>
4	<i>Pooecetes gramineus altus</i>
1	<i>Porzana carolina</i>
4	<i>Procyon lotor</i>
1	<i>Procyon lotor crassidens</i>
44	<i>Puma concolor</i>
3	<i>Pyrocephalus rubinus</i>
1	<i>Quiscalus quiscula</i>
1	<i>Regulus calendula</i>
1	<i>Regulus satrapa</i>
8	<i>Reithrodontomys fulvescens</i>
8	<i>Reithrodontomys megalotis</i>
1	<i>Reithrodontomys megalotis aztecus</i>
1	<i>Reithrodontomys megalotis peninsulae</i>
1	<i>Riparia riparia</i>
1	<i>Sayornis saya</i>
8	<i>Sciurus aberti</i>
1	<i>Sciurus aberti aberti</i>
2	<i>Selasphorus platycercus</i>
1	<i>Selasphorus rufus</i>
1	<i>Sialia currucoides</i>
3	<i>Sialia mexicana</i>
1	<i>Sialia sialis</i>
1	<i>Sicista strandi</i>
3	<i>Sigmodon fulviventer minimus</i>
25	<i>Sigmodon hispidus</i>
3	<i>Sitta canadensis</i>
3	<i>Sitta carolinensis</i>
2	<i>Sitta pygmaea</i>
1	<i>Somateria spectabilis</i>
13	<i>Sorex</i>
20	<i>Sorex araneus</i>
1	<i>Sorex arcticus</i>
170	<i>Sorex cinereus</i>
5	<i>Sorex haydeni</i>

3	<i>Sorex minutus</i>
180	<i>Sorex monticolus</i>
2	<i>Sorex palustris</i>
1	<i>Sorex rohweri</i>
1	<i>Spermophilus armatus</i>
13	<i>Spermophilus beecheyi</i>
1	<i>Spermophilus beecheyi nudipes</i>
5	<i>Spermophilus lateralis</i>
1	<i>Spermophilus lateralis arizonensis</i>
2	<i>Spermophilus mexicanus parvidens</i>
100	<i>Spermophilus parryi</i>
1	<i>Spermophilus suslicus</i>
3	<i>Spermophilus tereticaudus neglectus</i>
4	<i>Spermophilus variegatus</i>
2	<i>Sphyrapicus nuchalis</i>
2	<i>Sphyrapicus thyroideus</i>
1	<i>Spizella arborea</i>
1	<i>Spizella arborea ochracea</i>
4	<i>Spizella breweri</i>
1	<i>Spizella passerina</i>
1	<i>Stercorarius</i>
1	<i>Sterna paradisaea</i>
3	<i>Streptopelia decaocto</i>
1	<i>Sturnella</i>
1	<i>Sturnella magna lilianae</i>
3	<i>Sylvilagus</i>
3	<i>Sylvilagus floridanus</i>
1	<i>Sylvilagus nuttallii</i>
37	<i>Synaptomys borealis</i>
1	<i>Tachycineta bicolor</i>
2	<i>Tadarida brasiliensis</i>
4	<i>Tamias</i>
6	<i>Tamias cinereicollis</i>
2	<i>Tamias dorsalis</i>
2	<i>Tamias dorsalis dorsalis</i>
9	<i>Tamias minimus</i>
11	<i>Tamias quadrivittatus</i>
2	<i>Tamias quadrivittatus quadrivittatus</i>
2	<i>Tamias speciosus frater</i>
1	<i>Tamiasciurus douglasii albolimbatus</i>
26	<i>Tamiasciurus hudsonicus</i>
1	<i>Taxidea taxus</i>
3	<i>Thomomys</i>
25	<i>Thomomys bottae</i>
1	<i>Thomomys bottae albatus</i>
2	<i>Thomomys bottae proximarinus</i>

2	Thomomys talpoides
2	Thryomanes bewickii
1	Toxostoma
1	Toxostoma curvirostre
2	Turdus migratorius
1	Turdus migratorius propinquus
1	Tympanuchus cupido
21	Tympanuchus pallidicinctus
1	Tympanuchus phasianellus
4	Tyto alba
1	Urocyon cinereoargenteus
2	Ursus americanus
4	Vermivora celata
1	Vermivora celata celata
2	Vermivora celata orestera
2	Vermivora luciae
6	Vermivora virginiae
1	Vireo cassinii
3	Vireo gilvus
1	Vireo huttoni stephensi
7	Vireo plumbeus
1	Vulpes velox
3	Vulpes vulpes
3	Wilsonia pusilla
10	Zapus hudsonius
2	Zenaida asiatica
2	Zonotrichia leucophrys gambelii

6. AWARDS, GRANTS, AND CONTRACTS.

Projects impacting DGR

Zapus hudsonius conservation and biogeography in the Southwest

Joseph A. Cook (Co-PI)

Jason L. Malaney (Graduate Student)

01 Jan 2005 - 01 Dec 2009

Bats of Texas, revised edition

David J. Schmidly (Principal Investigator)

13 Aug 2009 - 01 Sep 2010

Beringian coevolution project

Joseph A. Cook (Principal Investigator)-NSF

01 Sep 1999 - 31 Aug 2009

Evolution, Phylogeny, and Systematics of the Family Caviidae (Mammalia: Rodentia).

Jonathan L. Dunnum (Graduate Student)

01 May 2003 - 01 May 2009

Systematics, taxonomy and biogeography of the *Galea musteloides* complex.

Jon L. Dunnum (Principal Investigator)

23 Mar 2006 - 01 Jan 2010

7. Publications

The following 43 publications were based on tissue loans, processed from the Division of Genomic Resources. All publications are mammal based, and will also be listed in the Division of Mammals annual report as well.

1. Abraham, Jonathan, Jo Ann Kwong, Cesar G. Albarino, Jiajie G. Lu, Sheli R. Radoshitzky, Jorge Salazar-Bravo, Michael Farzan, Christina F. Spiropoulou, Hyeryun Choe. 2009. Host-species transferrin receptor 1 orthologs are cellular receptors for nonpathogenic New World Clade B Arenaviruses. *PLoS Pathog* 5(4): e1000358.
2. Armién, Aníbal G., Blas Armién, Frederick Koster, Juan M. Pascale, Mario Avila, Publio Gonzalez, Manuel de la Cruz, Yamitzel Zaldivar, Yaxelis Mendoza, Fernando Gracia, Brian Hjelle, Sang-Joon Lee, Terry L. Yates, and Jorge Salazar-Bravo. 2009. Hantavirus Infection and Habitat Associations among Rodent Populations in Agroecosystems of Panama: Implications for Human Disease Risk. *Am. J. Trop. Med. Hyg.* 81(1):59-66.
3. Bell, Kayce C., David J. Hafner, Philip Leitner and Marjorie D. Matocq. 2009. Phylogeography of the ground squirrel subgenus *Xerospermophilus* and assembly of the Mojave Desert biota. *Journal of Biogeography*, Volume 37(2):363-378.
4. Belmar-Lucero, Sebastián, Paula Godoy, Marcela Ferrés, Pablo Vial, & R. Eduardo Palma. 2009. Range expansion of *Oligoryzomys longicaudatus* (Rodentia, Sigmodontinae) in Patagonian Chile, and first record of Hantavirus in the region. *Revista Chilena de Historia Natural* 82: 265-275
5. Blanda-Kanfi, Shani, Hector Miranda, Osnat Penn, Tal Pupko, Ronald W DeBry and Dorothée Huchon. 2009. Rodent phylogeny revised: analysis of six nuclear genes from all major rodent clades. *BMC Evolutionary Biology* 9:71.
6. Carleton, Michael D., Louise H. Emmons, and Guy G. Musser. 2009. A New Species of the Rodent Genus *Oecomys* (Cricetidae: Sigmodontinae: Oryzomyini) from Eastern Bolivia, with Emended Definitions of *O. concolor* (Wagner) and *O. mamorae* (Thomas). *American Museum Novitates* 3661 :1-32.
7. Carraway, Leslie N. 2009. Determining Sex of Sorex Shrews (Soricomorpha: Soricidae). *The American Midland Naturalist* 162(1):87-97.

8. Chung-MacCoubrey, Alice, Heather L. Bateman, and Deborah M. Finch. 2009. Captures of Crawford's Gray Shrews (*Notiosorex crawfordi*) Along the Rio Grande in Central New Mexico. *Western North American Naturalist* 69(2):260-263.
9. Jerry W. Dragoo, Kathryn E Coan, Kristin A. Moore, Scott E Henke, Robert C. Fleischer, Samantha M. Wisely. 2009. Polymorphic microsatellite markers for the striped skunk, *Mephitis mephitis*, and other mephitids. *Molecular Ecology Resources* 9:383-385.
10. Esselstyn, Jacob A., and Rafe M. Brown. 2009. The role of repeated sea-level fluctuations in the generation of shrew (Soricidae:Crocidura) diversity in the Philippine Archipelago. *Molecular Phylogenetics and Evolution* 53 (2009) 171–181.
11. Esselstyn, Jacob A., Robert M. Timm, and Rafe M. Brown. 2009. Do Geological or Climatic Processes Drive Speciation in Dynamic Archipelagos? the Tempo and Mode of Diversification in Southeast Asian Shrews. *Evolution* 63(10):2595-2610.
12. Luis Ignacio Ferro, Juan Jose Martinez, Ruben M. Barquez. 2009. A New Species of *Phyllotis* (Rodentia, Cricetidae, Sigmodontinae) from Tucuman province, Argentina. *Mammalian Biology*:-.
13. Frey, Jennifer K. 2009. Genetics of Allopatric Populations of the Montane Vole (*Microtus montanus*) and Mogollon Vole (*Microtus mogollonensis*) in the American Southwest. *Western North American Naturalist* 69(2):215-222.
14. Frey, Jennifer K. 2009. Distinguishing range expansions from previously undocumented populations using background data from museum records. *Diversity and Distributions* 15:183–187.
15. Frey, Jennifer K., Robert D. Fisher, Suzanne C. Peurach. 2009. Capture Locations of Two Endangered Rodents During a 1902 Exploration of the Sacramento Mountains, New Mexico. *Western North American Naturalist* 69(2):267-271.
16. Frey, Jennifer K., Benjamin J. Frey, and Dwight W. Moore. 2009. Karyotypes of the Long-Tailed Vole (*Microtus longicaudus*) in Isolated Mountain Ranges of the American Southwest. *Western North American Naturalist* 69(3):388-390.
17. Frey, Jennifer K., Jason L. Malaney. 2009. Decline of the Meadow Jumping Mouse (*Zapus hudsonius luteus*) in two Mountain Ranges in New Mexico. *The Southwestern Naturalist* 54(1):31-44.
18. Frey, Jennifer K., and James Stuart. 2009. Nine-Banded armadillo (*Dasypus novemcinctus*) records in New Mexico, USA. *Edentata* 8-10:54-55.

19. Gardner, S.L. 2009. Coccidia (Apicomplexa: Eimeriidae) from the lagomorph *Lepus tolai* From Mongolia. J Parasitol 10:1. [Epub ahead of print].
20. Geluso, Keith. 2009. Records of the Yellow-Nosed Cotton Rat (*Sigmodon ochrognathus*) in Southwestern New Mexico. Western North American Naturalist 69(4):548-550.
21. Gunderson, Aren M., Brandy K. Jacobsen, and Link E. Olson. 2009. Revised Distribution of the Alaska Marmot, *Marmota Broweri*, and Confirmation of Parapatry with Hoary Marmots. Journal of Mammalogy 90(4):859-869.
22. Harding, Larisa E., and Felisa A. Smith. 2009. *Mustela* or *Vison*? Evidence for the taxonomic status of the American mink and a distinct biogeographic radiation of American weasels. Molecular Phylogenetics and Evolution 52(3):632-642.
23. Haverkost, Terry R., and Scott L. Gardner. 2009. A Redescription of Three Species of *Monoecocestus* (Cestoda: Anoplocephalidae) Including *Monoecocestus threlkeldi* Based on New Material. Journal of Parasitology 95(3):695-701.
24. Henson, Dallas D., and Robert D. Bradley, 2009. Molecular systematics of the genus *Sigmodon*: results from mitochondrial and nuclear gene sequences. Canadian Journal of Zoology 87(3):211-220(10).
25. Kang, Hae Ji, Shannon N. Bennett, Laarni Sumibcay, Satoru Arai, Andrew G. Hope, Gabor Mocz, Jin-Won Song, Joseph A. Cook, and Richard Yanagihara. 2009.
26. Evolutionary Insights from a Genetically Divergent Hantavirus Harbored by the European Common Mole (*Talpa europaea*). PLoS One 4(7): e6149.
27. Kang, Hae Ji, Satoru Arai, Andrew G Hope, Jin-Won Song, Joseph A Cook and Richard Yanagihara. 2009. Genetic diversity and phylogeography of Seewis virus in the Eurasian common shrew in Finland and Hungary. Virology Journal 6:208.
28. Kang, Hae Ji, Shannon N. Bennett, Laurie Dizney, Laarni Sumibcay, Satoru Arai, Luis A. Ruedas, Jin-Won Song, Richard Yanagihara. 2009. Host switch during evolution of a genetically distinct hantavirus in the American shrew mole (*Neurotrichus gibbsii*). Virology 388:8–14.
29. Koehler, Anson V.A., Hoberg, Eric P., Dokuchaev, Nikolai E., Tranbenkova, Nina A., Whitman, Jackson S., Nagorsen, David W., Cook, Joseph A. 2009. Phylogeography of a Holarctic nematode, *Soboliphyme baturini*, among mustelids: climate change, episodic colonization, and diversification in a complex host-parasite system. Biological Journal of the Linnean Society 96(3).

30. Koehler, Anson V.A., Hoberg, Eric P., _____, Fernando, Cook, Joseph A. 2009. A Molecular View of the Superfamily Dioctophymatoidea Nematoda). *Comparative parasitology* 76(1):100-104.
31. MacDonald, S. O., Eric Waltari, Robert A. Nofchissey, Yadéeh E. Sawyer, Gregory D. Ebel, and Joseph A. Cook. 2009. First Records of Deermice (*Peromyscus maniculatus*) in the Copper River Basin, Southcentral Alaska. *Northwestern Naturalist* 90(3):243-247.
32. Medina, Rafael A., Fernando Torres-Perez, Hector Galeno, Maritza Navarrete, Pablo A. Vial, R. Eduardo Palma, Marcela Ferres, Joseph A. Cook, and Brian Hjelle. Ecology, Genetic Diversity, and Phylogeographic Structure of Andes Virus in Humans and Rodents in Chile. 2009. *Journal of Virology* 83(6):2446–2459.
33. Piaggio, Antoinette J., Kirk W. Navo and Craig W. Stihler. 2009. Intraspecific comparison of population structure, genetic diversity, and dispersal among three subspecies of Townsend's big-eared bats, *Corynorhinus townsendii townsendii*, *C. t. pallascens*, and the endangered *C. t. virginianus*. *Conserv Genet* 10(1):143-159.
34. Plyusnina, Angelina, Emoek Ferenczi, Gabor R. Racz, Kirill Nemirov, Ake Lundkvist, Antti Vaheri, Olli Vapalahti, and Alexander Plyusnin. 2009. Co-Circulation of Three Pathogenic Hantaviruses: Puumala, Dobrava, and Saaremaa in Hungary. *Journal of Medical Virology* 81:2045–2052.
35. Smith, Felisa A., Dolly L. Crawford, Larisa E. Harding, Hilary M. Lease, Ian W. Murray, Adrienne Ranszewski and Kristin M. Youbert. 2009. A tale of two species: Extirpation and range expansion during the late Quaternary in an extreme environment. *Global and Planetary Change* 65(3-4):122-133.
36. Solari, Sergio, Steven R. Hoofer, Peter A. Larsen, Adam D. Brown, Robert J. Bull, Jose A. Guerrero, Jorge Ortega, Juan P. Carrera, Robert D. Bradley, and Robert J. Baker. 2009. Operational criteria for genetically defined species: analysis of the diversification of the small fruit-eating bats, *Dermanura* (Phyllostomidae: Stenodermatinae) *Acta Chiropterologica*, 11(2): 279–288.
37. Stuart, J. N., Frey, J. K., Schwenke, Z. J. and Sherman, J. S. 2009. Status of nine-banded armadillos (*Dasypus novemcinctus*) in New Mexico. *Prairie Nat.* 39:163–169.
38. Suzán, Gerardo, Erika Marcé, J. Tomasz Giermakowski, James N. Mills, Gerardo Ceballos, Richard S. Ostfeld, Blas Armien, Juan M. Pascale, and Terry L. Yates. 2009. Experimental evidence for reduced rodent diversity causing increased hantavirus prevalence. *PLoS ONE* 4(5): e5461.
39. Torres-Pérez R., Fernando, Eduardo Palma, Brian Hjelle, Marcela Ferrés and Joseph A. Cook. 2009. Andes virus infections in the rodent reservoir and in humans vary

across contrasting landscapes in Chile. *Infection, Genetics and Evolution*
doi:10.1016.

40. Valdez, Ernest W., Christopher M. Ritzi, and John O. Whitaker, Jr. 2009. Ectoparasites of the Occult Bat, *Myotis occultus* (Chiroptera: Vespertilionidae) Western North American Naturalist 69(3):364-370.
41. Valdez, Ernest W., Keith Geluso, Jennifer Foote, Gosia Allison-Kosior, and David M. Roemer. 2009. Spring and Winter Records of the Eastern Pipistrelle (*Perimyotis Subflavus*) in Southeastern New Mexico. Western North American Naturalist 69(3):396-398.
42. Valdez, Ernest W. and Paul M. Cryan. 2009. Food Habits of the Hoary Bat (*Lasiurus cinereus*) during Spring Migration through New Mexico. The Southwestern Naturalist 54(2):195-200.
43. Voss, Robert S., and Sharon Jansa. 2009. Phylogenetic relationships and classification of didelphid marsupials, an extant radiation of new world Metatherian mammals. Bulletin of the American Museum of Natural History 322, 177 pp.
44. Voss, Robert S, Philip Myers, François Catzefflis, Ana Paula Carmignotto, and Josefina Barreiro. 2009. The Six Opossums of Félix de Azara: Identification, Taxonomic History, Neotype Designations, and Nomenclatural Recommendations. Bulletin of the American Museum of Natural History 331:406-433.

Books, Chapters, Edited Volumes

See Mammal Division Report, Joseph Cook for specific activity.

A. Web-Based

See Mammal Division Report, Joseph Cook for specific activity.

B. Books, Chapters, Edited Volumes

See Mammal Division Report, Joseph Cook for specific activity.

D. Technical Reports

University of New Mexico, Museum of Southwestern Biology, Division of Genomic Resources: 2009 Annual Report. Joseph A. Cook & Cheryl A. Parmenter.

C. Theses/Dissertations Complete

See Mammal Division Report, Joseph Cook for specific activity.

F. Work In Progress

Projects

See Mammal Division Report, Joseph Cook for specific activity.

G. Publications and reports based on museum specimens by researchers excluding Museum staff, students and Associates.

See above list of publications.

8. ACTIVITIES IN LEARNED SOCIETIES.

A. Invited or plenary talks

See Mammal Division Report, Joseph Cook for specific activity.

C. Attendance at professional meetings. Contributed talks or posters.

See Mammal Division Report, Joseph Cook for specific activity.

D. Service as editor or on editorial board of a journal.

See Mammal Division Report, Joseph Cook for specific activity.

E. Service as officer of professional society or organization.

See Mammal Division Report, Joseph Cook for specific activity.

9. OTHER PROFESSIONAL ACTIVITIES.

A. Colloquium Presentations.

See Mammal Division Report, Joseph Cook for specific activity.

B Presentation to General Audience in a Scholarly Capacity.

See Mammal Division Report, Joseph Cook for specific activity.

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

See Mammal Division Report, Joseph Cook for specific activity.

D. Service in a Scholarly Capacity as a Member of a Local, State, Regional or National Committee, Panel etc.

See Mammal Division Report, Joseph Cook for specific activity.

E. Journal Referee.

See Mammal Division Report, Joseph Cook for specific activity.

10. SERVICE.

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

See Mammal Division Report, Joseph Cook for specific activity.

B. Public Service

Joseph Cook:

See Mammal Division Report for specific activity.

Cheryl Parmenter:

Division tours – provided educational tours and assistance for visitors.

Visitors:

Dr. Greg Glass, Johns Hopkins University, -Infectious Disease Class (8 students) 14th August, 2009.

Biology New Graduate Students tour. August 20, 2009.

Publio Gozales-Panama.

Senators Bingaman and Udall staffers & Representatives from Heinrich & Lujan. August 20, 2009.

ARCTOS Database Visits:

Total visits 90,868

Unique visitors 54,326

Countries 187

11. ADVANCED STUDY, HONORS, AWARDS, FELLOWSHIPS, ETC.

See Mammal Division Report for specific activity.

12. DONATIONS AND GIFTS RECEIVED.

James Lackey-collection 1,118 rodent specimens to date.

Kurt Galbreath-collection 426 pika specimens.

Pumas-620 specimens.

13.CURRENT STAFF.

Faculty:

Joseph A. Cook: **Interim Curator** of Genomic Resources, Curator of Mammals Museum of Southwestern Biology and Professor the Department of Biology UNM.

Staff:

Cheryl Parmenter: **Collection manager** 1.0FTE.

Students:

Andrew Hope **Graduate Assistant** .25FTE Fall.

Comparative Phylogeography of the Sorex Cinereus Complex: PhD in progress.

Jason Malaney **Graduate Assistant** .50FTE Spring-remote data entry.

Comparative Phylogeography of boreal mammals: PhD in progress.

13. MUSEUM ASSOCIATES.

A. Curatorial Associates

None

B. Research Associates

Robert J. Baker	The Museum, Texas Tech University, Lubbock, TX
Troy L. Best	Department of Biology, Auburn University
James Derr	Texas A&M University
Jerry Dragoo	UNM Department of Biology
Jennifer Frey	New Mexico State University,
Scott L. Gardner	Dept. Nematology, Curator, University Nebraska.
Bruce J. Hayward	Department of Biology, Western New Mexico University
Edward J. Heske	Illinois Biological Survey
Dwight W. Moore	Emporia State University
Robert Parmenter	Valles Caldera Preserve- Chief Scientist
James L. Patton	Museum of Vertebrate Zoology, University of California
Luis Ruedas	Portland State University, Portland, Oregon
Jorge-Salazar Bravo	Texas Tech University, Lubbock, TX

HERBARIUM

1. DIVISION HIGHLIGHTS

The UNM herbarium contained more than 119,005 accessioned specimens of vascular and non-vascular plants at the end of 2009.

Interpretive activities or Collections-related Outreach including tours for UNM students and the Native Plant Society of New Mexico and maintaining the Herbarium webpage.

The Herbarium continues to provide the leadership for the statewide collection database, New Mexico Biodiversity Consortium (NMBCC), that serves natural history specimen data via the World Wide Web.

2. TABLE OF COLLECTION USE

Collection Growth (specimens catalogued & entered in collection)	Loans/# specimens (outgoing)	Loans (incoming)	Visitors (not including tour groups)	Information Requests Personally Responded to	Publications Citing MSB Specimens
3831	10/479	9/287	143	120	7

3. COURSES USING THE COLLECTIONS

Biol 402/502- Plants and People-16 students (Spring 2009)

Biol 463- Flora of New Mexico- 9 students (Fall 2009)

4. COURSES TAUGHT BY MSB PERSONNEL

A. Faculty/Collection Manager

Bixby, R.J.

BIOL 504- Ecosystem Studies, 9 graduate students

Hanson, D.

Biol. 519- Environmental Monitoring, 6 students (Fall 2009)

Lowrey, T.K.

Biol 402/502- Plants and People- 16 students (Spring 2009)

Biol. 463- Flora of New Mexico- 9 students (Fall 2009)

B. Graduate Students/Associates

Bixby, R.J.

Biol 514- Ecosystem Studies

5. COLLECTION MANAGEMENT

Herbarium staff processed and added 3831 new acquisitions to the collection. The UNM Herbarium received 21 gifts and 2 exchanges of specimens, totaling 1745 specimens. The majority of specimens were collected from New Mexico.

The herbarium logged more than 143 visits from the botanical community. We average 2-3 information requests per week by e-mail and/or phone, and the Biodiversity website receives many hits per month for herbaria in the state.

Jane Mygatt and Julianna Medeiros (TA for the Flora of New Mexico, and part-time GA for the Herbarium) worked on updating the handouts to the Flora of New Mexico lab, and created a "Lab Manual to the Flora of New Mexico", to accompany the Flora of New Mexico course (Biology 463L). The manual contains ~155 pages detailing plant family characteristics for more than 74 families, including scanned images, an illustrated glossary, and information on field trips and collecting plants. The manual was created in InDesign, all files, images, etc. are archived so that the manual may be easily updated by the collection manager.

Accessions for 2009:

2009.01	Jim McGrath, 110 specimens
2009.02	Don Henze, 41 specimens
2009.03	RM, Laramie, WY, 256 various specimens
2009.04	Chick Keller, Los Alamos, 1 specimens
2009.05	BRY, Provo, Utah 19 specimens in exchange
2009.06	Jack Carter, Silver City, NM- 10 various trees and shrubs
2009.07	NHNM, Yvonne Chauvin, 43 specimens from Ladder Ranch
2009.08	NHNM, Yvonne Chauvin, 206 Upper Rio Grande Watershed specimens
2009.09	NHNM, Yvonne Chauvin, 210 Canadian River specimens
2009.10	R.C. Sivinski, NM Rare Plant Botanist, 84 specimens
2009.11	ASC, Flagstaff, AZ- 31 <i>Arceuthobium</i> in exchange
2009.12	UTEP- El Paso, TX- 14 miscellaneous specimens
2009.13	TEX-LL, Austin, TX- 1 isotype of <i>Gutierrezia elegans</i>
2009.14	DeWitt Ivey, ABQ- 1 <i>Lorandersonia microcephala</i>
2009.15	Chick Keller, Los Alamos, 29 specimens
2009.16	R.C. Sivinski, NM Rare Plant Botanist, 335 specimens collected in 2008
2009.17	Gene Jercinovic- 14 various southern NM species
2009.18	Nancy Nicolai- 8 specimens
2009.19	Jack Carter, Silver City, NM- 1 <i>Packera neomexicana</i>
2009.20	NHNM, Yvonne Chauvin, 115 San Juan River (96PD)

2009.21 NHNM, Yvonne Chauvin, 8 BLM Roswell- Lower Pecos
2009.22 NHNM, Yvonne Chauvin, 29 Roswell Springs
2009.23 NHNM, Yvonne Chauvin, 178 BLM-ABQ Springs (2000 YC)

6. AWARDS, GRANTS, AND CONTRACTS

Awarded:

\$382,503 (\$126,921 for 2009-2010). Effects of nutrient availability of periphyton biomass and diversity in the Middle Rio Grande: top-down and bottom-up factors “(P.I.), Middle Rio Grande Endangered Species Act Collaborative Program, Bureau of Reclamation, 2007-2010: **R. Bixby**

\$35,329. Survey of Aquatic Community Structure and Food Web Constituents at the Bosque del Apache NWR. Middle Rio Grande Endangered Species Act Collaborative Program, Bureau of Reclamation and TetraTech. **R. Bixby**, A.S. Burdett and T.F. Turner. 2008-2009

\$480,000 (360,000 to UNM). Collaborative Research: Light enhanced ^{13}C enrichment of dark respired CO_2 : Implications for leaf internal CO_2 conductance and respiration in the light. **D.T. Hanson**, Nate McDowell, and Todd Rosenstiel (Portland State University). National Science Foundation Integrative Organismal Biology Environmental and Structural Systems Cluster. Award period: 08/15/2007 - 06/30/2010

\$350,000 (\$64,000 to UNM). Integrated Bioenergy Processing System for Productive Use of NM Dairy Industry Waste Streams. R. Pate, P. Pohl, K. Hoodenpyle, **D.T. Hanson**, V. Cabrera, S. Deng. New Mexico Technology Research Collaborative. Award period: 02/15/2007 - 1/19/2009

\$4000. Isotopic Signature of Photorespiration; D. Pater and **D.T. Hanson**, PIs; Summer Undergraduate Research Fellowship, American Society of Plant Biologists; May 1– August 30, 2009.

Lowrey, T.K.

\$125,000. New Mexico Biodiversity Collections Consortium. P.I.: **T.K. Lowrey**. New Mexico Minerals, Energy, and Natural Resources Department. 07/15/08-06/30/09.

\$55,000. Development of a Wildlife Conservation Plan for Albuquerque. CO-P.I.s: Snell, H. and T.K. Lowrey. 05/01/08-06/30/09.

7. PUBLICATIONS

A. Books, Book Chapters, Edited Volumes

Crawford, D. J., **T. K. Lowrey**, G.J. Anderson, G. Bernardello, A. Santos-Guerra, and T.F. Stuessy . 2009. Genetic diversity in the colonizing ancestors of Asteraceae endemic

to oceanic islands: Baker's Law and polyploidy. In, Evolution and Systematics of the Compositae. Funk, V., T. Stuessy, A. Susanna, and R. Bayer eds. IAPT, University of Vienna. Pgs. 139-151.

Brouillet, L., **T.K. Lowrey**, L. Urbatsch, V. Karaman, G. Sancho, S. Wagstaff, J.C. Semple. 2009. Phylogeny and evolution of the Astereae (Asteraceae). In, Evolution and Systematics of the Compositae. Funk, V., T. Stuessy, A. Susanna, and R. Bayer eds. IAPT, University of Vienna. Pgs. 589-630

Funk, V., T. Stuessy, A. Susanna, and R. Bayer eds (50 co-authors, including **T.K. Lowrey**). 2009. Compositae metatrees: the next generation. In, Evolution and Systematics of the Compositae.. IAPT, University of Vienna. Pgs. 747-777.

B. Journal Articles

Barbour, M.M. and **D.T. Hanson**. 2009. Commentary: Stable carbon isotopes reveal dynamics of respiratory metabolism. New Phytologist 181:243-245.

Bickford, C.P., N.G. McDowell, E.B. Erhardt and **D.T. Hanson**. 2009. High frequency field measurements of diurnal carbon isotope discrimination and internal conductance in a semi-arid species, *Juniperus monosperma*. Plant Cell and Environment 32(7):796-810.

Bixby, R.J., J. P. Benstead., M.M. Douglas and C.M. Pringle. 2009. Relationships of stream algal community structure to catchment deforestation in eastern Madagascar. Journal of the North American Benthological Society 28:196-209.

Brouillet L., A.A. Anderberg, G.L. Nesom, **T.K. Lowrey** and L.E. Urbatsch. 2009. *Welwitschiella* is a member of the African subtribe Grangeinae (Asteraceae Astereae): a new phylogenetic position based on ndhF and ITS sequence data. KEW BULLETIN Vol. 64: 645–660

DeLong, J. P. and **D.T. Hanson**. 2009. Metabolic rate links density to demography in *Tetrahymena pyriformis*. The International Society of Microbial Ecology (ISME) Journal 1:1-6.

DeLong, J. P. and **D.T. Hanson**. 2009. Density-dependent individual and population-level metabolic rates in a suite of single-celled eukaryotes. The Open Biology Journal 2:32-37.

Gardiner, N., Sutherland, A., **R.J. Bixby**, M.C. Scott, J.L. Meyer, G. Helfman, F. Benfield, C.M. Pringle, P.V. Bolstad, and D.N. Wear. 2009. Linking stream and landscape trajectories in the southern Appalachians. Environmental Monitoring and Assessment 156: 17-36.

C. Web-Based / Curriculum Development

Mygatt, J. and J. Medeiros. 2009. Lab Manual to the Flora of New Mexico. 155 pp.

D. Technical Reports

Bixby, R.J. and A.S. Burdett. Annual report to the Middle Rio Grande Collaborative Program 2007-2008: Effects of nutrient availability on periphyton growth and diversity in the Middle Rio Grande: top-down and bottom-up factors. Middle Rio Grande Endangered Species Act Collaborative Program, Bureau of Reclamation.

Sivinski, R.C. 2009. Mogollon hawkweed (*Hieracium brevipilum*) status report. Submitted to USDI-Fish & Wildlife Service, Region 2 Office, Albuquerque, NM.

E. Theses/Dissertations Completed

F. Work In Progress

Bixby, R.J. and E.C. Zeek. In review. A simple method for measuring valve curvature. Submitted to the Proceedings of the Academy of Natural Sciences, Philadelphia.

Pringle, C.M., E.P. Anderson, M. Ardon, **R.J. Bixby**, S. Connelly, J.H. Duff, A.P. Jackman, P. Paaby, A. Ramírez, G.E. Small, M.N. Snyder, and F.J. Triska. In press. Rivers of Costa Rica. In: M. Kappelle (ed.) Costa Rican Ecosystems. The University of Chicago Press, Chicago, Illinois.

G. Publications/Reports Based on MSB Specimens (including outside researchers)

McGrath, J. 2009. Plant Distribution Reports. The New Mexico Botanist 47:7.

Mygatt, J. 2009. Plant Distribution Reports. The New Mexico Botanist 46:7.

Nesom, G. 2009. Taxonomic notes on acaulescent Oxalis (Oxalidaceae) in the United States. Phytologia. 91 (3) 501-526

Sivinski, R.C. 2009. The genus *Nama* in New Mexico. The New Mexico Botanist 46:4-6.

Sivinski, R.C. 2009. Identification of *Mentzelia* species in New Mexico. The New Mexico Botanist 48:1-4.

8. ACTIVITIES IN LEARNED SOCIETIES

A. Invited/Plenary Talks and/or Seminars

Bixby, R.J. and E.C. Zeek. 2009. A Simple method for calculating valve curvature. North American Diatom Symposium, Milford, IA.

B. Contributed Talks/Posters

Burdett, A.S. and **R.J. Bixby**. 2009. Bottom-up and top-down effects on algal

community dynamics in an aridland river: the Middle Rio Grande, New Mexico. Ecological Society of America, Albuquerque, NM.

Bixby, R.J. and A.S. Burdett. 2009. Nutrient and water quality influences on periphyton biomass and community composition in an aridland river. Ecological Society of America, Albuquerque, NM.

Verb, R.G., L.J. Fuelling, **R.J. Bixby**, J.A. Adams, W.B. Chiasson and M.J. Vis. 2009. An occurrence of an epizootic read algal chantransia on rusty crayfish. North American Benthological Society, Grand Rapids, MI.

Graham, L.E., M.E. Cook and **D.T. Hanson**. 2009. Evidence that the enigmatic Paleozoic macrofossil Prototaxites formed from wind-rolled liverwort mats. Botanical Society of America, Snowbird UT, July 25-29, 2009.

Lowrey, T.K., M. Garcia, and A. Porras-Alfaro. Plant-fungal symbioses in gypsophilic plants. Botany 2009. Snowbird, Utah. July 25-29, 2009

C. Attendance at Professional Meetings

Bixby, R.J.

North American Benthological Society meetings, May 2009, Grand Rapids, MI
Ecological Society of America meetings, August 2009, Albuquerque, NM.
North American Diatom Symposium, September 2009, Milford, IA.

Hanson, D.T.

Annual Meeting of the American Society of Plant Biologists, Honolulu HI, July 18-22, 2009.

Lowrey, T.K.

Botany 2009 International Meeting. Snowbird Utah. July 25-29 2009.

D. Service as Editor or on Editorial Board of a Journal

Bixby, R.J.

Editorial Board, *Diatom Research*, 2005-present

Lowrey, T.K.

Co- Editor, Madrono, Journal of the California Botanical Society, Nov. 2008 to present.

E. Service as Officer of Professional Society/Organization

Hanson, D.T.

Vice-Chair/Chair, Gordon Research Conference on CO₂ Assimilation in Plants, August 30, 2008–August 30, 2014 (elected). Secretary, UNM Chapter of Sigma Xi, August 1, 2008–August 1, 2011 (appointed).

Lowrey, T.K.

Appointed member, Collections Committee, American Society of Plant Taxonomists
Member, Board of Directors, Flora North America, Elected.

9. OTHER PROFESSIONAL ACTIVITIES

A. Presentation to General Audience in a Scholarly Capacity (*presenter)

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

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

Hanson, D.T.

Grant Reviewer, U.S.–Israel Binational Agricultural Research and Development Fund,
March 2009.

Grant Reviewer, National Science Foundation, February, March and July, 2009.

Lowrey, T.K.

Member, New Mexico Rare Plant Technical Council
Systematic Biology Panel Member, National Science Foundation, October 2009.

Mygatt, J.

Member, New Mexico Rare Plant Technical Council

D. Journal Referee

Bixby, R.J.

Botany (1), Journal of the North American Benthological Society (1)

Hanson, D.T.

Acta Oecologia (1), *Plant, Cell, and Environment* (3), *Talanta* (1)

Lowrey, T.K.

American Journal of Botany(1), Molecular Phylogenetics and Evolution (1), Australian
Systematic Botany (1), Annals of Botany (1), Madagascar Conservation & Development
(1)

E. Hosting Professional Colloquia and Groups

10. SERVICE

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

B. Public Service

Lowrey, T.K.

Plant Identification for the general public in the UNM Herbarium.

Mygatt, J.

Webmaster of the Native Plant Society of New Mexico website. <http://npsnm.unm.edu>

C. University and Departmental Committees

Hanson, D. T.

Biology Department Seminars Committee

Greenhouse Committee

Seminars Committee

Lowrey, T.K.

Academic Freedom and Tenure Committee

Policy Committee, UNM Faculty Senate

Library Committee, UNM Faculty Senate

Committee on Governance

Biology Dept. Tenure and Promotion Committee

Biology Dept. Space Committee

11. ADVANCED STUDY, HONORS, AWARDS, FELLOWSHIPS, ETC.

12. DONATIONS AND GIFTS RECEIVED

\$500 annually. Native Plant Society donation for New Mexico Herbaria.

13. CURRENT STAFF (List Faculty/Staff, Students and Volunteers)

A. Faculty/Staff

Lowrey, T.K., Curator

Mygatt, J., Collection Manager

B. Graduate students

Medeiros, J. (Spring and Fall 2009)

Gryzmala, T. (Summer 2009)

C. Undergraduate Student Workers and Volunteers

Hiring freeze, did not have an undergraduate employee in 2009

Jones, L. (Volunteer for 2009, one day a week, ~4 hours/week)

14. MUSEUM ASSOCIATES

A. Curatorial Associates

Hanson, D.T., UNM Faculty (Curator of Bryophytes)

Sivinski, R., New Mexico State Botanist

B. Research Associates

Bixby, R.J. UNM Research Associate, Diatoms

Bleakly, D., Botanical Consultant

Carter, J.L., Emeritus Professor, Colorado College and Botanist

Dunmire, W., Retired U.S. National Park Service and Author

Keller, C., Retired, Los Alamos National Laboratory

Knight, P., Botanical Consultant

Tonne, P., Natural Heritage New Mexico, Rare Plant Botanist

DIVISION OF MAMMALS

1. DIVISION HIGHLIGHTS.

- A. **Collection Growth.** The DOM added approximately 15,000 specimens to its catalogue during 2009 and now contains just under 200,000 specimens. 5000 were newly catalogued specimens, while the remaining 10,000 consisted of material that was already in the Arctos database as DGR catalogued material. DGR records are currently being converted to DOM records as they are catalogued into the DOM. When mammal specimens from the DGR and DOM are combined, the MSB holds about 233,000 mammal specimens (3rd largest collection in the Western Hemisphere).

The collection remains among the fastest growing in the world. The continued exceptional growth is the result of a number of important facets of our operation:

a. **Specimen growth through fieldwork**

- i. Directed specimen-based studies within Joe Cook's research program.
- ii. 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. Work primarily sponsored by the National Science Foundation, National Institutes of Health, USDA Forest Service and US Fish and Wildlife Service.
- iii. New initiatives focused on building the collection in certain geographic regions.

b. **Specimen growth through donation**

- i. A well developed network of researchers and agencies worldwide which are now heavily invested in the strength of the DOM and continue to deposit their material here.
- ii. Donations of personal collections from individual researchers.

The fact that we continue to grow as a repository for research material points to the strength and good standing of the collection in the greater scientific community.

- B. **Training in specimen based research and NH collection curation.** Training remains one of the integral goals of the DOM. Students are involved in all activities of the division. During 2009, 18 students worked in the division, 2 graduate students, 14 undergraduates and 2 high school interns. 9 females, 9 males, 7 from under-represented groups. Students gain experience in bioinformatics, natural history collection curation, and field and laboratory based research.

- C. Publications citing MSB DOM specimens.** The DOM integrated collection continues to be utilized heavily in wide range of disciplines. During 2009 our specimens were cited in 52 studies published in a wide range of journal including: PLoS Pathogens, Evolution, Molecular Phylogenetics and Evolution, Bioscience, Journal of Biogeography, American Journal of Tropical Medicine and Hygiene, AMNH Novitates, Bulletin of the AMNH, Journal of Mammalogy, Southwestern Naturalist, Revista Chilena de Historia Natural, BMC Evolutionary Biology, Western North American Naturalist, Genomics, Diversity and Distributions, Journal of Parasitology, Canadian Journal of Zoology, Revista Mexicana de Biodiversidad, PLoS One, Virology, Biological Journal of the Linnean Society, Conservation Genetics, Global and Planetary Change, Acta Chiropterologica, Infection, Genetics and Evolution, Western North American Naturalist, Naturwissenschaften, Northwestern Naturalist.
- D. Arctos database and collection accessibility.** The Arctos database is a cutting edge relational museum database and it continues to provide an invaluable resource for researchers worldwide and is serving to greatly enhance the visibility of the MSB. Since our 2008 report we have seen an increase from 35,000 to 91,000 visits to Arctos and an increase of 1,000 visits from NCBI. Additionally, more than half the visitors were new users, suggesting that this trend should continue. Further resources should be put into improving our website and front end interface as this is where the majority of our interactions with the community lie.
- E. NSF BRC Improvement grant – “Curation, Data Basing and Integration of the Orphaned Illinois Mammal Collection”.** *UIMNH Collection Integration:* The large majority of this 2 year project was completed during 2009. Remaining work involves the physical integration of the family Cricetidae.

	Number	Percent complete
MSB catalog numbers assigned to UIMNH specimens	32,746	100%
UIMNH specimen catalog data loaded into Arctos electronic database and now web accessible	32,746	100%
UIMNH specimens through Integrated Pest Management (IPM) procedures and cleaned of pest debris	32,746	100%
Skins, skels matched, MSB labels attached, ready for integration in main collection	32,665	99%
UIMNH localities (4305) georeferenced	2830	66%
Specimens fully integrated into MSB main collection	14,733	45%

Student training in UIMNH project: This project has been instrumental in providing training in natural history collection curation and helping to convey the historical and future value of specimens to the next generation of environmental scientists. A total of 22 students (4 Graduate students, 16 undergraduate students,

2 high school interns) participated in this project (including 7 minority students and 12 females).

Improvements to Collection space: Main collection reorganized to accommodate the addition of the 32,000 UIMNH and 25,000 USGS specimens. 70 new cases and 960 new drawers were added over the course of the 2 year period. Wooden drawers are being replaced with new metal ones as funding allows. New acid and lignin free specimen trays and blotter paper have been added to about 2/3 of the collection.

F. **Integration of USGS Collection.** Great progress was made during 2009 in terms of integrating the USGS Biological Surveys collection (25,000 specimens). Approximately 35% of the collection has now been integrated.

2. COLLECTION USE

Collection Growth (specimens catalogued)	Loans (outgoing)	Loans (incoming)	Visitors	Information Requests Personally Responded to	Publications Citing MSB DOM Specimens
15,000*	27(572) / 31(805)**	4	207***	>400****	52

* Currently the fastest growing collection worldwide.

** Loans originating in DOM / loans of mammal tissue originating in DGR
Combined total of 58 loans of 1375 specimens of traditional voucher specimens, mammalian parasites, and tissue samples.

*** 31 visiting researchers, 4 school group tours (47 people), 40 other visitors.

**** Estimate of email or phone requests to Jon Dunnum and Joe Cook. Web visits to the DOM searchable database (ARCTOS) tracked via Google analytics = 90,868 visits (from 187 countries (7% (6,413) visitors referred to our site from GenBank).

3. COURSES USING THE COLLECTIONS

Educational tours

Johns Hopkins University	(7 students)
Bosque High School	(12 students)
Newcomb Middle School	(15 students)
East San Jose Elementary	(13 students)

Classes receiving loans of material for educational purposes

UNM BIOL 204L - Plant and Animal Form and Function. Spring

BIOL 204L - Plant and Animal Form and Function. Fall

UNM BIOL 386L General Vertebrate Zoology

UNM BIOL 489 Mammalogy
UNM Natural Sciences 262L
UNM BIOL K-12 Education Program. Spring
UNM BIOL K-12 Education Program. Fall
Putnam Science Carnival
Bosque School

UNM Courses visiting or using collection

BIOL 461 Tropical Biology	(15 students)
BIOL 561 Tropical Biology	(3 students)
BIOL 489L Mammalogy	(10 students)
Drawing I	(12 students)
Freshman Learning LLC	(18 students)
Freshman Learning ARSC	(18 students)
Freshman Learning Gear up	(10 students)
General Vertebrate Zool	(1 student)
BIOL 400 (Fall) Senior Honors Thesis	(1 student)
BIOL 599 Masters Thesis	(1 student)
BIOL 699 Dissertation	(2 students)

4. COURSES TAUGHT BY MSB PERSONNEL

A. Faculty/Collection Managers

Cook, J. A.

Spring: Biol. 461, Introduction to Tropical Biology, 15 students

Spring: Biol. 561, Tropical Biology, 3 students

Fall: Biol. 489, Mammalogy, 10 students

Student Mentoring

1. Vani Aran, Honor's student, January 1–December 31, 2009.
2. David Banks-Richardson, UnO Program, worked in molecular genetics lab and museum, January 1–October 1, 2009.
3. Hiyatsi Bassett, UnO Program, museum project, June 1–December 31, 2009.
4. Eudora Claw, UnO Program, worked in molecular genetics lab, January 1–June 1, 2009.
5. Victoria Corvino, UnO Program, worked in museum and molecular genetics lab, January 1–December 31, 2009.
6. Randle McCain, UnO Program, worked in museum and fieldwork in Alaska, January 1–December 31, 2009.
7. Kelly Speer, UnO Program, worked in molecular genetics lab, January 1–December 31, 2009.

B. Graduate Students (labs, etc.)

BIOL 489L – Mammalogy Lab

BIOL 386L - General Vertebrate Zoology Lab

5. COLLECTION MANAGEMENT

The DOM received 65 new accessions of material (about 6000 specimens) and added approximately 15,000 specimens to its catalogue during 2009 and now contains just under 200,000 specimens. 5000 were newly catalogued specimens, while the remaining 10,000 consisted of material that was already in the Arctos database as DGR catalogued material. DGR records are currently being converted to DOM records as they are catalogued into the DOM. When mammal specimens from the DGR and DOM are combined, the MSB holds about 233,000 mammal specimens (3rd largest collection in the Western Hemisphere).

Current projects generating specimens for DOM

Beringian Coevolution Project - NSF

Mexican wolf reintroduction – USFWS

Mongolian Vertebrate Parasite Project – NSF (800 specimens)

Chilean Hantavirus Project – ICIDR NIH

Panama Hantavirus – ICIDR NIH

Panama Climate Change Project - STRI/Gorgas

Bighorn Sheep Reintroduction Program - NMGF

James Lackey Collection

ISLES

Tom Jung Yukon/NW Territory collection

Jackson Whitman carnivore collection

Kurt Galbreath *Ochotona* Dissertation Project

The majority of staff time was spent:

1. Integration of USGS and UIMNH material into the main collection.
2. Working on the Arctos database.
3. Reorganizing and relabeling of dry collections.
4. Training student technicians and UnO students in museum work.
5. Preparation, cataloging and installation of museum specimens.
6. Data entry for the incoming accessions.
7. Filling information requests.
8. Processing loan material.
9. Assisting with BIOL 489 - Mammalogy.

6. AWARDS, GRANTS, AND CONTRACTS**Cook, J.A.**

1. “ISLES—Island Survey to Locate Endemics, Amendment 1”; J.A. Cook, PI; USDA Forest Service; \$100,000, September 1, 2009–September 1, 2012.
2. “Training in Hantavirus Ecology, Virology and Clinical Investigation in the Americas”; G. Mertz, (UNM SOM), PI, J.A. Cook, co-PI; Fogarty International

- Training Grant 2D43 TW001133-06A1, National Institutes of Health; \$510,000, July 1, 1999–March 31, 2011, \$132,133/year.
3. “Mammal Inventory of Tongass”; J.A. Cook, PI; USDA Forest Service Pacific Northwest Lab; \$49,983, May 2005–July 2010, \$24,000/year.
 4. “ICIDR, Hantavirus Ecology and Disease in Chile and Panama” (2nd year); G. Mertz (School of Medicine, UNM), PI; National Institutes of Health 2 U19 AI045452-06; \$800,000, August 31, 2005–April 30, 2010.
 5. “URM: Undergraduate Nurturing Opportunities (UNO)”; J.A. Cook, PI; Division of Environmental Biology (DEB) 0731350, National Science Foundation; \$1,010,000, August 1, 2007–August 1, 2012, \$200,155/year (OH \$15,000).
 6. “ISLES—Island Survey to Locate Endemics”; J.A. Cook, PI; USDA Forest Service; \$100,000, September 1, 2008–September 1, 2012, \$50,000/year.
 7. “Mongolia Vertebrate Parasite Project”; S. Gardner, PI, J.A. Cook, co-PI; Division of Environmental Biology (DEB) 0717214, National Science Foundation; \$466,000, September 11, 2007–September 1, 2009, \$210,000/year (grant and OH to University of Nebraska).
 8. “Curation, Databasing, and Integration of the Orphaned Illinois Mammal Collection”; J.A. Cook, PI; DEB 0744025, National Science Foundation; \$259,285, February 1, 2008–February 1, 2010. No cost extension through February 2011.

Dunnum, J. L.

1. Curation, Databasing, and Integration of the Orphaned Illinois Mammal Collection. NSF-DEB 0744025 (Dunnum, Co-PI, Cook, PI,) 2/01/2008–2/01/2010. Total \$259,285, yearly \$130,000 (F&A \$50,052). No cost extension through February 2011.
2. Improved housing of Mexican wolf (*Canis lupus baileyi*) specimens and its conservation in New Mexico. U. S. Fish and Wildlife Service. Total \$5,000 (No F&A).

Rearick, J.

1. Three-year National Science Foundation Graduate Fellowship.

7. PUBLICATIONS

A. Books, Book Chapters, Edited Volumes

1. MacDonald, S.O. and J.A. Cook. 2009. *Recent Mammals of Alaska*. Fairbanks, AK: University of Alaska Press.

B. Journal Articles

Barker, B

1. **Barker, B.S.,** R.W. Henderson, and R. Powell. 2009. Geographic distribution. *Epicrates monensis granti*. *Herpetological Review* 40:455-456.

Cook, J. A.

1. Koehler A.V.A., E.P. Hoberg, F. Torres-Pérez and J.A. Cook. 2009. A molecular view of the superfamily Dioctophymatoidea (Nematoda). *Comparative Parasitology* 76:100-104.
2. Koehler, A.V.A., E.P. Hoberg, N.E. Dokuchaev, N.A. Tranbenkova, J.S. Whitman, D.W. Nagorsen and J.A. Cook. 2009. Phylogeography of a Holarctic nematode, *Soboliphymebaturini* among mustelids: Climate change, episodic colonization, and diversification in a complex host-parasite system. *Biological Journal of the Linnean Society* 96:651-663.
3. MacDonald, S.O., E. Waltari, R. Nofchissey, Y. Sawyer, G. Ebel and J. A. Cook. 2009. First records of deermice in southcentral Alaska. *Northwestern Naturalist* 90:243-247.
4. Runck, A., M. Matocq and J.A. Cook. 2009. Historic hybridization and persistence of a novel mito-nuclear combination in red-backed voles (genus *Myodes*). *BMC Evolutionary Biology* 9:114
5. Medina, R.A., F. Torres-Perez, H. Galeno, M. Navarrete, P.A. Vial, R.E. Palma, M. Ferres, J.A. Cook and B. Hjelle. 2009. Ecology, genetic diversity and phylogeographic structure of Andes virus in humans and rodents in Chile. *Journal of Virology* 83:2446-2459.
6. Kang, H.J., S. Bennett, L. Sumbicay, S. Arai, A.G. Hope, G. Mocz, J.-W. Song, J.A. Cook and R. Yanagihara. 2009. Evolutionary insights from a genetically divergent hantavirus harbored by the European common mole (*Talpa europaea*). *PLOS ONE* 4(7): e6149. doi:10.1371/journal.pone.0006149.
7. Galindo, E., L. Broncho, E. Keeley, R. Inouye, S. Galindo, V. Winston, L. Farrell, J. Cook. 2009. Compassion: A hearts-on paradigm for transiting Native American students into a STEM university environment. *Journal of Mathematics and Culture* 4:1-22.
8. Kang, H.J., S. Arai, A. Hope, J.-W. Song, J.A. Cook and R. Yanagihara. 2009. Genetic diversity and phylogeography of Seewis virus in Eurasian common shrew in Finland and Hungary. *Virology Journal* 6:208.

Dunnum, J.L.

1. Dunnum, J.L. 2009. Mammals of South America. Lord, R.D. 2007. Johns Hopkins University Press, Baltimore, Maryland, 198 pp. ISBN 0-8018-8494-2. *Journal of Mammalogy* 90(1):248-249.

Escobedo, Y.

1. MacDonald, SO, E Waltari, RA Nofchissey, YE Sawyer, and JA Cook. 2009. First Record of Deermice (*Peromyscus maniculatus*) in the Copper River Basin Southcentral Alaska. *Northwestern Naturalist*. 90: 243-247.
2. Sawyer, YE, D Banks-Richardson, SO MacDonald, and JA Cook. 2009. Introduction of Exotic Species on Islands: *Peromyscus* Found on Shemya Island of the far western Aleutian Islands of Alaska. *Peromyscus Newsletter*. 44: 27-28.

Malaney, J.

1. Frey, J.K. and J.L. Malaney. 2009. Decline of the Meadow Jumping Mouse (*Zapus hudsonius luteus*) in two mountain ranges in New Mexico. *Southwestern Association of Naturalists*. 54(1):31-44.

C. Web-Based

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

D. Technical Reports

None

E. Theses/Dissertations Completed

1. Dunnum, J. L. 2009. Phylogeny, Evolution and Systematics within the Family Caviidae (Mammalia: Rodentia). Doctoral Dissertation. Texas Tech University.

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

Barker, B

1. **Barker, B.S.**, P.C. Phillips, and S.J. Arnold. A test of the conjecture that G-matrices are more stable than B-matrices. *Evolution*, in press.
2. **Barker, B.S.** and Y.E. Sawyer. *Aspidoscelis tessalatus* (Common Checkered Whiptail) and *Salvadora hexalepis deserticola* (Big Bend Patch-nosed Snake). Ecology; Predation. *Herpetological Review*, in press.

Cook, J. A.

1. Dawson, N. G. and J. A. Cook. In review. Behind the genes: Diversification of North American marten (*Martes americana* and *Martes caurina*). Biology of Marten, S. Buskirk and K. Aubry, eds.
2. Hoberg, E., A.V.A. Koehler, and J. A. Cook. Complex host-parasite systems in Martes: Implications for conservation biology of endemic faunas. Accepted. *In* Biology of Marten, S. Buskirk and K. Aubry, eds.
3. Cook, J. A., and V. Fedorov. 2010. Arctic genetic diversity: heavily shaped by past climate change. Genetic Diversity chapter in Arctic Biodiversity and Climate Change Assessment Highlights, Conservation of Arctic Fauna and Flora Committee. Copenhagen. In press
4. Kang HJ, Arai S, Hope AG, Cook JA, Yanagihara R. 2010. Novel Hantavirus in the Flat-Skulled Shrew (*Sorex roboratus*). Vector Borne Zoonotic Diseases. 2010 Apr 28. [Epub ahead of print]
5. Gonzalez, P., Y. E. Sawyer, M. Avila, A. Armien, B. Armien, J. A. Cook. In Press. Variation in Cytochrome-b Haplotypes Suggests a New Species of *Zygodontomys* (Rodentia: Cricetidae) on Isla Coiba, Veraguas, Panama. *Zoologia*
6. Hope, A. G., E. Waltari, N. E. Dokuchaev, S. Abramov, T. Dupral, H. Henttonen, S. O.

- MacDonald, and J. A. Cook. Accepted. New perspectives on biotic diversification at high latitudes provided by the Eurasian least shrew and Alaska tiny shrew (Soricidae). *Journal of Mammalogy*.
7. Cook, J. A., A. A. Eddingsaas, J. L. Loxterman, S. Ebbert, and S.O. MacDonald. Accepted. Insular ground squirrels of the North Pacific: Indigenous or Exotic? *Journal of Mammalogy*.
 8. Matsumoto, K., J. A. Cook, H. K. Goethert, and S. R. Telford, III. 2010. *Bartonella* sp. infection of voles trapped from an Interior Alaskan site where ticks are absent.
 9. Runck, A.R., M. Matocq, and J. A. Cook. Accepted. Do contact zones evolve over time? A case of readily hybridizing red-backed voles (Genus *Myodes*). *Molecular Ecology*
 10. Esteva, M., F. A. Cervantes, S. V. Brant, and J. A. Cook. Accepted. Molecular phylogeny of long-tailed shrews (genus *Sorex*) from México and Guatemala. *Zootaxa*
 11. Weckworth, B., S. Talbot, J. A. Cook. 2010. Phylogeography of wolves (*Canis lupus*) in the Pacific Northwest. *Journal of Mammalogy*.
 12. Torres-Pérez, F., R. E. Palma, M. Ferres, B. Hjelle, J. A. Cook. 2010. Andes virus infection in the rodent reservoir and in humans varies across contrasting landscapes in Chile. *Infection, Genetics and Evolution*. In press.
 13. Cook, J. A. and S. O. MacDonald. In revision. Island life: Coming to grips with the insular nature of North Pacific Coastal Forests. Chapter in *Conservation of North Pacific Coastal Forests*, G. Orians, J. Schoen, and J. Franklin, eds. Univ. Washington Press.
 14. Torres-Pérez, F., M. Acuna-Retamar, J. A. Cook, A. Bacigalupo, A. García, P. E. Cattán. Submitted. Statistical phylogeography and population dynamics of Chagas disease vector *Triatoma infestans*: testing biogeographic hypotheses of dispersal. *Evolution and Infectious Disease*.
 15. Galbreath, K. E., J. A. Cook, A. A. Eddingsaas, E. G. DeChaine. In revisión. Multi-locus tests of paleodistributional models reveal different facets of the complex demographic history of arctic ground squirrels in Beringia. *Evolution*.

Dunnum, J.L.

1. Dunnum, J.L., and J. Salazar-Bravo. 2010. Molecular systematics, taxonomy and biogeography of the genus *Cavia* (Rodentia: Caviidae). *Journal of zoological systematics and evolutionary research*. In press.
2. Dunnum, J. L., and J. Salazar-Bravo. 2010. Phylogeny, evolution and systematics of the *Galea musteloides* complex (Rodentia: Caviidae). *Journal of Mammalogy*. In press.
3. Dunnum, J. L. Family Caviidae, in *Mammals of South America vol. II Rodents* (James Patton, ed.). University of Chicago Press. Accepted.

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

45. Abraham, Jonathan, Jo Ann Kwong, Cesar G. Albarino, Jiajie G. Lu, Sheli R. Radoshitzky, Jorge Salazar-Bravo, Michael Farzan, Christina F. Spiropoulou, Hyeryun Choe. 2009. Host-species transferrin receptor 1 orthologs are cellular receptors for nonpathogenic New World Clade B Arenaviruses. *PLoS Pathog* 5(4): e1000358.
46. Armien, Aníbal G., Blas Armien, Frederick Koster, Juan M. Pascale, Mario Avila, Publio Gonzalez, Manuel de la Cruz, Yamitzel Zaldivar, Yaxelis Mendoza, Fernando Gracia, Brian Hjelle, Sang-Joon Lee, Terry L. Yates, and Jorge Salazar-Bravo. 2009. Hantavirus Infection and Habitat Associations among Rodent

- Populations in Agroecosystems of Panama: Implications for Human Disease Risk. *Am. J. Trop. Med. Hyg.* 81(1):59-66.
47. Astúa, Diego. 2009. Evolution of Scapula Size and Shape in Didelphid Marsupials (Didelphimorphia: Didelphidae). *Evolution* 63(9):2438-2456.
 48. Bell, Kayce C., David J. Hafner, Philip Leitner and Marjorie D. Matocq. 2009. Phylogeography of the ground squirrel subgenus *Xerospermophilus* and assembly of the Mojave Desert biota. *Journal of Biogeography*, Volume 37(2):363-378.
 49. Belmar-Lucero, Sebastián, Paula Godoy, Marcela Ferrés, Pablo Vial, & R. Eduardo Palma. 2009. Range expansion of *Oligoryzomys longicaudatus* (Rodentia, Sigmodontinae) in Patagonian Chile, and first record of Hantavirus in the region. *Revista Chilena de Historia Natural* 82: 265-275.
 50. Blanga-Kanfi, Shani, Hector Miranda, Osnat Penn, Tal Pupko, Ronald W DeBry and Dorothée Huchon. 2009. Rodent phylogeny revised: analysis of six nuclear genes from all major rodent clades. *BMC Evolutionary Biology* 9:71.
 51. Carleton, Michael D., Louise H. Emmons, and Guy G. Musser. 2009. A New Species of the Rodent Genus *Oecomys* (Cricetidae: Sigmodontinae: Oryzomyini) from Eastern Bolivia, with Emended Definitions of *O. concolor* (Wagner) and *O. mamorae* (Thomas). *American Museum Novitates* 3661 :1-32.
 52. Carraway, Leslie N. 2009. Determining Sex of *Sorex* Shrews (Soricomorpha: Soricidae). *The American Midland Naturalist* 162(1):87-97.
 53. Chung-MacCoubrey, Alice, Heather L. Bateman, and Deborah M. Finch. 2009. Captures of Crawford's Gray Shrews (*Notiosorex crawfordi*) Along the Rio Grande in Central New Mexico. *Western North American Naturalist* 69(2):260-263.
 54. Dragoo, J. W. 2009. Nutrition and Behavior of Striped Skunks. *Veterinary Clinics of North America: Exotic Animal Practice* 12(2):313-326.
 55. Dragoo Jerry W., and Steven R. Sheffield. 2009. *Conepatus leuconotus* (Carnivora: Mephitidae). *Mammalian Species* 827:1-8.
 56. Esselstyn, Jacob A., and Rafe M. Brown. 2009. The role of repeated sea-level fluctuations in the generation of shrew (Soricidae:Crocidura) diversity in the Philippine Archipelago. *Molecular Phylogenetics and Evolution* 53 (2009) 171–181.
 57. Esselstyn, Jacob A., Robert M. Timm, and Rafe M. Brown. 2009. Do Geological or Climatic Processes Drive Speciation in Dynamic Archipelagos? the Tempo and Mode of Diversification in Southeast Asian Shrews. *Evolution* 63(10):2595-2610.
 58. Flores, David A. 2009. Phylogenetic Analyses of Postcranial Skeletal Morphology in Didelphid Marsupials. *Bulletin of the American Museum of Natural History* 320, 81 pp.
 59. Fontanesi, Luca, Lionel Forestier, Daniel Allain, Emilio Scotti, Francesca Beretti, Séverine Deretz-Picoulet, Elena Pecchioli, Cristiano Vernesi, Terence J. Robinson, Jason L. Malaney, Vincenzo Russo and Ahmad Oulmouden. 2009. Characterization of the rabbit agouti signaling protein (*ASIP*) gene: Transcripts and phylogenetic analyses and identification of the causative mutation of the nonagouti black coat colour. *Genomics* doi:10.1016.

60. Frey, Jennifer K. 2009. Genetics of Allopatric Populations of the Montane Vole (*Microtus montanus*) and Mogollon Vole (*Microtus mogollonensis*) in the American Southwest. *Western North American Naturalist* 69(2):215-222.
61. Frey, Jennifer K. 2009. Distinguishing range expansions from previously undocumented populations using background data from museum records. *Diversity and Distributions* 15:183–187.
62. Frey, Jennifer K., Robert D. Fisher, Suzanne C. Peurach. 2009. Capture Locations of Two Endangered Rodents During a 1902 Exploration of the Sacramento Mountains, New Mexico. *Western North American Naturalist* 69(2):267-271.
63. Frey, Jennifer K., Benjamin J. Frey, and Dwight W. Moore. 2009. Karyotypes of the Long-Tailed Vole (*Microtus longicaudus*) in Isolated Mountain Ranges of the American Southwest. *Western North American Naturalist* 69(3):388-390.
64. Frey, Jennifer K., Jason L. Malaney. 2009. Decline of the Meadow Jumping Mouse (*Zapus hudsonius luteus*) in two Mountain Ranges in New Mexico. *The Southwestern Naturalist* 54(1):31-44.
65. Frey, Jennifer K., and James Stuart. Nine-Banded armadillo (*Dasypus novemcinctus*) records in New Mexico, USA. *Edentata* 8-10:54-55.
66. Galbreath, Kurt E., David J. Hafner, and Kelly R. Zamudio. 2009. When cold is better: climate-driven elevation shifts yield complex patterns of diversification and demography in an alpine specialist (american pika, *Ochotona princeps*). *Evolution* 63 (11): 2848 – 2863.
67. Gardner, S.L. 2009. Coccidia (Apicomplexa: Eimeriidae) from the lagomorph *Lepus tolai* From Mongolia. *J Parasitol* 10:1. [Epub ahead of print].
68. Geluso, Keith. 2009. Records of the Yellow-Nosed Cotton Rat (*Sigmodon ochrognathus*) in Southwestern New Mexico. *Western North American Naturalist* 69(4):548-550.
69. Gunderson, Aren M., Brandy K. Jacobsen, and Link E. Olson. 2009. Revised Distribution of the Alaska Marmot, *Marmota Broweri*, and Confirmation of Parapatry with Hoary Marmots. *Journal of Mammalogy* 90(4):859-869.
70. Harding, Larisa E., and Felisa A. Smith. 2009. *Mustela* or *Vison*? Evidence for the taxonomic status of the American mink and a distinct biogeographic radiation of American weasels. *Molecular Phylogenetics and Evolution* 52(3):632-642.
71. Haverkost, Terry R., and Scott L. Gardner. 2009. A Redescription of Three Species of *Monoecocestus* (Cestoda: Anoplocephalidae) Including *Monoecocestus threlkeldi* Based on New Material. *Journal of Parasitology* 95(3):695-701.
72. Hayes, Mark A., Kirk W. Navo, Lea'R. Bonewell, Cyndi J. Mosch, and Rick A. Adams. 2009. Allen's Big-Eared Bat (*Idionycteris phyllotis*) Documented in Colorado Based on Recordings of its Distinctive Echolocation Call. *The Southwestern Naturalist* 54(4):499-501.
73. Henson, Dallas D., and Robert D. Bradley, 2009. Molecular systematics of the genus *Sigmodon*: results from mitochondrial and nuclear gene sequences. *Canadian Journal of Zoology* 87(3):211-220(10).
74. Hortelano-Moncada, Y., F.A. Cervantes, and A. Trjo-Ortiz. 2009. Wild mammals of Reserva Ecologia del Pedregal de San Angel, Ciudad Universaria, UNAM, Mexico, D.F. *Revista Mexicana de Biodiversidad* 80:507-520.

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76. Kingsley, Evan P., Marie Manceau, Christopher D. Wiley, Hopi E. Hoekstra. 2009. Melanism in *Peromyscus* is caused by independent mutations in *agouti*. *PLoS ONE* 4(7): e6435.
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84. McDonough, Thomas J. and Link E. Olson. 2009. First Record of a Least Weasel, *Mustela nivalis*, on the Kenai Peninsula, Alaska. *Northwestern Naturalist* 90(3):256-258.
85. Valdez, Ernest W., Christopher M. Ritzi, and John O. Whitaker, Jr. 2009. Ectoparasites of the Occult Bat, *Myotis occultus* (Chiroptera: Vespertilionidae) *Western North American Naturalist* 69(3):364-370.
86. Valdez, Ernest W., Keith Geluso, Jennifer Foote, Gosia Allison-Kosior, and David M. Roemer. 2009. Spring and Winter Records of the Eastern Pipistrelle (*Perimyotis Subflavus*) in Southeastern New Mexico. *Western North American Naturalist* 69(3):396-398.

87. Valdez, Ernest W. and Paul M. Cryan. 2009. Food Habits of the Hoary Bat (*Lasiurus cinereus*) during Spring Migration through New Mexico. *The Southwestern Naturalist* 54(2):195-200.
88. Voss, Robert S., and Sharon Jansa. 2009. Phylogenetic relationships and classification of didelphid marsupials, an extant radiation of new world Metatherian mammals. *Bulletin of the American Museum of Natural History* 322, 177 pp.
89. Voss, Robert S, Philip Myers, François Catzeflis, Ana Paula Carmignotto, and Josefina Barreiro. 2009. The Six Opossums of Félix de Azara: Identification, Taxonomic History, Neotype Designations, and Nomenclatural Recommendations. *Bulletin of the American Museum of Natural History* 331:406-433.
90. Wolf, Mosheh, Michael Friggens and Jorge Salazar-Bravo. 2009. Does weather shape rodents? Climate related changes in morphology of two heteromyid species. *Naturwissenschaften* 96(1):93-101.

8. ACTIVITIES IN LEARNED SOCIETIES

A. Invited/Plenary Talks and/or Seminars

J.A. Cook

1. "A Variable Demographic History of the Holarctic Tundra Shrew (*Sorex tundrensis*)," 10th International Mammal Congress, Mendoza, Argentina, August 2009.
2. "Distribution Modeling and Statistical Phylogeography of the Western Jumping Mouse (*Zapus princeps*): Admixture vs. Vicariance," 10th International Mammal Congress, Mendoza, Argentina, August 2009.
3. "An Overview of Mammalian Phylogeography in North America," 10th International Mammal Congress, Mendoza, Argentina, August 2009.
4. "Evolutionary Epidemiology of Andes Virus: Bayesian Analyses Reveal Increase in the Number of Infections in Rodents and Humans Congruent with Increase in HCPS Cases," Annual Meeting of the American Society of Tropical Medicine and Hygiene, Washington DC, November 2009.

B. Contributed Talks/Posters

Cook, J.A.

1. Hae Ji Kang, Shannon N. Bennett, Laarni Sumibcay, Satoru Arai, Gabor Mocz, Andrew G. Hope, Jin-Won Song, Joseph A. Cook, Richard Yanagihara. Evolutionary Insights from a Newfound Hantavirus harbored by the European Common Mole (*Talpa europea*). American Society for Virology, Vancouver, July 2009.
2. Speer, K. A., Andrew G. Hope, and Joseph A. Cook. A relict population of shrews in New Mexico provides insight into environmental change. Ecological Society of America, August 2009.
3. Cook, J. A., S. O. MacDonald, N. Dawson, Y. Sawyer. 2009. Insularity along the

- North Pacific: Endemics and Colonizers of the Alexander Archipelago. International Biogeography Society Conference, Merida, Mexico January 2009.
4. Fleming, M. A., & J. A. Cook Genetic differentiation and the evolution of late breeding in coastal mink (*Neovison vison*). American Society of Mammalogists, Fairbanks AK, June 2009.
 5. Bell, K. J. Light, N. Reid, J. Sullivan, J. Cook, and J. R. Demboski. Investigations of pinworms and lice in North American chipmunks. American Society of Mammalogists, Fairbanks AK, June 2009.

Barker, B.

1. **Barker, B.S.**, J.A. Rodríguez, R.B. Waide, J.A. Cook, and V. Aran. 2009. Ecological niche models predict patterns of genetic diversity in Puerto Rico, a component of the Caribbean biodiversity hotspot. Ecological Society of America (ESA) 2009 annual conference, Albuquerque, New Mexico.
2. **Barker, B.S.**, J.A. Rodríguez, R.B. Waide, J.A. Cook, and V. Aran. 2009. Tests of biogeographic hypotheses for diversification in the Puerto Rican frogs, *Eleutherodactylus portoricensis* and *E. antillensis*: Integrating distribution models and phylogeography. American Society for the Study of Ichthyology and Herpetology (ASIH) 2009 annual conference.
3. Montoya, A. and **B.S. Barker**. 2009. Testing biogeographic hypotheses in a Puerto Rican frog, *Eleutherodactylus antillensis*: Integrating distribution models and phylogeography. University of New Mexico Department of Biology Research Day, Albuquerque.

Escobedo, Y.

1. Cook, Joseph A., J Malaney, A Hope, YE Sawyer, N Dawson, and SO MacDonald. 2009. A synthesis of mammalian phylogeography in western North America. The 10th International Mammalogical Congress, Mendoza, Argentina.
2. Sawyer, YE. 2009. Testing the Coastal Refugia Hypothesis: Comparative Phylogeography along the North Pacific Coast. Annual Meetings of the American Society of Mammalogists, Fairbanks, Alaska.
3. Banks-Richardson, David, YE Sawyer, SO MacDonald and JA Cook. 2009. An Introduced Exotic to Shemya Island of the Far Western Aleutian Islands of Alaska. Department of Biology at UNM's 18th Annual Research Day. Albuquerque, New Mexico.
4. Sawyer, YE. 2009. Keen's Deer Mouse: A Complex History and Distribution along the North Pacific Coast. Department of Biology at UNM's 18th Annual Research Day. Albuquerque, New Mexico.
5. Barker, BS, BP Theiling, JC Lopez Pearce, D Swenton-Olson, J Thomas, S Whiteman, K Herrera, D Jaramillo, D Jones, A McCleary, H Yazzie, K Michelson, YE Sawyer, O Shufeldt, S Yurchyk, LJ Crossey and SL Collins. 2009. Increasing Educational Experience in Rural Regions: Bringing STEM Into the Classroom in New Mexico. National Science foundation Graduate Teaching Fellows in K-12 Education Program Annual Meetings – *Celebrating 10 Years*. Renaissance Hotel, Washington, DC.

6. Sawyer, YE, SO MacDonald, and JA Cook. 2009. Historical biogeography of the North Pacific Coast. Darwin's Legacy: A symposium in honor of Charles Darwin's 200th Birthday. University of New Mexico, Albuquerque, New Mexico.
7. Cook, JA, SO MacDonald, N Dawson, and YE Sawyer. 2009. Insularity along the North Pacific: Endemics & Colonizers of the Alexander Archipelago. Biennial Conference of the International Biogeography Society, Merida Mexico.

Hope, A.

1. Holarctic Shrews Provide a Tool for Investigating Rapid Evolution in Response to Environmental Change. Darwin Day Symposium, Department of Biology, UNM, February 2009.
2. A Variable Demographic History of the Holarctic Tundra Shrew (*Sorex tundrensis*). 10 International Mammal Congress, Mendoza, Argentina, August 2009.
3. Hope, A. and JA Cook. Spatiotemporal Demography of the Holarctic Tundra Shrew (*Sorex tundrensis*). American Society of Mammalogists, Fairbanks AK, June 2009.

Malaney, J.

1. Distribution Modeling and Statistical Phylogeography of the Western Jumping Mouse (*Zapus princeps*): Admixture vs. Vicariance. 10th International Mammal Congress, Mendoza, Argentina, August 2009.

Torrez-Perez, F.

1. Torres-Perez, F., J. A. Cook, R. E. Palma, M. Ferres, B.Hjelle. Evolutionary epidemiology of Andes virus: Bayesian analyses reveal increase in the number of infections in rodents and humans congruent with increase in HCPS cases. American Society of Tropical Medicine and Hygiene, Washington, DC. November 2009.

C. Attendance at Professional Meetings

Barker, B.

American Society for the Study of Ichthyology and Herpetology (ASIH) 2009 annual conference.
Ecological Society of America (ESA) 2009 annual conference, Albuquerque, New Mexico.

Cook, J. A.

American Society of Mammalogists, Fairbanks AK, June 10-14, 2009.
International Mammal Congress, Mendoza, Argentina, August 2009.

Escobedo, Y.

American Society of Mammalogists, Fairbanks AK, June 10-14, 2009.
International Mammal Congress, Mendoza, Argentina, August 2009.
Biennial Conference of the International Biogeography Society, Merida Mexico.

Hope, A. G.

American Society of Mammalogists, Fairbanks AK, June 10-14, 2009.
International Mammal Congress, Mendoza, Argentina, August 2009.

Malaney, J.

American Society of Mammalogists, Fairbanks AK, June 10-14, 2009.
International Mammal Congress, Mendoza, Argentina, August 2009.

Torrez-Perez, F.

American Society of Tropical Medicine and Hygiene, Washington, DC.
November 2009.

D. Service as Editor or on Editorial Board of a Journal

Cook, J.A.

Zoologia, September 1, 2008–September 1, 2012.

E. Service as Officer or Professional Society/Organization

Cook, J.A.

Member, Board of Directors, American Society of Mammalogists (elected) 2007-2010.

9. OTHER PROFESSIONAL ACTIVITIES

A. Presentations to General Audience in a Scholarly Capacity

1. Invited Talk, “Island Life: Coming to Grips with the Insular Nature of Southeast Alaska,” Dahlem Conference on Resource Management of Tongass National Forest, Juneau AK, February 2009.

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

None

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

Cook, J.A.

Grant Review Panel, National Science Foundation, March 28–April 2, 2009.

USFWS Species Review, USFWS, May 2009.

External Faculty Review, Kansas State University, July 2009.

External Faculty Review, Cornell University, November 2009.

Member, MSB Executive Committee

Editorial Board, MSB Publications Series

Member, Resolutions Committee, American Society of Mammalogists

Chair, Latin American Scholarship Committee, American Society of Mammalogists

D. Journal Referee

Cook, J.A.

Emerging and Infectious Disease (1)
Journal of Biogeography (1)
Mammalian Species (1)

Dunnum, J.L.

Journal of Mammalogy (1)

E. Hosting Professional Colleagues and Groups

31 visiting academics and professionals from 16 outside institutions visited the collections for research purposes.

Cook personally hosted the following individuals:

Dr. Elena Buzan, University Primorski, Slovenia.
Dr. Enrique Lessa, Universidad Nacional, Montivideo, Uruguay
Dr. Heikke Henttonen, Finnish Forest Research Institute, Metla, Finland
Publio Gonzalez, Gorgas Institute, Panama.

10. SERVICE

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

B. Public Service

General

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

Cook, J. A.

1. Panelist, Carnivore Conservation in the Southwest, sponsored by Wildearth Guardians, Santa Fe NM, September 16, 2009.
2. Faculty Sponsor, UNM Wild Student Organization

Dunnum, J. L.

1. Division tours – provided educational tours and information for visitors and school groups. 207 visitors to collection.
2. Volunteer coach for American Youth Soccer Organization. U11 girls.

Barker, B

1. 2007-2009 National Science Foundation (NSF) GK-12 Fellow, 2007-current, 7th and 8th grade science, Belen Middle School, New Mexico.

11. ADVANCED STUDY, HONORS, AWARDS, FELLOWSHIPS, ETC.

12. DONATIONS AND GIFTS RECEIVED

James Lackey Collection (1700 Specimens)
Tom Jung Yukon/NW Territory collection (900 specimens)
Robert and Virginia Rausch collection material (150 specimens)

13. CURRENT STAFF

A. Faculty/Staff

J.A. Cook, Curator
J.L. Dunnum, Collection Manager
C.A. Ramotnik, USGS Collection Manager
M.A. Bogan, Emeritus Curator
J.S. Findley, Emeritus Curator
Fernando Torres, Post-Doctoral Associate
Stephen O. MacDonald, Curator II
Gordon Jarrell, Cyber Coordinator
Sylvia Brunner, UnO Coordinator

B. Graduate students

Barker, Brittany. 4th year Ph.D. student. Landscape genetics of two frogs from Puerto Rico: *Eleutherodactylus antillensis* and *E. portoricensis*.

Escobedo, Yadeeh. 3rd year Ph.D. Linkage corridors along the North Pacific Coast.

Kavanaugh, John. 1st year Master's student.

Hope, Andrew. Ph.D. Candidate. Comparative phylogeography of trans-Beringian *Sorex*: a tool for investigating geographic and genetic responses to climate change.

Malaney, Jason. 4th Ph.D. student. *Zapus* and *Lepus* historical biogeography and plant herbivore coevolution.

Rearick, Jolene. 3rd year Ph.D. Phylogeography and molecular evolution of freeze tolerance in *Lithobates sylvaticus*.

Thomas, Jason Andrew. 4th year Ph.D. student. Phylogeography of the Sin Nombre virus, */Peromyscus maniculatus/* a coevolutionary relationship.

C. Undergraduate Student Workers and Volunteers

14 undergraduate students

Jamie Raines
Sadie Yurista
David Banks-Richardson
Randle McCain
Eudora Claw
Justin Pichardo
Kyle Crossey
Hiyatsi Bassett
Melissa Picchione
Jennifer Hester
Anthony Becerra
Matt Jones
Victoria Corvino
Kelly Speer

3 high school interns

Joanna Johnson
Aron Kruchoski
Will Kenagy

14. MUSEUM ASSOCIATES

A. Curatorial Associates

James H. Brown, UNM Department of Biology
Jerry W. Dragoo, UNM Department of Biology
William Gannon, UNM Research Ethics
Gabor R. Racz, University of Nebraska Department of Biology

B. Research Associates

J. Scott Altenbach, UNM Department of Biology
Sydney Anderson, American Museum of Natural History, New York
Robert J. Baker, The Museum, Texas Tech University, Lubbock, TX
Troy L. Best, Department of Biology, Auburn University
M. Scott Burt, Kirksville, Missouri
Fernando Cervantes, UNAM, Mexico City, Mexico
Paul J. Cryan, Ft. Collins, Colorado
John Demboski, Denver Museum of Science and Nature, Denver, Colorado
Eugene Fleharty, Oklahoma
Melissa Fleming, Poulsbo, Washington
Jennifer K. Frey, Las Cruces, New Mexico
Scott L. Gardner, Dept. Nematology, Curator, University Nebraska

Keith Geluso, Albuquerque, New Mexico
 Ken Geluso, Lincoln, Nebraska
 Sarah B. George, Director, Utah State Museum
 Gary L. Graham, Texas Parks and Recreation Division
 David J. Hafner, New Mexico Museum Nat. History
 Art Harris, University of Texas, El Paso, Texas
 Bruce Hayward, Silver City, New Mexico
 Heikki Henttonen, Finland
 Edward J. Heske, Illinois Biological Survey
 Erik Hoberg, Beltsville, Maryland
 R. Dewitt Ivey, Retired. Active in Botany, mammals
 Clyde Jones, The Museum Texas Tech University
 Sue Kutz, Saskatoon, Saskatchewan
 Enrique Lessa, Montevideo, Uruguay
 Stephen MacDonald, Silver City, New Mexico
 Michael Mares, Norman, Oklahoma
 Pablo Marquet, Valdivia, Chile
 Rodrigo Medillín, UNAM, Mexico City, Mexico
 Tony R. Mollhagen, Lubbock, Texas
 Gary Morgan, New Mexico Museum Natural History, New Mexico
 Dwight W. Moore, Emporia State University
 Michael J. O'Farrell, Jr., Las Vegas, Nevada
 Thomas J. O'Shea, Ft. Collins, Colorado
 Eduardo Palma, Valdivia, Chile
 Robert Parmenter, Valles Caldera, Jemez, New Mexico
 James L. Patton, Museum of Vertebrate Zoology, Berkeley, California
 Paul J. Polechla, Albuquerque, New Mexico
 Robert Rausch, University of Washington, Seattle
 Brett R. Riddle, University of Nevada, Las Vegas, NV
 Jorge Salazar Bravo, Texas Tech University, Texas
 C. Greg Schmitt, Farmington, New Mexico
 Richard E. Sherwin, Christopher Newport University, Virginia
 Fred Szalay, Los Ranchos de la Rio Grande, New Mexico
 Sandy Talbot, Molecular Ecology Lab- USGS Anchorage, Alaska
 Ernie Valdez, Tijeras, New Mexico
 Alasdair Veitch, Department of Renewable Resources, Norman Wells, NWT, Canada
 Jack Whitman, Alaska Department of Fish and Game – Fairbanks, Alaska
 Don E. Wilson, Smithsonian, Washington, DC

NATURAL HERITAGE NEW MEXICO

1. DIVISION HIGHLIGHTS

In 2009, the Natural Heritage New Mexico Division continued to expand its conservation science activities as well as build its conservation information dissemination capacity. Within the division, there are four working groups: zoology, botany, conservation ecology, and data management. The Zoology Group conducts field research on habitat requirements of animal species of conservation concern in New Mexico and surveys and monitors animal populations around the state. In cooperation with the Navajo Nation and the Hopi Tribe, we completed a remote-sensing survey and population modeling study of Gunnison's prairie dog towns on tribal lands. We also completed a remote-sensing monitoring study of black-tailed prairie dogs in eastern New Mexico for the NM Department of Game and Fish. In cooperation with the National Park Service, we evaluated habitat for threatened and endangered bird species and conducted riparian bird surveys at Pecos National Historical Park. We continued work on a natural resource condition assessment for Pecos NHP and Fort Union National Monument. We completed year two of a three-year, multi-scale habitat study of pinyon-juniper birds on three DOD installations. We began our second year of monitoring grassland birds and raptors at Holloman Air Force Base. We are surveying migrating and breeding wetland birds and revising an operational plan for constructed wetland management at the Lake Holloman Wetland Complex Area.

For the Botany Group (Phil Tonne, Lead), our focus was on two key sensitive species in the state: The Chihuahua scurf pea and Holy Ghost Ipomopsis. The Chihuahua scurf pea is a rare plant in New Mexico's bootheel that is threatened by brush control and proposed activities by the U.S. Border Patrol. We have focused on documenting the sole New Mexico population (one of two recorded globally in recent history) and informing public agencies of its conservation needs. For Holy Ghost Ipomopsis, we partnered with the State Forestry Division and Forest Service to implement critical forest thinning projects in Holy Ghost Canyon, the only natural population of this rare plant. Documenting and implementing management needs such as forest thinning is critical to understanding the habitat needs of this endangered plant.

The Conservation Ecology Group (Esteban Muldavin, Lead; Elizabeth Milford, Riparian Ecologist; and Paul Arbetan, Assoc. Ecologist) initiated a new project with the U.S. Army Corps of Engineers to database and analyze the legacy dataset of the middle Rio Grande Hink and Ohmart ecological studies from the early 1980s, and to complete the re-establishment and rereading of their transects. We tracked down the original field records at Arizona State University and are now entering the data into a relational database in preparation for comparing changes in vegetation composition and structure since the 1980s. We made significant progress on our collaboration with New Mexico Environment Department to develop a "New Mexico Rapid Assessment Method" (NMRAM) for New Mexico's wetlands and riparian areas. The goal of the NMRAM is to develop a tool (handbook) of easily applied metrics to evaluate and rank the ecological

condition and function of wetlands for conservation, restoration, and management. We conducted a scoping meeting and organized an advisory panel to guide the development of the method. We then followed up with an eight-week sampling campaign to collect data on various metrics and test field methods. We also began the development of a wetlands database that will eventually allow web-based data entry of wetland assessments state-wide. As part of Collaborative Forest Restoration Program (USFS) grant, we established a monitoring program for a major post-fire riparian restoration project in the Middle Rio Grande near Belen. Also in the Rio Grande, we completed a study on river bar biodiversity that looked at the interaction of aerial insects, vegetation structure and bird habitat funded by the Middle Rio Grande Bosque Initiative (USFWS). We completed baseline aquatic macroinvertebrate monitoring on the lower reach of the Santa Fe River for the Bureau of Land Management (BLM). This work supplemented our ongoing vegetation monitoring of the reach to aid in adaptive management as grazing is reduced and restoration begun within. For Santa Fe County, we completed a wetlands vegetation map for the Galisteo Watershed to be used as an aid in growth planning. Also, within the riparian program, we collected vegetation-monitoring data along the Pecos River as part of a long-term monitoring project with the Roswell BLM. With respect to our upland projects, we continued the development of vegetation classifications and maps for national parks in the state and west Texas. In 2009, we completed maps for Bandelier National Monument and Salinas Pueblo Missions National Monument and conducted accuracy assessment field campaigns at El Malpais National Monument, Pecos National Historic Park, and Capulin Volcano National Monument. The data collected on national parks will provide a valuable reference dataset for comparing the potential conservation value of other sites around the state. We initiated a new study with the USFWS to evaluate and monitor the effects of planned and unplanned fires in pinyon-juniper woodlands of San Andres National Wildlife Refuge in south-central New Mexico. Lastly, we concluded a project on evaluating prairie chicken habitat in the context of grazing regimes on a private ranch in eastern New Mexico as part of a unique public-private venture funded through the state Landowner Incentive Program of the NM Game & Fish Department.

As part of our service role in the museum to provide conservation information to the broader public as well as for research, the Conservation Data Management Group (Rayo McCollough, Lead; Teri Neville, GIS manager) worked on projects to make conservation data more readily available via the web. We made major improvements and additions to the NMBCC (New Mexico Biodiversity Collections Consortium), <http://nmbiodiversity.org/>. This included updating data, making it available via an international data discovery service, Digir, adding security and administrative functions so collection managers/curators can upload data and change security settings, and adding two different data mapping options. We worked with NatureServe to make our data available via LandScope, a media-rich website that promotes conservation across the USA. We also worked with NatureServe on designing an internet data delivery tool to make Heritage conservation data available to agencies while protecting sensitive data. We provided the Environmental Protection Agency with statewide sensitive species data for their new National Environmental Protection Act (NEPA) tool. We assisted NM Department of Game and Fish with their species characterization database Bison-M,

adding information to their Species of Greatest Conservation Need and working collaboratively with David Lightfoot and Sandra Brantley of the MSB Arthropod division to update arthropod information in Bison-M. We also helped NMDGF build a permits database so they can track their permitting information more efficiently. We helped several federal and state agencies with efforts to gather, database, and analyze all relevant data for several endangered species including the Jemez Mountains salamander, Chiricahua leopard frog, and lesser prairie-chicken. We helped MSB with their web server and helped them transfer and update the MSB and the Undergraduate Opportunities websites. We provided conservation information to the Trust for Public Land for a number of New Mexico conservation projects and participated in a statewide wildlife corridor workshop.

2. TABLE OF COLLECTION USE

Collection Growth (specimens catalogued)	Loans (outgoing)	Loans (incoming)	Visitors	Information Requests Personally Responded to	Publications Citing MSB Specimens
2,243 new records, 570 updated records	NA	NA	9,455 visitors to web site	141 personally, 40,253 publications downloaded	UNKNOWN

3. COURSES USING THE COLLECTIONS

4. COURSES TAUGHT BY MSB PERSONNEL

A. Faculty/Collection Managers

Johnson, K. ARSC 198, Explore the Natural World, Fall 2009, 21 students

B. Staff

None.

5. COLLECTION MANAGEMENT

As part of our service role in the museum to provide conservation data to the broader public as well as for research, in 2009 the Conservation Data Management Group worked on several initiatives to add to our conservation information. We added over 2,000 records and updated another 570 to our NMBiotics database, and we added over 1,100 records to our new Web data-entry database. These combined conservation data sets

were made available to partners via the updated web mapping website for data discovery and analysis. We created an online data-entry website so authorized biologists can enter data from anywhere they have an internet connection. We also worked on several initiatives to build our conservation database (see Section 1). As an outcome of our database activities, we answered 141 information requests.

6. AWARDS, GRANTS, AND CONTRACTS

NHNM AWARDS:

\$64,234. NM Military Affairs Dept. Banner #048765. Biological resource support NMARNG – Protected, threatened, endangered species 2007. **Paul Arbetan**, PI. 09/06-06/09. \$34,259 (F&A \$5,710).

\$60,000. NM Military Affairs Dept. Banner #048772. Biological resource support NMARNG – Protected, threatened, endangered species. **Paul Arbetan**, PI. 09/06-06/09. \$0 (F&A 0).

\$25,000. NM Military Affairs Dept. Banner #048896. Rare, protected, and endangered and threatened species survey for Camel Tracks Training Site; Species monitoring for Grey Vireo. **Paul Arbetan**, PI. 10/07-06/09. \$24,996 (F&A \$4,166).

\$66,150. NM Military Affairs Dept. Banner #048897. Rare, protected, and endangered and threatened species survey for Roswell WETS. **Paul Arbetan**, PI. 10/07-12/10. \$31,918 (F&A \$5,320).

\$50,000. NM Military Affairs Dept. Banner #048898. Rare, protected, and endangered and threatened species survey for Black Mtn. Training Site; Night-blooming Cereus monitoring & surveys. **Paul Arbetan**, PI. 10/07-12/10. \$14,980 (F&A \$2,497).

\$47,000. NM Military Affairs Dept. Banner #04800S. Aplomado falcon habitat survey. **Paul Arbetan**, PI. 02/09-12/10. \$0 (F&A \$0).

\$49,000. NM Military Affairs Dept. Banner #04800T. Environmental assessment, grey vireo monitoring, Gunnison's prairie dog survey. **Paul Arbetan**, PI. 02/09-12/10. \$7,125 (F&A \$1,188).

\$50,000. Army Corps of Engineers. Banner #04800V. Pinyon jay surveys at Kirtland AFB. **Kristine Johnson**, PI. 03/09-12/10. \$75,330 (F&A \$11,219).

\$120,436. Bureau of Reclamation. Banner #048710. Water requirements for SW willow flycatcher habitat and nesting at the Pueblo of Isleta. **Kristine Johnson**, PI. 05/06-04/09. \$10,269 (F&A \$1,278).

\$40,000. Dept. of Defense. Banner #04800C. Raptor surveys at Holloman AFB. **Kristine Johnson**, PI. 01/09-09/11. \$10,881 (F&A \$2,511).

\$85,000. Dept. of Defense. Banner #04800D. Grassland bird surveys at Holloman AFB. **Kristine Johnson**, PI. 01/09-09/11. \$20,475 (F&A \$4,725).

\$117,494. Dept. of Defense. Banner #04800P. Habitat use by pinyon-juniper birds. **Kristine Johnson**, PI. 03/09-09/10. \$75,330 (F&A \$11,219).

\$110,000. Dept. of Defense. Banner #04801C. Management, Wetlands/Floodplain. **Kristine Johnson**, PI. 04/09-04/12. \$9,237 (F&A \$2,132).

\$54,452. T.E. Parkinson Ranch. Banner #048840. Wildlife habitat improvement of the Parkinson Ranch. **Kristine Johnson**, PI. 07/07-03/10. \$22,120 (F&A \$0).

\$47,900. NPS. Banner #048918. Indicator species at Pecos Nat'l. Historic Park. **Kristine Johnson**, PI. 04/08-07/10. \$13,271 (F&A \$1,976).

\$94,340. NPS. Banner #048962. Natural resource condition assessment for Pecos Nat'l. Historic Park. **Kristine Johnson**, PI. 09/08-11/10. \$35,553 (F&A \$5,295).

\$143,915. Navajo Nation. Banner #048821. DOQ survey of Gunnison's prairie dog towns on the Navajo Nation & Reservation of the Hopi Tribe. **Kristine Johnson**, PI. 07/07-03/10. \$19,474 (F&A \$4,018).

\$72,400. NM Dept. of Game and Fish. Banner #048960. Remote-sensing monitoring of black-tailed prairie dogs. **Kristine Johnson**, PI. 08/08-06/10. \$40,452 (F&A \$5,767).

\$10,000. Bureau of Land Management. Banner #048974. Biological resource data collection and storage 08-09. **Rayo McCollough**, PI. 09/08-10/09. \$9,995 (F&A \$1,489).

\$9,999. NatureServe. Banner #04802T. Handheld field inventory and mapping tools. **Rayo McCollough**, PI. 10/09-8/10. \$2,399 (F&A \$495).

\$62,443. NM Dept. of Game and Fish. Banner #048946. Information for species of greatest conservation need project. **Rayo McCollough**, PI. 07/08-06/10. \$20,934 (F&A \$2,539).

\$16,700. NM Dept. of Game and Fish. Banner #04801K. Abstracts for species of greatest conservation need. **Rayo McCollough**, PI. 05/09-05/10. \$10,363 (F&A \$1,727).

\$18,000. NM Environment Dept. Banner #04801W. NM rapid assessment database – final requirements. **Rayo McCollough**, PI. 07/09-10/10. \$8,752 (F&A \$1,459).

\$20,000. BLM. Banner #048945. Pecos River riparian monitoring study. **Esteban Muldavin**, PI. 07/08-10/09. \$14,527 (F&A \$2,164).

\$65,000. BLM. Banner #04802Q. Santa Fe River vegetation map. **Esteban Muldavin**, PI. 10/09-09/12. \$14,527 (F&A \$2,164).

\$30,000. BLM. Banner #04802P. Pinyon-juniper woodlands and bird diversity in Wild Rivers Recreation Area. **Esteban Muldavin**, PI. 10/09-10/11. \$0 (F&A \$0).

\$10,000. BOR. Banner #048855. Albuquerque overbank project monitoring. **Esteban Muldavin**, PI. 09/07-09/11. \$0 (F&A \$0).

\$91,453. Middle Rio Grande Conservancy District. Banner #048980. Post-fire bosque restoration in the middle Rio Grande: a landscape-scale approach towards revitalization of an ecosystem. **Esteban Muldavin**, PI. 10/08-06/11. \$29,274 (F&A \$2,661).

\$224,097. NPS. Banner #048546. Vegetation map for El Malpais Nat'l. Monument. **Esteban Muldavin**, PI. 08/04-09/09. \$44,562 (F&A \$5,812).

\$31,500. NPS. Banner #048623. White Sands Nat'l. Monument vegetation map accuracy assessment. **Esteban Muldavin**, PI. 07/05-6/10. \$456 (F&A \$59).

\$323,547. NPS. Banner #048637. Guadalupe Mountains Nat'l. Park vegetation map and classification. **Esteban Muldavin**, PI. 07/05-07/10. \$49,062 (F&A \$6,400).

\$152,363. NPS. Banner #048721. Vegetation map for Petroglyphs Nat'l Monument. **Esteban Muldavin**, PI. 06/06-03/11. \$11,845 (F&A \$1,414).

\$40,400. NPS. Banner #048628. Carlsbad Caverns Nat'l. Park vegetation map accuracy assessment. **Esteban Muldavin**, PI. 07/05-3/09. \$3,307 (F&A \$431).

\$16,000. NPS. Banner #048842. Map tamarisk park-wide – White Sands Nat'l. Monument. **Esteban Muldavin**, PI. 09/07-01/10. \$3,795 (F&A \$565).

\$69,928. NPS. Banner #048847. Monitoring long-term vegetation dynamics in Big Bend Nat'l. Park. **Esteban Muldavin**, PI. 09/07-12/10. \$19,380 (F&A \$2,886).

\$65,472. NPS. Banner #048819. Vegetation mapping at Capulin Volcano NM & Pecos NHP. **Esteban Muldavin**, PI. 05/07-04/10. \$31,160 (F&A \$4,707).

\$94,674. NPS. Banner #048697. Capulin Volcano NM & Pecos NHP vegetation mapping. **Esteban Muldavin**, PI. 04/06-06/09. \$8,951 (F&A \$1,168).

\$31,206. NPS. Banner #048957. Vegetation classification and map of Ft. Davis Nat'l. Historic Site. **Esteban Muldavin**, PI. 08/08-06/10. \$11,758 (F&A \$1,751).

\$7,020. NPS. Banner #048969. Preliminary GIS hearth maps for White Sands Nat'l Monument. **Esteban Muldavin**, PI. 10/08-07/10. \$5,913 (F&A \$881).

\$16,000. NPS. Banner #048842. Map tamarisk park-wide – White Sands Nat'l. Monument. **Esteban Muldavin**, PI. 09/07-01/10. \$3,772 (F&A \$562).

\$31,920. NPS. Banner #048963. Evaluating vegetation response to prescribed fire at San Andres Nat'l. Wildlife Refuge. **Esteban Muldavin**, PI. 09/08-09/12. \$17,754 (F&A \$2,316).

\$14,900. NPS. Banner #04801H. Plant species inventory and herbarium specimen verification, Petroglyph Nat'l. Monument. **Esteban Muldavin**, PI. 05/09-01/12. \$0 (F&A \$0).

\$2,475. NPS. Banner #04802G. Supplemental work to improve vegetation mapping for three SOPN parks. **Esteban Muldavin**, PI. 07/09-06/10. \$1,290 (F&A \$192).

\$61,425. NPS. Banner #04802H. Pinyon-juniper restoration monitoring. **Esteban Muldavin**, PI. 10/09-09/12. \$0 (F&A \$0).

\$31,184. NPS. Banner #04802J. Development of vegetation classification and map for Ft. Davis Nat'l. Historic Site. **Esteban Muldavin**, PI. 09/09-01/12. \$0 (F&A \$0).

\$199,957. NM Environment Dept. Banner #048929. Rapid assessment of riverine wetlands in the upper Rio Grande watershed. **Esteban Muldavin**, PI. 05/08-09/11. \$179,175 (F&A \$0).

\$25,778. Santa Fe County. Banner #048961. Galisteo Watershed: Wetlands for the Santa Fe Growth Management Strategy. **Esteban Muldavin**, PI. 08/08-06/09. \$18,174 (F&A \$3,750).

\$32,970. U.S. Fish & Wildlife Service. Banner #048893. Middle Rio Grande bosque initiative web page database and GIS. **Esteban Muldavin**, PI. 09/07-09/10. \$4,828 (F&A \$996).

\$10,000. BLM. Banner #048954. Kuenzler surveys. **Phil Tonne**, PI. 05/09-10/09. \$9,995 (F&A \$1,489).

\$10,000. BLM. Banner #04802R. Pediomelum pentaphyllum surveys. **Phil Tonne**, PI. 10/09-10/11. \$0 (F&A \$0).

\$28,000. NM Energy, Minerals & Natural Resources Dept.. Banner #048951. Endangered plants survey and recovery. **Phil Tonne**, PI. 07/08-06/09. \$22,900 (F&A \$3,817).

\$16,800. NM Energy, Minerals & Natural Resources Dept.. Banner #04801Z. Holy Ghost Ipomopsis 2009-10. **Phil Tonne**, PI. 08/09-06/10. \$7,738 (F&A \$1,290).

\$9,000. NM Energy, Minerals & Natural Resources Dept.. Banner #04802W. Endangered plants recovery. **Phil Tonne**, PI. 12/09-06/10. \$0 (F&A \$0).

\$25,800. U.S. Forest Service. Banner #048972. Development of native plant materials program. **Phil Tonne**, PI. 09/08-09/13. \$0 (F&A \$0).

PUBLICATIONS

A. Books, Book Chapters, Edited Volumes

None.

B. Journal Articles

Cervantes, Sandy D., **P. Tonne**, R. Govindarajulu, P. Alexander, and C. D. Bailey. 2010. Population genetic analysis of *Argemone pleiacantha* subsp. *pinnatisecta* (Sacramento Prickly Poppy, Papaveraceae) and re-evaluation of its taxonomic status. Botanical Research Institute of Texas. **In Press**.

Muldavin, E. H., G. Harper, P. Neville, and S. Wood (2009). A Vegetation classification of the Sierra del Carmen, U.S.A. and Mexico. Proceeding of the Fifth Annual Chihuahuan Desert Symposium. Chihuahuan Desert Research Institute, Alpine TX.

Romme, W.H., C. D. Allen, J. D. Bailey, W. L. Baker, B. T. Bestelmeyer, P.M. Brown, K. S. Eisenhart, M. L. Floyd Hanna, D.W. Huffman, B. F. Jacobs, R. F. Miller, **E. H. Muldavin**, T.W. Swetnam, R. J. Tausch, P. J. Weisberg. 2009. Historical and Modern Disturbance Regimes, Stand Structures, and Landscape Dynamics in Piñon-Juniper Vegetation of the Western U.S. Rangeland Ecology and Management 62:203-222.

Xia, Y., D.I. Moore, S.L. Collins, and **E.H. Muldavin**. 2009. Aboveground production and species richness of annuals in Chihuahuan Desert grassland and shrubland plant communities. J. of Arid Environments 74:378-385.

C.

Web-Based

D. Technical Reports

Milford, E., E. Muldavin, P. Arbetan, and K. Mann. 2009. River Bar Biodiversity Studies: Aerial Insects, Vegetation Structure, and Bird Habitat. Final Report to the Middle Rio Grande Bosque Initiative, U.S. Fish and Wildlife Service. Natural Heritage New Mexico Publ. No. 09-GTR-347

Teel., W., E. Muldavin, K. Johnson, T. Neville, Y. Chauvin, and P. Neville. 2009. Wildlife Habitat Improvement of the Parkinson Ranch, Milnesand, New Mexico. Final report to

New Mexico Game and Fish Department, Landowner Incentive Program under Cooperative Agreement #07-516-0000-I5T104.

Tonne, P. 2009. Lee's Pincushion Cactus (*Coryphantha sneedii* var. *leei*) Five-Year Review; Summary and Evaluation. USFWS Albuquerque, NM.

Tonne, P. 2009. Sneed's Pincushion Cactus (*Coryphantha sneedii* var. *sneedii*) Five-Year Review; Summary and Evaluation. USFWS Albuquerque, NM

Tonne, P. 2009. Bosque Ecosystem Monitoring Program - Vegetation 2009. Natural Heritage New Mexico Publ. No. 09-GTR-349. Natural Heritage New Mexico, University of New Mexico, Albuquerque, NM. 21 p.

E. Theses/Dissertations Completed

F. Work In Progress

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

8. ACTIVITIES IN LEARNED SOCIETIES

A. Invited/Plenary Talks and/or Seminars

B. Contributed Talks/Posters

S. Wondzell, E. Muldavin,, and J.A. Ludwig. 2009. Fifty years of Woodland Dynamics, Chisos Mountains, Big Bend National Park, Texas. Poster: Ecological Society of America-Albuquerque, NM 2009 Annual meeting.

C. Attendance at Professional Meetings (List division personnel alphabetically then list meetings attended under each)

R. McCollough: NatureServe National Conference at Gettysburg, PA, Wildlife Corridors Information Sharing and Needs Workshop, Albuquerque, NM.

E. Muldavin: Ecological Society of America-Albuquerque, NM 2009 Annual meeting.

D. Service as Editor or on Editorial Board of a Journal

None

E. Service as Officer of Professional Society/Organization

None

9. OTHER PROFESSIONAL ACTIVITIES

A. Presentation to General Audience in a Scholarly Capacity

E. Milford. Progress report on New Mexico Rapid Assessment Methodology for the New Mexico Wetlands Roundtable.

P. Tonne: Poster presentation at the Rio Grande Botanic Garden for Earth Day.

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

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

E. Muldavin: Collaborative Forest Restoration Program Federal Advisory Board,
Ecological Society of America Vegetation Panel

K. Johnson: NM Prairie Dog Working Group

P. Tonne: Rare Plant Technical Council

E. Milford: New Mexico Wetlands Roundtable

New Mexico Environmental Flows Workshop

D. Journal Referee

K. Johnson: Auk

E. Muldavin: Madrono, Ecosystems

E. Hosting Professional Colloquia and Groups

10. SERVICE

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

The New National Vegetation Classification Standard: an introduction to the system with field applications and training (E. Muldavin, Lead). Ecological Society of America Workshop, Albuquerque, NM 2009 Annual meeting.

B. Public Service

P. Tonne: Docent training in rare plant conservation, Rio Grande Botanic Garden, Albuquerque, NM.

11. ADVANCED STUDY, HONORS, AWARDS, FELLOWSHIPS, ETC.

12. DONATIONS AND GIFTS RECEIVED

13. CURRENT STAFF

A. Faculty/Staff

Paul Arbetan, Research Assistant Professor
Yvonne Chauvin, Sr. Research Tech/Life Sciences
Charles Jackson, Research Tech/Life Sciences
Kristine Johnson, Research Associate Professor
Rebecca Keeshen, Office Administrator
Rayo McCollough, Database Administrator
Elizabeth Milford, Research Scientist III
Esteban Muldavin, Research Associate Professor
Teri Neville, GIS Analyst
Jacqueline Smith, Sr. Research Tech/Life Sciences
Phil Tonne, Sr. Research Scientist I

B. Graduate students

Brandon Lee Drake, M.S.
Annette Evangelisti, Ph.D.
Amanda Kennedy, M.S.
Keith Woodell, M.A.
Sri Harsha Reddy Yenumula, M.S.

C. Undergraduate Student Workers and Volunteers

Jenny Alsup
Matthew Baumann
Katie Carillo
Anthony Fettes
Bryant Flores
Hugh Hulse
Brian Kramer
Eric Lindahl
Olivia Nunez
Kari Paustian
Desiree Quinones-Soria
James Tabinski
Matthew Wilder
Cole Wolf
Mary Alice Root, Volunteer

14. MUSEUM ASSOCIATES

None

DIVISION OF PARASITES

1. DIVISION HIGHLIGHTS

Establishing the Division as an official division of the MSB

2. TABLE OF COLLECTION USE

Specimens Accessioned	Loans (outgoing)	Loans (incoming)	Visitors	Information Requests	Publications Citing MSB Specimens
10	0	0	0	0	2

3. COURSES USING THE COLLECTION

None

4. COURSES TAUGHT BY MSB PERSONNEL

A. Faculty/Collection Managers

Loker, E.S. 490 Biology of infectious organisms

5. COLLECTION MANAGEMENT

This division is still in its development stages. A plan was formulated to curate the Rausch collection

6. AWARDS, GRANTS, AND CONTRACTS

R01 AI024340 Loker (PI) 3/1/2006 – 2/28/2011
NIH/NIAID *Biology of Trematode-Snail Associations*

R03 TW008127 Loker (PI) 08/01/2008 – 04/30/2011
NIH/Fogarty International Center
Evo-epidemiology of Schistosoma mansoni in children in Kenya

P20 RR 018754 Loker (PI) 9/30/2003 – 5/31/2014
NIH/NCRR *COBRE: Center for Evolutionary and Theoretical Immunology*

7. PUBLICATIONS

A. Books, Book Chapters, Edited Volumes

None.

B. Journal Articles

Agola LE, Steinauer ML, Mburu DN, Mungai BN, Mwangi IN, Magoma GN, Loker ES, Mkoji GM. 2009. Genetic diversity and population structure of *Schistosoma mansoni* within human infrapopulations in Mwea, central Kenya assessed by microsatellite markers. *Acta Tropica* 111: 219-225.

Aragon AD, Imani RA, Blackburn VR, Cupit PM, Melman SD, Goronga T, Webb T, Loker ES, Cunningham C. 2009. Towards an understanding of the mechanism of praziquantel. *Molecular and Biochemical Parasitology* 164: 57-65.

Brant SV, Loker ES. (2009b). Molecular systematics of the avian schistosome genus *Trichobilharzia* (Trematoda: Schistosomatidae) in North America. *Journal of Parasitology* 95: 941-963.

Hanelt, B, Brant SV, Steinauer ML, Maina GM, Kinuthia JM, Agola LE, Mwangi IN, Mungai BN, Mutuku MW, Mkoji GM, Loker ES. (2009a). *Schistosoma kisumuensis* n. sp. (Digenea: Schistosomatidae) from murid rodents in the Lake Victoria Basin, Kenya and its phylogenetic position within the *S. haematobium* species group. *Parasitology* 136: 987-1001.

Hanelt B, Steinauer ML, Mwangi IN, Maina GM, Agola LE, Mkoji GM, Loker ES. 2009b. A new approach to characterize populations of *Schistosoma mansoni* from humans: development and assessment of microsatellite analysis of pooled miracidia. *Tropical Medicine and International Health* 14: 322-331.

Brant SV, Loker ES. (2009a). Schistosomes in the southwest United States and their potential for causing cercarial dermatitis or 'swimmer's itch. *Journal of Helminthology* 83: 191-198.

Melman SD, Steinauer ML, Cunningham C, Kubatko LS, Mwangi IN, Wynn NB, Mutuku MW, Karanja DMS, Colley DG, Black CL, Secor WE, Mkoji GM, Loker ES. 2009. Reduced susceptibility to praziquantel among naturally occurring Kenyan isolates of *Schistosoma mansoni*. *PLoS Neglected Tropical Diseases* 3: e504.

Steinauer ML, Hanelt B, Agola LE, Mkoji GM, Loker ES. 2009. Genetic structure of *Schistosoma mansoni* in western Kenya: The effects of geography and host sharing. *International Journal for Parasitology* 39: 1353-1362.

Zhang SM, Nian H, Wang B, Loker ES, Adema CM. 2009. Schistosomin from the snail *Biomphalaria glabrata*: expression studies suggest no involvement in trematode-mediated castration. *Molecular and Biochemical Parasitology* 165: 79-86.

C. Web-Based

None.

D. Technical Reports

None.

E. Theses/Dissertations Completed

None.

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

Brant SV, Cohen AN, James D, Hui L, Hom L, Loker ES. 2010. Cercarial dermatitis transmitted by an exotic marine snail. *Emerging Infectious Diseases* (IN PRESS).

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

None.

8. ACTIVITIES IN LEARNED SOCIETIES

A. Invited/Plenary Talks and/or Seminars

B. Contributed Talks/Posters (*presenter)

C. Attendance at Professional Meetings

Loker, E. S. November 2008 American Society of Tropical Medicine and Hygiene, Washington D.C. USA

Brant, S.V. November 2008 American Society of Tropical Medicine and Hygiene, Washington D.C. USA

D. Service as Editor or on Editorial Board of a Journal

None.

E. Service as Officer of Professional Society/Organization

None.

9. OTHER PROFESSIONAL ACTIVITIES

A. Presentation to General Audience in a Scholarly Capacity

None.

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

None.

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

D. Journal Referee

Loker, E. S. Journal of Helminthology

Brant, S. V. Comparative Parasitology, Journal of Invertebrate Pathology, Journal of Wildlife Disease, Journal of Parasitology, and ZooTaxa

E. Hosting Professional Colleagues and Groups

None.

10. SERVICE

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

None.

B. Public Service

None.

11. ADVANCED STUDY, HONORS, AWARDS, FELLOWSHIPS

None.

12. DONATIONS AND GIFTS RECEIVED

13. CURRENT STAFF

A. Faculty/Staff

Eric S. Loker, Regent's Professor, Curator

Sara Brant, Research Assoc. Professor, Collection Manager

B. Graduate Students

Ramesh Devkota

C. Undergraduate Student Workers and Volunteers

None.

14. MUSEUM ASSOCIATES

A. Research Associates

U.S. GEOLOGICAL SURVEY

1. DIVISION HIGHLIGHTS

Integration of the U.S. Geological Survey (USGS) collection of fishes into the Museum of Southwestern Biology (MSB) Division of Fishes was completed in January. This tremendous effort provided us the opportunity to conduct a 100% inventory, upgrade the taxonomy of scientific names, and improve the physical storage condition of 265,000 (4,683 lots) Federal specimens of fishes. The work was completed by 2 full-time USGS contractors with oversight by the MSB fish and USGS collection managers. Integration of Federal mammals into the MSB Division of Mammals is 32% complete and we anticipate the completion of this activity in the summer of 2010.

Curatorial responsibility between USGS and the divisions of fishes, amphibians and reptiles, birds, and mammals is shared by reviewing and processing specimen loans and information requests. In addition, the Curator Emeritus and collection manager attend numerous MSB meetings throughout the year. USGS provides service to Department of Interior agencies on museum issues by way of museum tours, giving oral and written technical assistance on museum issues, and responding to annual National Park Service museum inventories.

Cindy Ramotnik and Adrienne Raniszewski participated in the Putnam Science Carnival, an annual science event in Ft. Collins, Colorado for elementary level kids and their parents. A variety of Federal, state, and local groups showcase their scientific endeavors. Ramotnik and Raniszewski represented the USGS Fort Collins Science Center and introduced the wonders of natural history collections to 325 kids. As a member of the New Mexico Endemic Salamander Team, Ramotnik attended several meetings and conducted one site visit to evaluate forest activities that impact salamanders. She traveled to Yale University in September to participate on two sessional committees of the Society for the Preservation of Natural History Collections-- Best Practices and Federal Scientific Collections.

Ernie Valdez, a USGS wildlife biologist and Research Associate of MSB, together with biologists from the USGS Fort Collins Science Center (FORT) and Pacific Island Ecosystems Research Center (PIERC) completed a final report on the assessment of the current status and natural history of the Pacific sheath-tailed bat on the islands of Aguihan and select areas of Tinian. This report was followed by a draft manuscript written, containing key items related to the Pacific sheath-tailed bat. Fecal samples of the sympatric Mariana swiftlet were analyzed to compare with the findings of the Pacific sheath-tailed bat diet. These results were written up as a manuscript for submission. Valdez published four bat-related papers in three journals, with topics ranging from morphology, food habits, ectoparasites and new records of occurrence. In addition to preparing two manuscripts for submission from the Pacific sheath-tailed bat report, he is preparing and assisting with two additional manuscripts, with one related to diets of hoary bats at wind turbine facilities and the other on the bats of Mesa Verde National

Park. Valdez has stepped down as co-chair of the New Mexico Bat Working Group, but continues to maintain a bat news and information website for the group. He continues his studies on ectoparasites, food habits, and morphology of bats of the region and in 2009 assisted graduate students from Canada and California, who were studying migration of the hoary bat in New Mexico.

Janet Ruth, a USGS Research Ecologist/Ornithologist, was the lead author on an article published in the Proceedings of the Partners in Flight International Conference in McAllen, TX – *Partners in Flight Research Needs Assessment Summary*. Ruth is completing the final report on a three-year project with the University of Southern Mississippi that used NEXRAD radar data to document bird migration patterns and stopover habitat in the Southwest, and will develop a manuscript for publication in a peer-reviewed scientific journal. Ruth also received the first year of funding from Bureau of Land Management – NLCS program – for research on the breeding ecology of the Arizona Grasshopper Sparrow (*Ammodramus savannarum ammoregus*), and conducted the first year of field data collection. She also received funding from the USGS Quick Response Program to conduct a synthesis of information about bird-related projects (research, monitoring, conservation, and education/outreach) in semidesert grasslands and pine-oak woodlands. The project is being conducted in collaboration with the Sonoran Joint Venture, the Rio Grande Joint Venture, the Playa Lakes Joint Venture, and the Intermountain West Joint Venture. Ruth attended national meetings of the Partners in Flight (PIF) Implementation Committee and the PIF Federal Agency Committee as the USGS Coordinator for PIF (northern Virginia, March 2009) and Austin, Texas (September 2009). In addition, she attended meetings of the international PIF Science Committee in Mexico City, Mexico (February 2009), Port Rowan, Ontario, Canada (July 2009), and Austin, Texas (September 2009), working as a co-author on a tri-national document on conservation of landbirds for PIF (to be released in May 2010).

Mike Bogan, Curator Emeritus of the USGS collection, and Tony Mollhagen, MSB Research Associate, continued their work in the collection by verifying identifications of vespertilionid bats in the MSB collection. Bogan also assisted the integration effort by verifying identifications of some Neotamias in the collection. Bogan and Mollhagen continued their resurvey of the bats of Dinosaur National Monument in northwestern Colorado. This effort is aimed at acquiring current information on numbers of species and individuals by mist-netting at historic localities so that current and historic data on bats from the original survey in the 1980s can be compared. Work in 2009 concentrated on netting in the river corridors using rafts to travel from site to site. The work is funded by the National Park Service with funds administered by the NPS Colorado Plateau Cooperative Ecosystems Studies Unit to the University of New Mexico. The Final Report is due in early 2010.

2. TABLE OF COLLECTION USE

Specimens catalogued	Loans (outgoing)	Loans (incoming)	Visitors	Information Requests	Publications Citing MSB-USGS Specimens
348	5	0	See MSB	85	4

3. COURSES USING THE COLLECTIONS

See MSB Divisions.

4. COURSES TAUGHT BY MSB/USGS PERSONNEL

A. Faculty/Collection Managers

None.

B. Graduate Students

A.E. England-BIOL 203L - Ecology and Evolution Lab, Spring 2009, 23 students.

5. COLLECTION MANAGEMENT

The USGS cataloged 348 specimens of fishes and mammals in 2009, primarily from Federal lands (national parks and national wildlife refuges) in the southwest United States. Staff reviewed 35 loan and information requests, and 50 requests for technical information regarding pest control, specimen identification, and museum supplies. Outreach activities included tours of the collections to 5 groups and an interview in the UNM Daily Lobo newspaper on natural history collections. In addition, Cindy Ramotnik and Adrienne Raniszewski traveled to Fort Collins, Colorado to participate in the Putnam Science Carnival, an annual science event for elementary level kids and their parents. Cindy and Adrienne displayed examples of natural history specimens and introduced 325 kids to the wonders and uses of natural history collections. Staff assisted 9 researchers with use of the collection, and provided 20 specimens of an endangered fish to a researcher from FWS to test for mercury and selenium in museum specimens collected before 1967. Federal specimens were included in 5 outgoing loans: 2 tissue loans (1 mammal and 5 amphibians); 3 loans of voucher specimens (19 mammals) and one loan return.

Physical integration of the USGS fish collection started in August 2008 and was completed in January 2009. Two full-time USGS contractors accomplished the work with some assistance from a volunteer and the USGS collection manager. Oversight was provided by the MSB fish and USGS collection managers. The effort involved a 100% inventory of the USGS fishes, and allowed us to proof the specimen data in the electronic database against the handwritten museum catalog, and incorporate current taxonomy. In the process, we went through ten 55-gallon drums of 99% isopropyl alcohol, and printed and inserted new thermal labels for all USGS specimens. The federal specimens are primarily from the Colorado and Missouri River drainages, and included approximately

30 taxa new to the MSB collection. In the process, we generated nearly 4,500 surplus jars, primarily 8- and 12-ounce bail-type glass jars that were donated to the New Mexico Museum of Natural History and the Colorado State University Larval Fish Laboratory.

Integration of Federal mammals into the MSB Division of Mammals is 32% complete. Since May 2009, on-the-ground integration efforts have been led by USGS employee Adrienne Raniszewski who works with MSB staff to simultaneously integrate the Federal collection and a collection of 32,700 specimens of mammals formerly at the University of Illinois Museum of Natural History. In addition to physically handling and rearranging approximately 15,000 specimens since May, staff have updated taxonomy and corrected specimen data in the Arctos database, and printed and installed new box, vial, drawer, and case labels. By the time integration is complete, the entire collection will have been reorganized as part of an overall goal to match the physical arrangement with the current taxonomic authority.

In addition to integration activities, we continue to conduct routine collection management activities such as cleaning and numbering skeletons, integrated pest management, and entering specimen data into the Arctos database.

6. AWARDS, GRANTS, AND CONTRACTS

Faculty and Staff:

\$23,400. National Park Service, Dinosaur NM. A resurvey of the bats of Dinosaur National Monument. **M.A. Bogan** and T.R. Mollhagen, Co-PIs. 05/08-05/10. \$11,700.

\$150. UNM, BGSA, GRAC Travel Grant, Conference registration. **A. England.** Fall 2009.

\$2,200. USGS, Fort Collins Science Center. Supplies for Integration of USGS vertebrate collections. **C.A. Ramotnik**, PI. 2009. \$2,200.

\$20,000. USGS Headquarters, Reston, VA. Funds for radar workshop and subsequent publications and activities of the collaborative. **J.M. Ruth**, P.I. 02/06-09/09. \$10,000.

\$25,000. Bureau of Land Management, National Landscape Conservation System program, Washington, D.C. Breeding ecology of the Arizona Grasshopper Sparrow (Year 1), **J.M. Ruth**, P.I. 7/09 – 6/10. \$25,000.

\$25,000. USGS Quick Response Program, Reston, VA. Avian research, monitoring and conservation work in southwestern semidesert grasslands and pine-oak woodlands – a synthesis. **J.M. Ruth**, P.I. 10/09 – 9/11. \$25,000.

7. PUBLICATIONS

A. Books, Book Chapters, Edited Volumes

Ruth, J.M. and K.V. Rosenberg. 2009. Partners in Flight research needs assessment summary. Pp. 23-33 in Tundra to tropics: connecting birds, habitats and people (T.D. Rich, C. Arizmendi, D.W. Demarest, and C. Thompson, eds.). Proceedings of the Fourth International Partners in Flight Conference, McAllen, TX.

B. Journal Articles

Smith, F.A., D. Crawford, L. Harding, H.M. Lease, I.W. Murray, **A. Raniszewski**, and K.M. Youberg. 2009. A tale of two species: evolution, extirpation and range expansion during the late Quaternary in an extreme environment. *Global and Planetary Change*, 65: 122-133.

Valdez, E. W., and M. A. Bogan. 2009. Does variation in cranial morphology of *Myotis occultus* (Chiroptera: Vespertilionidae) reflect a greater reliance on certain prey types? *Acta Chiropterologica*, 11: 443-450.

Valdez, E. W., and P. M. Cryan. 2009. Migration and food habits of the hoary bat (*Lasiurus cinereus*) during spring in New Mexico. *The Southwestern Naturalist*, 54: 195-200.

Valdez, E. W., C. M. Ritzi, and J. O. Whitaker, Jr. 2009. Ectoparasites of the occult bat, *Myotis occultus* (Chiroptera: Vespertilionidae). *Western North American Naturalist*, 69: 364-370.

Valdez, E. W., K. Geluso, J. Foote, G. Allison-Kosior, and D. M. Roemer. 2009. Spring and winter records of the eastern pipistrelle (*Perimyotis subflavus*) in southeastern New Mexico. *Western North American Naturalist*, 69: 396-398.

C. Web-Based

Ruth, J.M. Ongoing. Serves as the content webmaster for the following websites:
Partners in Flight – U.S. website (national) <http://www.partnersinflight.org>
New Mexico Ornithological Society <http://www.nmbirds.org>

D. Technical Reports

Bogan, M.A. and T.R. Mollhagen. 2009. A resurvey of the bats of Dinosaur National Monument. Annual Report on 2008 activities submitted to the National Park Service.

E. Theses/Dissertations Completed

None.

F. Work In Progress

Bogan, M.A., and T.R. Mollhagen. A resurvey for bats at Dinosaur National Monument, Colorado-Utah. Final Report to National Park Service.

England, A.E. Spatial-use patterns of the Mexican long-nosed bat, *Leptonycteris nivalis*, in Big Bend National Park. Journal of Mammalogy.

Mollhagen, T.R., and **M.A. Bogan**. The bats of the Chinati Mountains State Wildlife Area, Texas. Occasional Papers, The Museum, Texas Tech University, Lubbock, TX.

O'Shea, T. J., P. M. Cryan, E. A. Snider, **E. W. Valdez**, L. E. Ellison, and D. J. Neubaum. Bats of Mesa Verde National Park, Colorado: Faunal Composition, Reproduction, and Roosting Habits. Western North American Naturalist.

Valdez, E. W., G. J. Wiles, and T. J. O'Shea. Diets of the sympatric Pacific sheath-tailed bat (*Emballonura semicaudata rotensis*) and Mariana swiftlet (*Aerodramus bartschi*) on Aguiguan, Mariana Islands. Pacific Science.

Valdez, E. W., and P. M. Cryan. Feeding habits and mortality of the hoary bat at wind turbine facilities.

Wiles, G. J., T. J. O'Shea, D. J. Worthington, J. A. Esselstyn and **E. W. Valdez**. Status and natural history of the last known population of *Emballonura semicaudata rotensis*. Acta Chiropterologica

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

Chung-MacCoubrey, A., H.L. Bateman, and D.M. Finch. 2009. Captures of Crawford's gray shrews (*Notiosorex crawfordi*) along the Rio Grande in central New Mexico. Western North American Naturalist 69(2):260-263.

Goebel, A.M., T.A. Ranker, P.S. Corn, and R. G. Olmstead. 2009. Mitochondrial DNA evolution in the *Anaxyrus boreas* species group. Molecular Phylogenetics and Evolution 50(2): 209-225.

Valdez, E. W., and M. A. Bogan. 2009. Does variation in cranial morphology of *Myotis occultus* (Chiroptera: Vespertilionidae) reflect a greater reliance on certain prey types? Acta Chiropterologica, 11: 443-450.

Valdez, E.W., K. Geluso, J. Foote, G. Allison-Kosior, and D.M. Roemer. 2009. Spring and winter records of the eastern pipistrelle (*Perimyotis subflavus*) in southeastern New Mexico. *Western North American Naturalist* 69(3): 396-398.

8. ACTIVITIES IN LEARNED SOCIETIES

A. Invited/Plenary Talks and/or Seminars

None.

B. Contributed Talks/Posters

England, A.E. 2009. Habitat use of the Greater Long-nosed Bat, *Leptonycteris nivalis*, in Big Bend National Park. Poster presented at 18th Annual Research Day, Department of Biology, University of New Mexico, Albuquerque, NM.

England, A.E. 2009. Landscape use of the greater long-nosed bat, *Leptonycteris nivalis*, in Big Bend National Park, Texas. Poster presented at 94th Ecological Society of America Annual Meeting, Albuquerque, NM.

England, A.E. 2009. Resource use of the greater long-nosed bat, *Leptonycteris nivalis*, in Big Bend National Park, Texas. Oral presentation, 39th Annual North American Symposium on Bat Research, Portland, OR.

C. Attendance at Professional Meeting

England, A.E. Ecological Society of America Annual Meeting, Albuquerque, NM.

England, A.E. North American Symposium on Bat Research, Portland, OR.

Ruth, J.M. Annual meeting of the New Mexico Ornithological Society, Los Alamos, April.

D. Service as Editor or on Editorial Board of a Journal

Ramotnik, C.A. Associate Editor, *Collection Forum* (Society for the Preservation of Natural History Collections).

E. Service as Officer of Professional Society/Organization

Ramotnik, C.A. Society for the Preservation of Natural History Collections (SPNHC): Conservation Committee (Chair, Resources Subcommittee); member of the following standing committees: Documentation, Membership, and Publication; Sessional committee

on Federal Scientific Collections.

Ruth, J.M. New Mexico Ornithological Society, Board Member.

Valdez, E.W. Co-Chair of New Mexico Bat Working Group.

9. OTHER PROFESSIONAL ACTIVITIES (List division personnel alphabetically and in **bold** with list of other professional activities under each)

A. Colloquium Presentations

None.

B. Presentation to General Audience in a Scholarly Capacity

Ruth, J.M. 2009. Winter Sparrow Identification. Invited workshop at Audubon Appleton-Whittell Research Ranch, Elgin, AZ., November.

Ruth, J.M. 2009. Abundance and distribution of Arizona Grasshopper Sparrow: current and historical surveys. Invited presentation at Audubon Appleton-Whittell Research Ranch, Elgin, AZ, November.

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

None.

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

Bogan, M.A. Member, MSB Executive Committee.

Ramotnik, C.A. Member, New Mexico Endemic Salamander Team.

Ruth, J.M. USGS Partners in Flight (PIF) Coordinator; Chair of PIF National Research Working Group; Member of PIF Science Committee and PIF Implementation Committee; Steering Committee Member, New Mexico Avian Conservation Partners.

E. Journal Referee

Bogan, M.A. The Southwestern Naturalist (2), and Western North American Naturalist (1).

Ramotnik, C.A. USGS Administrative Report (1).

Ruth, J.M. Wilson Journal of Ornithology (1); Southwestern Naturalist (1); Rangeland Ecology and Management (1).

F. Hosting Professional Colleagues and Groups

Dr. C. Richard Tracy, University of Nevada, Reno.

10. SERVICE

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

England, A. Research Day Committee, 17th Annual Research Day, Department of Biology, University of New Mexico, Albuquerque.

B. Public Service

Bogan, M.A. Member, Technical Advisory Group, Corrales Bosque Advisory Commission, Corrales, NM.

England, A.E. Member, UNM Building Space Committee, Research Day Committee, and Biology Graduate Students Association.

England, A.E. Graduate Research Allocations Committee (GRAC) grants reader, Spring 2009.

Ramotnik, C.A. Participated in the Albuquerque Christmas Bird Count.

Ruth, J.M. Participated in the Albuquerque Christmas Bird Count. Annually conducts/participates in two Breeding Bird Survey routes – Counselors, NM and Fence Lake, NM.

Ruth, J.M. Member, Technical Advisory Group and Member, Corrales Bosque Advisory Commission, Corrales, NM.

11. ADVANCED STUDY, HONORS, AWARDS, FELLOWSHIPS, ETC.

Bogan, M.A. Served as Faculty Co-Advisor for one doctoral candidate in the Department of Biology, UNM.

Ruth, J.M. Took UNM class on bird specimen preparation taught by Andy Johnson (MSB); prepared 9 bird specimens.

12. DONATIONS AND GIFTS RECEIVED

None.

13. CURRENT STAFF

A. Faculty/Staff

Michael A. Bogan – Curator Emeritus

Cindy A. Ramotnik – Museum Specialist (Zoology)

Adrienne Raniszewski – Museum Technician

Janet M. Ruth – Research Ecologist (Ornithology), Adjunct Assistant Professor (UNM)

Ernest W. Valdez—Wildlife Biologist, Adjunct Assistant Professor (UNM)

B. Graduate students

Angela E. England—Wildlife Biologist, Ph.D. candidate

C. Undergraduate Student Workers and Volunteers

Jobette Chour, volunteer

14. MUSEUM ASSOCIATES

A. Curatorial Associates

None.

B. Research Associates

Paul Cryan, Ph.D., USGS wildlife research biologist, Ft. Collins, CO.

Keith Geluso, Assistant Professor, University of Nebraska-Kearney, NE.

Tony R. Mollhagen, Ph.D., emeritus professor, Texas Tech Univ., Lubbock, TX.

Tom O'Shea, Ph.D., USGS wildlife research biologist, Ft. Collins, CO.

Ernest Valdez, Ph.D., USGS wildlife research biologist, Albuquerque, NM.