

# Annual Report 2023



Biodiversity Research and Teaching Collections  
Department of Ecology and Conservation Biology  
Texas A&M University  
College Station, TX

*Interdisciplinary research, international collaboration, species discovery, collections growth, dissemination of results, and educating the next generation of conservation biologists.*

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## Executive Summary

The Biodiversity Research and Teaching Collections (BRTC) continues to be staffed with two staff Curators (Hibbitts and Prestridge) and four Faculty Curators (Conway, Fitzgerald, Light, and Voelker). One adjunct faculty Curator (Wicksten) and one Emeritus Curators (Arnold) were active in the collections in 2023 (Arnold working remotely). The collections continue to grow in both number and diversity: the Collection of Fishes added a total of 13,860 specimens divided across 1,060 lots. The total number of specimens in this collection is now 892,120, divided across 62,558 lots; The Collection of Amphibians and Reptiles added 1,088 specimens into the collection that now totals 110,181 specimens. The Collection of Birds added 1,446 specimens, bringing the total number of bird specimens to 31,304. A total of 1,446 specimens were added to the Collection of Mammals bringing the total number of mammal specimens to 68,572.

Material accessioned in 2023 included specimens from multiple localities throughout the state of Texas and the Gulf of Mexico but international material from Botswana. Specimens were borrowed by researchers in support of a variety of projects, totaling 62 loans of material, including both domestic and international loans. We hosted 24 research visitors on-site who utilized specimens from the collections in support of their research. Curators and students of the BRTC published 16 peer-reviewed articles in 2023, and 36 peer reviewed papers citing BRTC specimens were published. These articles appeared in a variety of journals, including *Vertebrate Zoology*, *Molecular Phylogenetics and Evolution*, *Conservation Genetics*, *Journal of Herpetology*, and others.

Projects supported by the National Science Foundation, Texas Parks and Wildlife Department, United States Geological Survey, Department of Defense, and others continue to provide significant support for enhancing the collections and research activities. Curators actively engaged numerous graduate students as Advisors or Committee members in research projects that aid in the curation of the collections and utilize specimens and/or genetic resources. Internships, directed studies, and writing intensive opportunities (ECCB 484/485/285) were offered in all divisions in 2023, with 3 students receiving credit. Students and community members continued to engage in collections improvement projects that included specimen preparation and conservation. The number of volunteers grew to include upwards of 40 individuals (including graduate and undergraduate students alongside community volunteers). Utilizing departmental and extramural funding, the BRTC employed 6 undergraduate students on a part-time basis in 2023 to assist with museum curation and research projects.

We hosted laboratory classes for eight ECCB courses during spring and fall semesters (ECCB 401- Mammalogy, ECCB 402- Ornithology, ECCB 311- Ichthyology, ECCB 315- Herpetology, ECCB 316 Field Herpetology, ECCB 302- Diversity and Evolution of the Vertebrates, ECCB 314/614- Biology of Gulf Coast Fishes. Collectively these labs provided education in biodiversity and related sciences for nearly 600 students. These courses were taught by BRTC faculty curators, with primarily ECCB graduate students serving as teaching assistants. Material from the research collections was made available to supplement the existing teaching collections. We also provided resources and space for sessions of three other courses: BIOL 430- Biological Imaging, VIBS 413/607- Introductory/Applied Epidemiology and ENTO/VIBS 426/636- Methods in Vector-borne Disease Ecology and 'Outbreak' One Health (TAMU-UTMB-UTRGV).

## Curatorial Staff 2023

Kevin W. Conway, Faculty Curator of Fishes  
Lee A. Fitzgerald, Faculty Curator of Reptiles and Amphibians  
Toby J. Hibbitts, Curator of Reptiles and Amphibians  
Jessica E. Light, Faculty Curator of Mammals  
Heather L. Prestridge, Curator  
Gary Voelker, Faculty Curator of Birds  
Mary K. Wicksten, Faculty Curator of Marine Invertebrates

## Emeritus Curators 2023

Keith A. Arnold, Faculty Curator Emeritus of Birds  
John D. McEachran, Faculty Curator Emeritus of Fishes

## Mission Statement

Texas A&M University's Biodiversity Research and Teaching Collections (BRTC) are dedicated to the curation of vertebrate specimens and their data in support of education, research, and conservation. The BRTC enhances collaborative and global reach through sharing digitized data sets broadly and publicly, welcoming use of our data and specimens in developing new understandings through research. Furthermore, the BRTC's mission is to support the Department of Ecology and Conservation by providing an interactive hands-on venue and resources for graduate and undergraduate research, education, and job training to prepare and grow the next generation in conservation scientists who will be able to assume roles in leadership, responsibility, and service to society.

## Vision Statement

Texas A&M University's Biodiversity Research and Teaching Collections vision is to be a world-class natural history collection that supports Texas A&M University and the Department of Ecology and Conservation Biology's unified visions of advancing interdisciplinary research, elevating graduate and professional education, and engaging with Texas and beyond to enhance our impact.

## Collections Activity

### Collection of Fishes

The Collection of Fishes incorporated 14 accessions of new material in 2023, representing 13,860 specimens divided across 1,060 lots. The total number of specimens in this collection is now 892,120, divided across 62,558 lots. Our collection now represents 4,113 species of fishes, from 1,608 genera and 372 families. Several species previously unrepresented in the collection were added in 2023 (Table 1). This includes for example, 28 species from Botswanan (collected by alumni of the Winemiller lab), two rare species of percid from Texas (added as a result of TX Comptroller funded survey work in the Neches and Sabine drainage), magnificent specimens of Speckled hind (a grouper) donated via the Portnoy Lab at TAMU-CC, and one species of loach discovered and described by Faculty Curator of Fishes Conway in 2023 (Figure 1).



Figure 1 The Rosy loach, *Physoschistura mango* a tiny new species of loach fish from Myanmar described by Conway & Kottelat (2023). The figure shows the same individual (TCWC 20684.01) photographed before (above) and after (below) preservation.

Table 1 - Species new to the Collection of Fishes at the Biodiversity Research and Teaching Collections 2023.

| Order              | Family           | Species                             | Common Name           |
|--------------------|------------------|-------------------------------------|-----------------------|
| Osteoglossiformes  | Mormyridae       | <i>Marcusenius macrolepidotus</i>   | Bulldog               |
| Osteoglossiformes  | Mormyridae       | <i>Pollimyrus castelnaui</i>        | Dwarf stonebasher     |
| Cypriniformes      | Cyprinidae       | <i>Enteromius afrovernayi</i>       | Spottail barb         |
| Cypriniformes      | Cyprinidae       | <i>Enteromius bifrenatus</i>        | Hyphen barb           |
| Cypriniformes      | Cyprinidae       | <i>Enteromius fasciolatus</i>       | Red Barb              |
| Cypriniformes      | Cyprinidae       | <i>Enteromius haasianus</i>         | Sickle-fin barb       |
| Cypriniformes      | Cyprinidae       | <i>Enteromius poechii</i>           | Dashtail barb         |
| Cypriniformes      | Cyprinidae       | <i>Enteromius radiatus</i>          | Beira barb            |
| Cypriniformes      | Nemacheilidae    | <i>Physoschistura mango</i>         | Rosy loach            |
| Characiformes      | Distichodontidae | <i>Nannocharax multifasciatus</i>   | Multibar citharine    |
| Characiformes      | Alestiidae       | <i>Brycinus lateralis</i>           | Striped robber        |
| Characiformes      | Hepsetidae       | <i>Hepsetus cuvieri</i>             | Southern African pike |
| Siluriformes       | Clariidae        | <i>Clarias ngamensis</i>            | Blunttooth catfish    |
| Siluriformes       | Clariidae        | <i>Clarias theodora</i>             | Snake catfish         |
| Siluriformes       | Mochokidae       | <i>Synodontis macrostoma</i>        | Largemouth squeaker   |
| Siluriformes       | Mochokidae       | <i>Synodontis nigromaculatus</i>    | Spotted squeaker      |
| Cyprinodontiformes | Procatopidae     | <i>Lacustricola katangae</i>        | Striped topminnow     |
| Cyprinodontiformes | Procatopidae     | <i>Micropanchax johnstoni</i>       | Johnson's topminnow   |
| Perciformes        | Serranidae       | <i>Epinephelus drummondhayi</i>     | Speckled hind         |
| Perciformes        | Percidae         | <i>Etheostoma thompsoni</i>         | Gumbo darter          |
| Perciformes        | Percidae         | <i>Percina apristis</i>             | Guadalupe darter      |
| Perciformes        | Cichlidae        | <i>Coptodon rendalli</i>            | Redbreast tilapia     |
| Perciformes        | Cichlidae        | <i>Oreochromis macrochir</i>        | Greenhead tilapia     |
| Perciformes        | Cichlidae        | <i>Pharyngochro acuticeps</i>       | Zambezi river bream   |
| Perciformes        | Cichlidae        | <i>Pseudocrenilabrus philander</i>  | Southern mouthbrooder |
| Perciformes        | Cichlidae        | <i>Sargochromis carlottae</i>       | Rainbow bream         |
| Perciformes        | Cichlidae        | <i>Sargochromis codringtonii</i>    | Dusky bream           |
| Perciformes        | Cichlidae        | <i>Serranochromis macrocephalus</i> | Thinface largemouth   |
| Perciformes        | Cichlidae        | <i>Serranochromis macrocephalus</i> | Purpleface largemouth |
| Perciformes        | Cichlidae        | <i>Serranochromis thumbergi</i>     | Brownspot largemouth  |
| Perciformes        | Cichlidae        | <i>Tilapia ruweti</i>               | Okavango tilapia      |
| Perciformes        | Cichlidae        | <i>Tilapia sparrmanii</i>           | Banded tilapia        |

During 2023, the Collection of Fishes facilitated a total of 20 traditional loans to both national and international researchers, including those affiliated with the University of Florida, University of North Texas, Rice University, Texas A&M – Corpus Christi, National Museum of Science and Nature (Japan), Pukyong National University (Republic of China), School of Biological, Earth and Environment (Australia), and others. Specimen data from the Collection of Fishes continues to be broadly discoverable via several web portals including VertNet.org, iDigBio.org, gbif.org and was updated on December 4, 2023. Other portals, including the Fishes of Texas, Fishnet2 and GGBN, continue to host cached data from the Collection of Fishes. Our CT datasets are available on Morphosource and this year marked the end of the NSF funded oVert Project. One student worker was supported with funds from the NSF oVert project and three students were supported

with funds from a current NSF CSBR project. Six undergraduate students volunteered and 3 student workers contributed to collections improvement and maintenance in 2023.

### Notable Research Visits to the Collection of Fishes in 2023

In 2023 the Collection of Fishes hosted numerous on-site visitors, including researchers from Rice University (Evans Lab) and the University of Houston - Clear Lake (Oakley Lab), and one graduate student from the School of Biological, Earth and Environment, Sydney (Australia).

### Fishes 2023 Projects

#### *CSBR: Crucial upgrades to specimen storage, organization, and database management at the Texas A&M Collection of Fishes (Conway and Prestridge)*

This project, funded by the National Science Foundation, aims to: (1) re-organize the Texas A&M Collection of Fishes to achieve an overall more efficient use of a limited collections area, with adequate space to enable future growth; (2) secure the future of valuable oversized (10–14') specimens that are currently housed in a container that is inadequate and failing; and (3) complete crucial and long overdue data management platform upgrades that will enable not only more efficient basic data management but enhance our ability to provide complete records for our extended specimens (e.g. those with images, media, field notes). These activities will rejuvenate our infrastructure available for fundamental ichthyological education, unique research, and discovery at Texas A&M University and regionally.

In 2023, 3 undergraduate student workers and 4 volunteers continued to work on integrating all cataloged material into the collection in preparation of supplies arriving for wholesale reorganization. Supplies for large specimen tanks have been ordered and Prestridge has engaged with the Specify community to understand the process of migrating database platform to occur soon.

#### *TX-FISH-DNA: A Regionally-Focused DNA Barcode Interface to Enhance Identification and Monitoring of the Freshwater, Estuarine, and Marine Fishes of Texas (Conway and Voelker)*

In collaboration with Dr. David Portnoy (TAMU-CC), Dr. Gary Voelker (TAMU), and researchers from TPWD inland fisheries (Dr. Preston Bean) and TPWD Coastal Fisheries (Dr. Joel Anderson), Dr. Conway is developing a regionally focused tissue bank and DNA barcode database for the ichthyofauna of TX. This database will fuel regional DNA-based research on freshwater, estuarine, and marine fishes (e.g., standard barcoding, metabarcoding, eDNA) by providing access to expert verified tissues and mitochondrial DNA sequences associated with voucher specimens housed in the Collection of Fishes. Part one (estuarine and marine fishes) of this ambitious project has already been funded by TPWD and a grant proposal to support part two (freshwater fishes) was submitted in 2023. This project involves both undergraduate and graduate student researchers and could potentially result in >1,500 high quality voucher specimens (associated with photographs and tissues) being added to the collection.

#### *TX Comptroller: Surveys of Freshwater Fishes Inhabiting the Neches and Sabine River Drainages of Texas (Conway)*

In collaboration with Drs Joshua Perkin (TAMU, PI) and Carmen G. Montaña (Stephen F. Austin University, co-PI), Dr. Conway is aiding surveys of freshwater fishes inhabiting the Neches and Sabine River drainages of Texas. This project is funded by the TX Comptroller and aims to compare historical survey data (compiled in the 1950s) to that of contemporary data compiled from recent surveys conducted by the research team. All material generated by this project will be deposited within the Collection of Fishes. We predict that >100,000 specimens will be generated as a result of project

activities, helping the Collection of Fishes surpass the important milestone of **1 million specimens by 2025**.

*TCN: oVert Open Exploration of Vertebrate Diversity in 3D (Conway, Potvin, Prestridge)*

The NSF supported oVert (openVertebrate) Thematic Collection Network (TCN) will generate and serve high-resolution digital three-dimensional data for internal anatomy across vertebrate diversity. As the scanning center for large specimens, we will contribute data to the network of digitization centers across the United States, which aim to CT-scan >20,000 fluid-preserved specimens (representing >80% of the living genera of vertebrates). This will provide broad coverage for exploration and research on all major groups of vertebrates. This collection of digital imagery and three-dimensional volumes will be open for exploration, download, and use to address questions related to the discovery of new species, documenting patterns of anatomical diversity and growth, and testing hypotheses of function and evolution. Previous reports from the oVert project can be found here:

<https://www.morphosource.org/About/report>



## Collection of Amphibians and Reptiles

In 2023, the Collection of Amphibians and Reptiles catalogued 1,088 specimens into the collection that now totals 110,181 specimens. Most recent accessions originated in Texas. Specimens were donated by faculty members, staff, current and former students, and research collaborators. Our collection currently contains 2,506 species in 114 families. The Division of Amphibians and Reptiles hosted 6 research visitors and processed a total of 8 loans to institutions including: Whittier College, Texas A&M University, University of Texas Austin, Oklahoma State University, Ohio State University, University of New Mexico, Los Angeles County Museum, and Purdue University. The collection database was queried frequently through the online museum database VertNet, and specimen images were accessed at Morphosource. We also fulfilled requests by photographing specimens and measuring specimens for outside researchers. In this way, we have reduced the risks of mailing and transporting irreplaceable specimens around the globe. These requests are important, especially for researchers in foreign countries in which it is difficult to send physical specimens. We are continuing to catalog specimens from the West Texas A&M University collection that was acquired with an NSF grant. Three volunteers worked in the herp range in 2023. Their main tasks were cataloging specimens from WTAMU. The herp division fields numerous requests for information, we are regularly interviewed by news outlets, and we receive more and more requests for photos of specimens.



Figure 2 - ECCB 316 Field Herpetology class in the field near Port Mansfield, Texas. Photo by: Toby J. Hibbitts

## Amphibians and Reptiles Projects 2023

*Camp Swift, Camp Bowie, Camp Maxey and Fort Wolters Herptile Planning Level Survey.* Texas Military Department, Wade Ryberg, Danielle Walkup, and Toby Hibbitts \$139,987

*Characterizing genetic structure and survival of the Western Chicken Turtle (*Deirochelys reticularia miaria*) in Texas to guide population management.* Texas Parks and Wildlife Department. Roel Lopez, Wade Ryberg, Danielle Walkup, and **Toby Hibbitts** \$150,000

*Houston Toad Recovery, Houston Zoo.* Roel Lopez, Wade Ryberg, Danielle Walkup, and **Toby Hibbitts**. \$65,000

*Effects of range management on the Plateau Spot-tailed Earless Lizard.* Texas Parks and Wildlife Department. Roel Lopez, Wade Ryberg, Danielle Walkup, and **Toby Hibbitts** \$149,026

*Habitat suitability modeling for the Houston Toad (*Anaxyrus houstonensis*).* Texas Parks and Wildlife Department. Roel Lopez, Wade Ryberg, Danielle Walkup, and **Toby Hibbitts** \$100,000

*Quantifying benefits of well site selection to avoid disturbance of shinnery oak dunes and to limit landscape fragmentation across the geographic range of the dunes sagebrush lizard.* **Lee Fitzgerald**, Burak Gunalp, Inci Gunalp 2022-2024 \$23,660

*Impacts Of Road Development On Biodiversity.* Texas A&M University T3 Triads for Research. Burak Gunalp, Amanda Stronza, **Lee Fitzgerald** 2021-2024 \$30,000

*Long-term monitoring of the Louisiana Pinesnake (*Pituophis ruthveni*).* Texas Parks and Wildlife Department. Roel Lopez, Wade Ryberg, Danielle Walkup, Josh Pierce, James Childress, and **Toby Hibbitts** \$163,905

*ESA Mitigation Credits at Eglin Air Force Base – Gopher Tortoise Translocation.* Department of Defense. Roel Lopez, Wade Ryberg, Danielle Walkup, and **Toby Hibbitts** \$406,350

*Surveys and habitat management for reptiles and amphibians at Laughlin Air Force Base post salt cedar eradication.* Department of Defense. Roel Lopez, Wade Ryberg, Danielle Walkup, and **Toby Hibbitts** \$61,026

*Endemic Peninsular and Insular Reptiles in Baja California.* Faculty Development Leave Research **Lee Fitzgerald**

## Collection of Birds

In 2023, the Collection of birds accepted 25 accessions of new material, adding 1,446 bird specimens to the collection. The total number of catalogued specimens in the collection is now 31,304. Taxonomically, the collection now represents 1,716 species, 798 genera, and 164 families. Data for all specimens was refreshed on the VertNet and iDigBio portals on 4 December 2023. A total of 234 traditional information requests were processed. Domestic fieldwork was conducted in the trans-Pecos region of Texas at Cibolo Creek Ranch (Presidio County) and Desert Door Ranch (Terrell County) and the Hill Country (Edwards County).

Because of our continued role in the statewide Lights Out conservation initiative, the Collection of Birds again received large numbers of salvage specimens from all major metropolitan areas, including several rare specimen records for Texas (e.g., American Pipit). Samples from the Lights Out materials have been shared with researchers from the Schubot Center for Avian Health (TAMU Vet School), the University of Texas – San Antonio, and the Harris County Health Department. In 2023, the Collection of Birds was awarded funding from the Innovation X program at Texas A&M to support work with Lights Out specimens, engage students, and produce an exhibit. The exhibit was installed in the Reynolds Gallery in the Memorial Student Center at Texas A&M University and attracted sponsorship dollars from HEB, Wild Spirit Wild Places, Defenders of Wildlife, Audubon Texas and Titos Vodka. In association with the exhibit, we hosted a Lights Out partners meeting and collections open house with leadership from Texan By Nature, Audubon Texas, Defenders of Wildlife, Texas Conservation Alliance and others.

We continue to maintain an active salvage network, with material being deposited by rehabilitation centers including the Friends of Texas Wildlife, Amos Rehabilitation Keep (ARK – Port Aransas, TX), Gulf Coast Wildlife Rehab (Brazoria, TX), and Southlake Animal Hospital (Southlake, TX). This salvage network continues to provide the collection with specimens that we would not otherwise have access to, such as raptors and owls. An important addition were 22 specimens representing 5 species of shearwaters all recovered in the course of a few days near Port Aransas (Figure 3).



*Figure 3 - Recent Shearwater specimens added to the Collection of Birds in 2023.*

Twenty-one loans were made to various institutions including 2 international loans and 3 loans of tissues for genetic or other analysis (microplastics/rodenticide studies). The Collection of Birds hosted seven on-site research scientists working on topics covering behavior, plumage, systematics and disease ecology.

We continued to rotate specimens through the Forsyth Gallery on a monthly basis in support of their "[Treasures From The Vault](#)" section, wherein rare artifacts are displayed. Numerous specimens from the research collection were used to support the teaching of ECCB 402 (Ornithology) and ECCB 302 (Diversity and Evolution of the Vertebrates) labs. In 2023 the Collection of Birds hosted three community science organizations for tours through the collection and included Travis Audubon, TMN Brazos Valley, TMN El Camino Real chapter.

The Collection of Birds continues to see a strong interest by a diverse group of students and community volunteers willing to assist with specimen preparation and curation on a weekly basis; and as of 2022, undergraduates had the opportunity to earn credit for their role in specimen preparation and curation duties. In 2023 our volunteer group included 11 undergraduates, 4 graduate students, and 3 community volunteers. In total, this group prepared 1,120 specimens for the Collection of Birds. One graduate student was supported with departmental funding to prepare specimens over the summer.

### Birds 2023 Projects

#### *Avian Malaria*

Voelker's lab is investigating the distribution and prevalence of avian malaria across Africa (D.R. Congo, Benin, Malawi and South Africa) and most recently in Europe. Several papers have been published in this research focus area, with the most recent papers published in 2022 in *Diversity* and in 2023 in *Parasitology Research*. In addition, we are proceeding with analyses of avian malarial communities in Texas and the sky islands of northern Mexico (Graduate student dissertation focus), and from Armenia (Graduate student dissertation focus); a recent paper focused on avian malaria in the Davis Mountains of west Texas was just published in *Parasitology*.

#### *Lights Out Texas*

In late 2020, the BRTC engaged with a group to promote a statewide effort to promote dark buildings during peak bird migration. The twofold approach includes educating business owners and city managers about the importance of keeping their buildings and cities dark during peak migration and engaging with volunteers at the local level to conduct surveys. Casualties that are found on survey routes become specimens at the BRTC. In 2023, Curators Prestridge and Voelker again represented the BRTC at the Texan by Nature Conservation summit and continued conversations about long-term partnerships with non-profit organizations and industry that can support the preparation and digitization of these specimens.

#### *Microbiomes*

With Dr. Sergei Drovetski (USGS), we are assessing microbiome variation in Bobwhite and Scaled Quail, Northern Mockingbirds, Golden-fronted Woodpeckers and Northern Cardinals. Specimens are collected in "clean sites" versus sites in heavy cotton production regions. We are assessing the taxonomic profiles of the microbiome, as well as the virulome, resistome and functional gene expression. This is accomplished through high throughput sequencing of the metagenome, transcriptome, and metabolome. Our first sampling for this project was in June of 2021, and additional sampling was

conducted in June of 2022. We anticipate publishing a paper on mockingbird microbiomes soon. This project is also the basis for the dissertation of a Ph.D. student in Voelker's lab.

#### *Phylogeography and systematics of Eurasian birds*

Voelker's lab is working in collaboration with Dr. Sergei Drovetski (USGS) and Italian Colleagues Drs. Marco Pavia, Irene Pellegrino and Giovanni Boano (University of Torino, University of Piemonte Orientale, and Natural History Museum of Carmagnola, respectively) on the phylogeography and systematics of selected bird species, for which they have extensive samples from Europe and Russia. Material from our recent expeditions to Sardinia and Sicily have provided new comparative material that will 1) allow us to assess the validity of described subspecies, and 2) provide additional localities for our ongoing assessments of biogeographic patterns and lineage diversification in birds distributed across known glacial refugia. Several papers have been published over the past few years, with the most recent being published in *The European Zoological Journal* in 2022.

#### *Phylogeography of African arid-lands birds*

With colleagues at UC-Berkley and Oklahoma State University, Voelker is investigating how genetic variation (if present) in a suite of bird species is distributed across southern African arid-lands, in the context of geography and historical climate change patterns. This work was initiated as part of an NSF funded collaborative project, and further collaborative funding is being sought. In addition to research products, this project has also generated over 1,800 specimens for the BRTC. This collaboration has produced a series of papers over the past five years, several papers are either in review or various stages of preparation, and the most recently published was in 2021 in *Diversity* and another is in minor revision at *Frontiers of Biogeography*.

## Collection of Mammals

The Collection of Mammals added 1,446 specimens to the collection in 2023 bringing the total number of specimens to 68,572; representing 994 species, 424 genera, 94 families, and 22 orders. In addition to research specimens added to the collections in 2023, we accessioned three taxidermy mounts from the estate of a former student. Included are a Polar Bear, Kamchatka Brown Bear, and Russian Moose.

During 2023, steps and negotiations continued to prepare and install hundreds of bat specimens into the BRTC that died during the February 2021 freeze with the coordination of a specimen preparation day with volunteers from the department. Curator Prestridge continues to work with rehab facilities and game wardens around the state to accession additional specimens. Tissue samples from recently completed research projects also were added to the collection in 2023.



*Figure 4. Dr. Light's ECCB 401 Mammalogy course and Dr. Hamer's laboratory group participated in the 2023 BioBlitz at Lick Creek Park. This image shows Dr. Light examining a male opossum with students and technicians.*

The Mammal Division filled 13 loans to various researchers and institutions nationally and internationally; numerous specimens from the research collection were used to support teaching ECCB 401 (General Mammalogy). Loans were made throughout Texas (Angelo State University and Texas A&M students and researchers from multiple Colleges and Departments), the United States (National Museum of Natural History in Washington DC, University of Washington, and Brigham Young University), and internationally (two separate researchers from Brazil). Visitors to the collection included a local artist, a local educator and researcher putting together educational materials, and two researchers from Brigham Young University who examined over 200 specimens during their visit. In 2023, in addition to loan requests and the visiting researcher, there were multiple inquiries about mammal specimens housed in the collections.

In 2023, 6 loans of CT datasets of specimens from the Collection of Mammals were loaned various institutions for a variety of research and teaching purposes. Data from the Collection of Mammals is easily discoverable on several web portals including VertNet, iDigBio, and GBIF. These records were updated in December of 2023.

During 2023, one technician (Amanda Moehring) has worked part time in the collections focusing on overall collection organization. Her work has been vital to the maintenance of the collections. Also, during 2023, ECCB 401 (General Mammalogy) students helped with pest management, examining all dry specimens for insect infestation. We had a specimen preparation day in June to help process bat specimens from the 2021 February freeze.

### Mammals 2023 Projects

#### *Morphological and genomic diversity in the North American deer mouse (Peromyscus maniculatus) across its geographic range*

With funding from the National Science Foundation, Dr. Light is exploring genomic data and 3D geometric morphometric data (taken primarily from fluid-preserved specimens) to explore diversity of putative species within *P. maniculatus* throughout its entire geographic range. Specimens from the BRTC, in addition to other specimens from natural history collections have been instrumental in this work. Recently graduated PhD student Natalie Hamilton is leading the genomic work and MS students Brandy Craft and Haley Ellis are tackling the morphology side of the project. In 2023, we also had several undergraduate students (Reese Williford and Thomas Yllander) and a technician (Grace Martindale) working on the project. In 2024, Grace will continue her work on the project as a MS student.

#### *Terrestrial Parasite Tracker*

This Thematic Collections Network initiative across over 20 collections was funded in 2019 by the National Science Foundation for over \$4.3 million to digitize data from parasites occurring on terrestrial animals. Dr. Light, in collaboration with the Texas A&M University Insect Collection (TAMUIC), received over \$430,000 to digitize the parasite collections at Texas A&M, including ectoparasites collected from bird and mammal specimens currently housed at the BRTC. This project was completed in 2023. A major effort that Dr. Light and a technician (Shelby Fischer) worked on was digitizing ectoparasite data and working to get those specimens installed at the TAMUIC and linked to their voucher specimens at the BRTC. PhD student Oluwaseun Ajileye assisted in adding all data to the TAMUIC database during the summer of 2023.

#### *Systematics and Selection in Sucking Lice*

Dr. Light and several of her collaborators outside of Texas A&M were recently funded by the National Science Foundation to explore relationships and selection of sucking lice that parasitize mammals. PhD student Ali Lira worked on this project in 2023, examining mammal specimens for lice and exploring morphology across all 15 families and approximately 600 species of sucking lice. Ali, a technician (Danielle Dillard), and an undergraduate student (Matylda Knypinski) also examined BRTC specimens for lice. During the Fall 2023 semester, Dr. Light and a research colleague traveled to the Manter Laboratory of Parasitology at the University of Nebraska, Lincoln, to examine their holdings for lice.

#### *RANGES: Building Capacity to Extend Mammal Specimens from Western North America*

Dr. Light is part of another National Science Foundation funded Thematic Collections Network initiative across over 20 natural history collections. For this project, each collection is digitizing important trait and ecological data from western North American mammal specimens. We started documenting these data during the summer of 2023, with PhD student Ayomiposi Ayodele (last name now Abraham) and technician Emily Coyote. During the Fall 2023 semester, Emily continued her efforts digitizing specimen data and attended a RANGES meeting in Salt Lake City, Utah.

### *Distribution of Nelson's pocket mouse (Chaetodipus nelsoni) in Texas*

With previous funding from Texas Parks and Wildlife and Texas EcoLabs, Dr. Light has explored the species limits and distribution of the *Chaetodipus nelsoni* species group in southwest Texas, specifically the recently described *C. collis* (Neiswenter et al. 2019). Although a specimen of *C. collis* from Webb County is housed in the Biodiversity Research and Teaching Collections, newly collected data (field work and ecological niche modeling; data collected by past PhD students Adrian Castellanos, Leilia Siciliano-Martina, Lacie LaMonica, and past undergraduate students Sarah Ardry, Emma Dohnalik, Stephen Fowler, River Martinez, and Grace Vielleux) support that the species is not currently found in southwestern Texas. We have a manuscript in preparation describing the distribution of the pocket mouse in Texas as well as determining geographic limitations of the other two species within the *C. nelsoni* species group. We are currently collaborating with PhD students in Dr. Daniel Spalink's lab (Lydia Morley, Katie Sanbonmatsu, Kyle Simpson) to develop ecological niche models of the species to complete the manuscript.

### *Documenting small mammal diversity at the BRTC*

Dr. Light and her mammalogy class trap at the collections and locally every semester (Figure 4), documenting small mammal diversity while keeping an out for ticks and notable pathologies (including the Brazospox virus) for collaborative research projects with Sarah Hamer's laboratory (VIBS).

### *Population genetics and phylogeography of pocket gophers and their chewing lice*

The Light lab continues to investigate relationships among pocket gophers and their parasitic lice (at the population level as well as across large geographic distributions). Current work is focused on finalizing a phylogeographic assessment of *Geomys breviceps* and pursuing pocket gopher and chewing louse population genetics. PhD students Ayomiposi Ayodele (last name now Abraham) and Oluwaseun Ajileye, technician Danielle Dillard, and undergraduate student Abby Jensen are exploring the relationships and phylogeographic patterns of chewing lice parasitizing *Geomys* pocket gophers in Texas and across the geographic range of the genus. This work is funded by Texas Ecolab and involves collecting specimens in the field as well as brushing voucher species in the BRTC and other collections.

### *Porcupine range expansion*

Using specimens from natural history collections (including the BRTC) and observations from community scientists, Dr. Light, Curator Heather Prestridge, technician Danielle Dillard, and several undergraduate students are exploring possible range expansions of porcupines (*Erethizon dorsatum*) across North America. We are currently collaborating with PhD students in Dr. Daniel Spalink's lab (Lydia Morley, Katie Sanbonmatsu, Kyle Simpson) to develop ecological niche models of this species to complete a manuscript in preparation.

### *Bat Population Genetics and Disease*

In 2023, we had a large accession of bat tissues and DNAs (bat species is Townsend's big-eared bat, (*Corynorhinus townsendii*) from California that were used in the dissertation of recent PhD student Natalie Hamilton. These samples from hundreds of bat individuals were used to examine population dynamics within this species. Several manuscripts are currently in preparation for publication. Also in 2023, samples from bat specimens (belonging to the species *Tadarida brasiliensis*, or the Mexican free-tailed bat) accessioned as part of the 2021 freeze were used in several studies led by students in Dr. Sarah Hamer's lab. One manuscript was submitted in 2023 and another is in preparation.



## Collection of Marine Invertebrates

As of 2023, the Collection of Marine Invertebrates consists of 13,610 lots of invertebrates, all of which are digitally cataloged. This year was an active one for use of our mollusk specimens. In May-November, our shells as well as shells from their own collection were featured in the public talk and display “Shells: the Elegant Armor of Mollusks”, at the Brazos Valley Museum of Natural History.

The Collection houses a large teaching collection of marine mollusks; approximately 500 lots of dry specimens, all donated by 3 former Aggies. Two undergraduates from the Biology Department re-organized a portion of this collection in 2023 by placing the shells in alphabetical order by species, removing broken shells and geographically organizing them. We now have a digital inventory of species with the number of specimens and provenance. Specimens from the Gulf of Mexico, Caribbean or northwest Atlantic were catalogued.

We were surprised to find two specimens identified as *Conus mindanus*. Cone shells are of pharmaceutical interest because they are venomous, but further studies have been hampered by taxonomic confusion. Because our specimens of *C. mindanus* have data. Dr. Douglass Biggs, formerly of the TAMU Oceanography Department, borrowed them and advises that these may belong to an undescribed species. If so, ours will become type material.



Figure 5- A deep-sea squat lobster *Uroptychus* sp., joins a brittle star and a deep coral shrimp on a bamboo coral. The lobster and shrimp always live on these corals but what, if any benefit they bring to the coral remains unknown. Dr. Mary Wicksten, Biology Department.

Wicksten continues her studies into deep-sea squat lobsters and their associations with soft corals. Dr. Charlotte Seid of Scripps Institution of Oceanography borrowed our specimens of the *Uroptychus nitidus* species complex for comparison with Pacific species. We are trying to match specimens with *in situ* photographs and coral hosts.

Collections of specimens of orange cup corals (*Tubastrea coccinea*) and oysters from an oil platform near the Flower Gardens Banks were made by Wicksten in 2023. There has been interest in trying to maintain out-of-production oil/gas platforms as “coral reefs”. The lack of horizontal surface and shading from above hinder the growth of “reef corals”, which require light to support their symbiotic algae. Cup corals rarely grow more than 50 mm high and do not create much “structure”.

## Student Engagement and Mentoring

### Teaching Use

The BRTC continues to be heavily used by undergraduate courses offered by the Department of Ecology and Conservation Biology. While labs are provided with collections of specimens dedicated to teaching, specimens from the research collections are also often utilized for rare species. Laboratory courses taught at the BRTC in 2023 included:

ECCB 401- Mammalogy (Fall and Spring – 50 students per semester; Light)

ECCB 402- Ornithology (Spring – 45 students; Voelker)

ECCB 315- Herpetology (Spring – 60 students; Fitzgerald)

ECCB 316 – Field Herpetology (Spring – 25 students; Hibbitts)

ECCB 311- Ichthyology (Fall – 60 students; Conway)

ECCB 302- Diversity and Evolution of the Vertebrates (Fall and Spring – 135 students per semester; Conway/Fitzgerald/Voelker)

ECCB 314/614 – Biology of Gulf Coast Fishes (Summer – 15 students; Conway)

RENH 400/ECCB 485 – South Africa Study Abroad (Hibbitts/Fitzgerald)

ECCB/ENTO 300, 450, 451 – Caribbean Field and Tropical Biology, Education Abroad (Conway)



*Figure 6 - Students participating in ECCB 314/614 Biology of Gulf Coast Fishes, a summer field course taught by Dr. Conway that trains students in both field and museum techniques.*

Collaborations with Dr. Sarah Hamer from the TAMU Vet School fostered use of the BRTC outdoor classroom and nature trails for several lab meetings including: VIBS 413/607: Introductory/Applied Epidemiology class, ENTO/VIBS 426/636: Methods in Vector-borne Disease Ecology and 'Outbreak' one health course (TAMU-UTMB-UTRGV collaboration).

## Graduate Student Advising

Graduate students directly engaged in BRTC Research and Teaching with a BRTC Curator as their advisor.

Ayomiposi Abraham (PhD; Light)  
Oluwaseun David Ajileye (PhD; Light)  
Wesley Arend (MSc; Conway)  
Carolina Bertoul (PhD; Voelker)  
Alberth Rojas Carranza (PhD; Fitzgerald)  
Brandy Craft (MSc; Light)  
Isis Davis (PhD; Fitzgerald/Delmore-TAMU Dept.  
of Biology)  
Haley Ellis (MSc; Light)  
Natalie Hamilton (PhD; Light)

Tiffany Inbody (PhD; Conway)  
Katrina Keith (PhD; Voelker)  
Camryn Kiel (PhD; Hibbitts)  
Ali Lira (PhD; Light)  
E. Griffin Nicholson (PhD; Fitzgerald)  
Mickey Parker (PhD; Fitzgerald)  
Amanda Pinion (PhD; Conway)  
Nicole Stevens (PhD; Fitzgerald)  
Ryan Weesner (PhD; Voelker)

## Student Workers

Utilizing funds from the Department of Ecology and Conservation Biology, the BRTC was able to employ 1 undergraduate student on a part-time basis during 2023. Nick Bruni was tasked with managing the beetle colony, skeletonization and preparation of specimens, fumigation and reinstallation of research specimens used in ECCB -ology courses. Several additional student workers were employed under extramural funding in 2023 including Carl Schmidt, James Miller and Sabri Amrani-Khaldi (NSF CSBR Collection of Fishes – Conway/Prestridge).

## Interns

Internships (ECCB 485/285) were offered in all divisions in 2023. Each intern had their own specific project that matched their interest in the collections. Below are the interns that worked at the BRTC during 2023:

Writing intensive (Prestridge Role) – Abby Jensen and Nicole Trinh

In 2023, the BRTC (Voelker) began offering WFSC 485 Directed Studies as a means of formalizing and recognizing students assisting with specimen preparation and curation. In 2023 Rory (Aimee) Ornelas – Specimen enrolled to support curation in the Collection of Birds.

## Community Engagement

### Support of Community Science

In 2023, the training class for the Brazos Valley Texas Master Naturalist (TMN) chapter continued exclusively utilizing the BRTC as their location for new member training (Figure 5). This organization is sponsored by Texas Agrilife Extension and has been advised by Prestridge since the chapters beginning in 2006. Prestridge serves as their chapter advisor and hosts the introductory session for each training class. Hibbitts contributes to the class annually, teaching the Reptile and Amphibian section. In 2023, ECCB graduate student Alberth Rojas contributed to the ornithology unit of their training. The BRTC provides a unique opportunity for this group because the trainees and members have access to specimens to learn from. Trainees from the class are also exposed to the value of natural history collections and offered volunteer opportunities to engage with the BRTC outside of their training hours. We also routinely supported k-12 education through loaning of educational kits of specimens (Figure 7).



*Figure 7. Texas Master Naturalist class of 2023 at the BRTC (left) specimens of birds from the BRTC on display at St. Thomas Early Learning Center.*

### Community Volunteers

Community volunteers including members of the Texas Master Naturalist (TMN) chapter and former students contributed time in several areas of the collections in 2023. TMN volunteers continued to maintain and improve the native pollinator garden and outdoor classroom area, with monthly workdays on the first Friday of each month. In addition to the TMN workdays, Squadron 6 of the Texas A&M Corps of Cadets volunteered with major projects in the garden several times (Figure 8). Within the collections, several community volunteers continued to serve not only as volunteers, but mentors to students.



*Figure 8. Texas Master Naturalist volunteers (left) and Corps of Cadets Squadron 6 (right) at the BRTC gardens workdays in 2023.*

## Public Expositions

In 2023, specimens from the BRTC were utilized for public expositions at local museums, galleries, and schools. One major gallery exhibit, Lights Out, Texas! was installed at the Memorial Student Center Reynolds Gallery and included artwork, specimens, and messaging about the important conservation initiative (Figure 9). A preview of this exhibit was featured at a local café (The Village) as a means of publicizing the primary installation. This exhibit is set to travel to several locations in 2024.



Figure 9. Lights Out, Texas! exhibition at the Reynolds Gallery, Memorial Student Center, Texas A&M University.

## BRTC Operations

### Funding

In FY 24, the BRTC received \$12,000 from the Department of Ecology and Conservation Biology for general support, \$3,000 for support of labs that meet at the BRTC, and additional departmental support to employ an undergraduate student worker (\$12/hr 10 hours per week).

In addition to our regular budget, the ECCB supported the purchase one large specimen cabinet and additional drawers for existing cabinets for the Collection of Birds (total: \$7,172) and supported one graduate student to overhaul the teaching collections for ECCB 302 (\$2,000).

## Curator Authored Peer Reviewed Journal Articles 2023

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- Britz, R., G.M.T. Mattox & **K.W. Conway** (2023). The quadrate-metapterygoid fenestra of otophysan fishes, its development and homology. *Vertebrate Zoology* 73:35-55.
- Brooks, D.M., **H.L. Prestridge**, **G. Voelker**, and **K.A. Arnold**. (2023). Specimen records of Sooty Shearwater (*Ardenna grisea*) from the Gulf of Mexico, with comments on temporal frequency. *Bull. Texas Ornithological Soc.* 55:136-139.
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- Martinez, V., K.D. Keith, J.K. Grace and **G. Voelker**. (2023). Avian haemosporidians of the breeding birds in the Davis Mountains sky-islands of west Texas, USA. *Parasitology*, 150:1266-1276. <https://doi.org/10.1017/S0031182023001087>
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