





Carolina Mantis Stagmomantis carolina









InvertEBase: Reaching Back to See the Future: Species-rich Invertebrate Faunas Document Causes and Consequences of Biodiversity Shifts

The rapid biodiversity change in North America has significant effects on essential ecosystems, from impact on soil health and nutrient cycling, to agriculture, forestry and water quality. Exploding populations of invasive species threaten freshwater and terrestrial habitats and potentially impact the natural resources of the nation. InvertEBase is involved in the rapid digitization of around two million specimens and their data from ten arthropod and mollusk collections housed at six major U.S. museums in six states (II, OH, AL, MI, DE, PA). The digitized data from this project will help scientists understand the distribution of species and their habitats.

- Download the Libraries of Life app from the iTunes store and install on your iOS device.
- · Launch the app.
- Hold your mobile device camera about 6 inches away from card image.
- View specimen and click buttons to view content.



Developed by the ExplorMor Labs at BioKIC (Biodiversity Knowledge Integration Center)
Arizona State University in collaboration with the iDigBio ARPEO (Augmented Reality for Public Education/Outreach) Working Group.

Project Leads Anne Basham and Austin Mast with graphic design by Jeremy Spinks. This material is based upon work supported by the National Science Foundation under Cooperative Agreement EF-111520. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation. This work is licensed under the Creative Commons (CC BY-NC-SA 4.0) License. To view a copy of the license, visit https://creativecommons.org/licenses/by-nc-sa/4.0)









White-topped Pitcher Plant

Sarracenia leucophylla









The Key to the Cabinets: Building and Sustaining a Research Database for a Global Biodiversity Hotspot

The southeastern U.S. is home to about 10,000 native vascular plant species with nearly a quarter, like the white-topped pitcher plant, naturally found nowhere else. The Southeastern Regional Network of Expertise and Collections is imaging almost five million specimens spread across 107 southeastern herbaria to enable a deeper understanding of the region's flora and the flora's likely response to global climate change.

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Ruby-throated Hummingbird

Archilochus colubris







Developing a Centralized Digital Archive of Vouchered Animal Communication Signals

This collection network is involved in fostering partnerships amongst multiple biological research collections along with the Macaulay Library of Natural Sounds, the world's largest scientific archive of animal signal recordings. Collectively these institutions co-curate and make accessible diaitized and vouchered recordinas of the communication signals of birds, frogs, fish and insects, and establish links between physical voucher specimens and their digitized recordings. This project will make accessible digital audio recordings of animal signals that can be used to address a host of scientific questions including the responses of animals to anthropogenic noise and other human activities. By providing a useful collaborative curation system that promotes the collection of recordings along with physical specimens this project will have a transformative influence on the way that researchers collect and use biological specimens in the future

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Channel Catfish

Ictalurus punctatus







iDigBio: The National Resource for Advancing Digitization of Biodiversity Collections

iDigBio coordinates activities funded by the U.S. National Science Foundation's Advancing Digitization of Biodiversity Collections Program. iDigBio fosters partnerships and innovations; develops digitization practices and workflows; establishes integration and interconnectivity among the data generated by collection digitization projects; and promotes uses of biological/paleontological collections data by the scientific community and other stakeholders, including government agencies, educational institutions, non-governmental organizations, and other national and international entities to benefit science and society through enhanced research and outreach activities. iDigBio is based at University of Florida and Florida State University, and www.idiabio.ora serves data and images for tens of millions of specimens.

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Daisy Earthstars

Geastrum floriforme







MYCOLOGY COLLECTIONS PORTAL

The Macrofungi Collection Consortium: Unlocking a Biodiversity Resource for Understanding Biotic Interactions, Nutrient Cycling and Human Affairs

Mushrooms and related fungi (macrofungi) play a critical role in the lives of plants and animals, including humans, yet their diversity is underestimated. Understanding this diversity will be critical in analyzing impacts of habitat change, nutrient cycling in ecosystems, and distributions and diversity of host organisms. Over the past 150 years approximately 1.4 million dried scientific specimens have been conserved in 35 institutions and in 24 states with digitization efforts under way to make these collections and their data accessible online.

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Thorn Bug Umbonia crassicornis









Arthropods (insects, spiders, crabs) are the most diverse and abundant group of macro-organisms in biological collections, but are underrepresented in databases accessible online or elsewhere. InvertNET is involved in compiling information from 160 years of North American arthropod collections and implementing the use of innovative technology like optical 3-D imaging and reconstruction. These efforts will support scientific inquiry on the effects of land use change on biodiversity and research on species discovery and identification.

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Photo credit: Jack Kallmeyer Courtesy of drydredgers.org

Brachiopod

Hebertella occidentalis









igital Atlas of Ancient Life

Diaitizina Fossils to Enable New Syntheses in Biogeography - Creating a PALEONICHES

Fossil collections, along with their data, provides millions of records that can tell us much about the distribution of species and what causes species to migrate, ao extinct, or evolve over long time periods. They are of great importance in understanding how global change has, and will continue to, impact life on this planet. The Paleoniches group is involved in entering data about the age and precise location of fossil specimens from key paleontological collections into electronic databases. Their efforts will digitize nearly 450,000 specimens from several museums throughout the U.S. These specimens involve 900 species from three different time periods: the Ordovician, Pennsylvanian, and Neogene.

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Photo Credit: U.S. Fish & Wildlife Service

Zebra Mussel

Dreissena polymorpha









GREAT LAKES INVASIVES NETWORK

Documenting the Occurrence through Space and Time of Aquatic Non-indigenous Fish, Mollusks, Algae, and Plants Threatening North America's Great Lakes

One of the greatest threats to the health of North America's Great Lakes is invasion by exotic species, several of which already have had catastrophic impacts on property values, the fisheries, shipping, and tourism industries, and continue to threaten the survival of native species and wetland ecosystems. This network of >20 institutions from eight states and Canada will digitize 1.73 million historical specimens representing 2,550 species of exotic fish, clams, snails, mussels, alage, plants, and their look-alikes documented to occur in the Great Lakes Basin.

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Greygreen Reindeer Lichen

Cladonia rangiferina





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Consortium of NORTH AMERICAN LICHEN HERBARIA

Consortium of

NORTH AMERICAN BRYOPHYTE HERBARIA



Lichens and bryophytes (mosses and their relatives) are sensitive indicators of environmental change and are dominant organisms in arctic-alpine and desert habitats where the effects of climate change are well-documented. These groups aim to image about 2.3 million North American lichen and bryophyte specimens from more than 60 collections to address questions on how species distributions change after major environmental events both in the past and projected into the future.

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lmage credit: Elijah Talamas

Stink Bug Parasitoid

Trissolcus euschisti





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Tri-Trophic Thematic Collection Network Collaborative Research: Plants, Herbivores, and Parasitoids: A Model System for the study of Tri-Trophic Associations

This databasing and imaging project focuses on a major herbivorous insect group called the Hemiptera (aphids, scales, hoppers, cicadas, and true bugs), their host plants, and their parasitoids. Hemiptera is represented in North America north of Mexico by more than 11,000 species. Many are agricultural pests with specialized sap-sucking habits, making them effective vectors of plant disease and of economic importance. The project is building a cross-cutting network to integrate information from 15 botanical and 19 entomological collections that will promote studies of climate change and a greater understanding of the relationships among the three trophic levels—plant, herbivore, and parasitoid.

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Elk Kelp *Pelagophycus porra*







Macroalgal Herbarium Portal

The Macroalgal Herbarium Consortium: Accessing 150 Years of Specimen Data to Understand Changes in the Marine/Aquatic Environment

Macroalgae are the foundation of marine, estuarine and freshwater ecosystems, providing food and protection for a myriad of other aquatic organisms. Many macroalgal species are sensitive to environmental change. The data provided through this group allows researchers and the public at large to learn more about how macroalgal biodiversity and our aquatic ecosystems have changed over the past 150 years as a result of climate change, bioinvasions, and a wide range of human activity.

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Earth-boring Scarab Beetle

Bolbocerastes regalis









The Symbiota Collections of Arthropods Network (SCAN) brings together ten diverse arthropod collections at universities and museums throughout the Southwest to create digital data about ground-dwelling arthropods (beetles, grasshoppers, spiders, ants), which are notably sensitive to environmental change. These collections document much of the Southwest's biodiversity, but currently the data associated with millions of arthropod specimens are not easily accessible. To address this SCAN is developing methods for integrating existing databases and producing a virtual library of ground-dwelling arthropods. This comprehensive online library will assist scientists in determining potential impacts of environmental and climate change on arthropods.

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Tsetse Fly

Glossinidae





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Fossil insects provide a unique record of ecological and evolutionary response to past environmental changes and are invaluable for understanding the impacts of climate change on the current biodiversity crisis. Given current models of future climate change and the important role that insects play in human society (biodiversity, pests, pollination, vectors of disease), the ability to access these data and make predictions about future insect populations has become even more urgent. The Fossil Insect Collaborative will make available all the major collections of fossil insect specimens in the United States by creating electronic specimen records consisting of digital images and associated collection data.

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Red Cardinal Flower

Lobelia cardinalis









Mobilizing New England Vascular Plant Specimen Data to Track Environmental Changes

This collection network provides data that supports studies on the impact of environmental change in the New England region over the last three centuries. It is digitally capturing specimen data and images from about 1.3 million vascular plant specimens housed in 15 large and small herbaria located across the region. The resulting images and data are made accessible online to scientists and the general public.

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