Presentations by Thematic Collections Networks (TCNs) at ADBC Summit VII

November 2, 2017

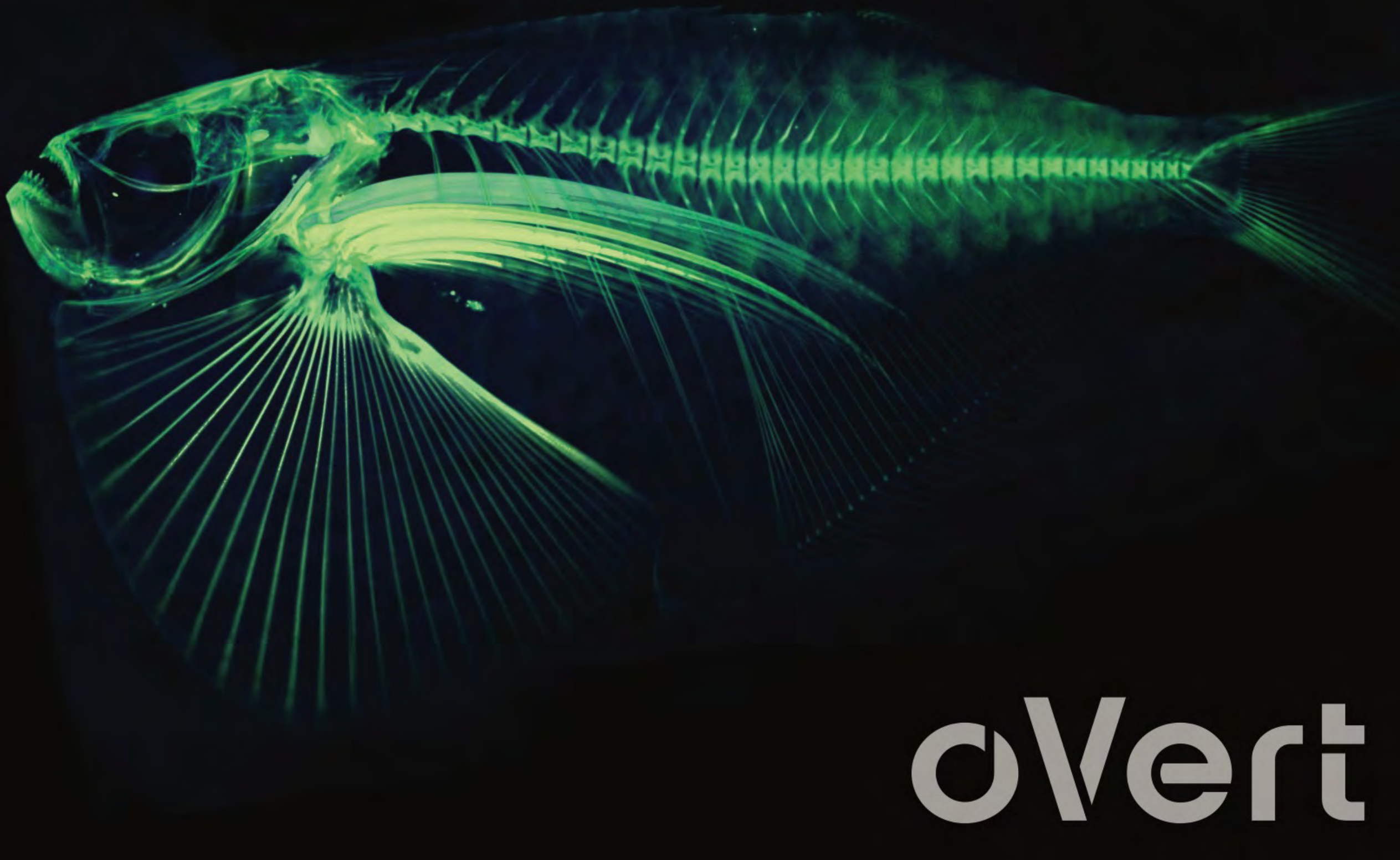
Reports included from the following **active** TCNs:

☒ InvertNet	☒ LBCC	☒ NEVP
☒ Paleoniches	☒ SCAN	☒ FIC
☒ VACS	☒ MHC	☒ GLI
☒ InvertEBase	☒ SERNEC	☒ MiCC
☒ EPICC	☒ Cretaceous World	☒ LepNet
☒ MAM	☒ SoRo (NEW)	☒ oVert (NEW)

Reports included from the following **retired** TCNs:

☐ TTD	☒ MaCC	

iDigBio is funded by a grant from the National Science Foundation's Advancing Digitization of Biodiversity Collections Program (Cooperative Agreement EF-1115210). 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.


oVert

oVert

openVertebrate Thematic Collections Network

$2.5M from NSF's *Advancing Digitization of Biodiversity Collections* program

2017–2021

CT-scan >20,000 fluid-preserved vertebrate specimens

Scan >80% extant genera; "soft tissue" scan >60% extant families

Make both raw and processed data freely available on-line

oVert

18 funded institutions, including 16 museums and 6 imaging centers

FLORIDA MUSEUM™

UNIVERSITY of WASHINGTON

MUSEUM OF COMPARATIVE ZOOLOGY
HARVARD UNIVERSITY

MICHIGAN

The Field Museum

THE UNIVERSITY OF CHICAGO

Duke UNIVERSITY

MORPHOSOURCE

Peabody Museum NATURAL HISTORY YALE UNIVERSITY

CORNELL UNIVERSITY FOUNDED A.D. 1865
Cornell University

SCRIPPS INSTITUTION OF OCEANOGRAPHY UCSD

Berkeley
UNIVERSITY OF CALIFORNIA

CALIFORNIA ACADEMY OF SCIENCES

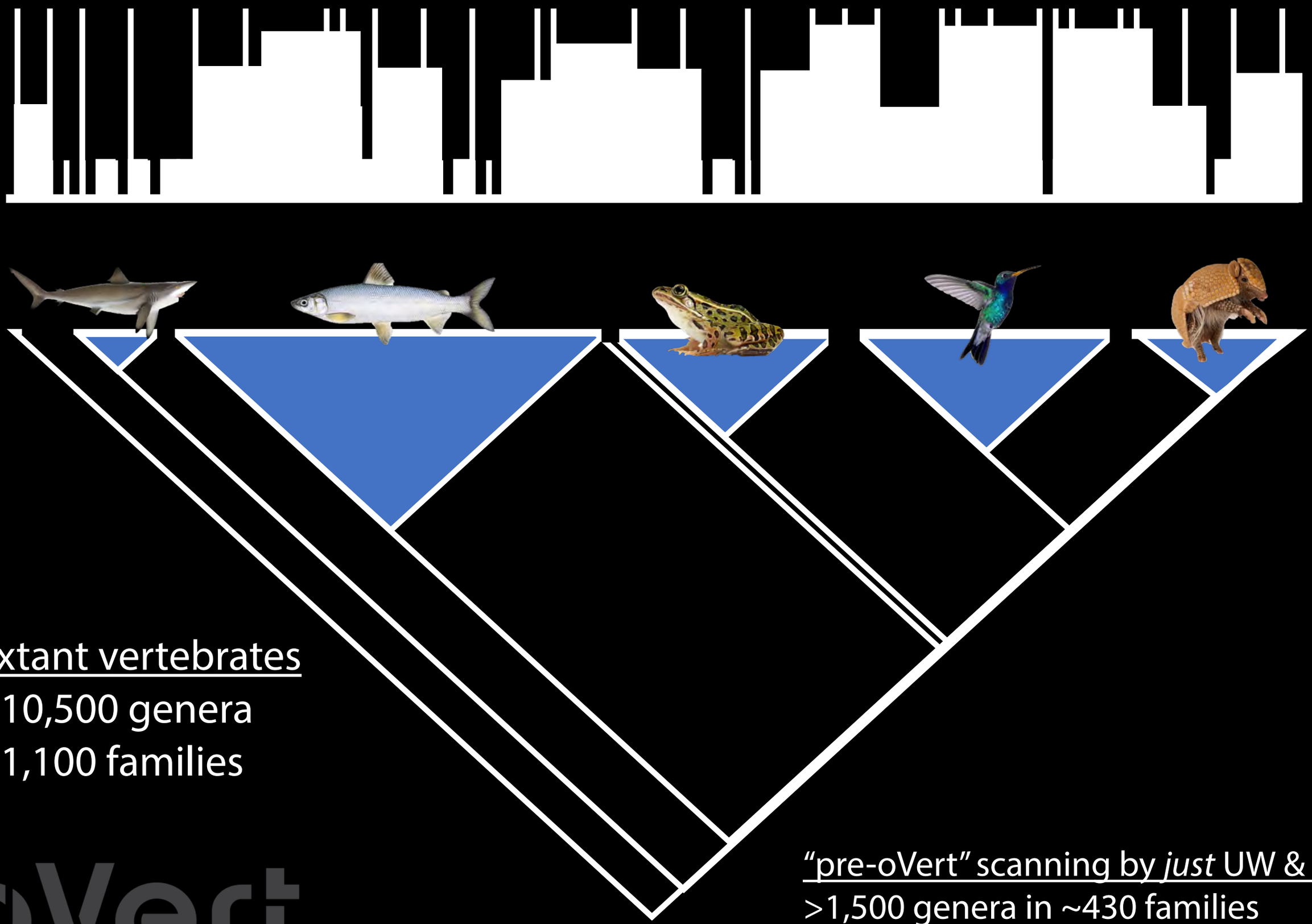
THE ACADEMY OF NATURAL SCIENCES
of DREXEL UNIVERSITY

TEXAS
The University of Texas at Austin

LSU
LOUISIANA STATE UNIVERSITY

KU THE UNIVERSITY OF KANSAS

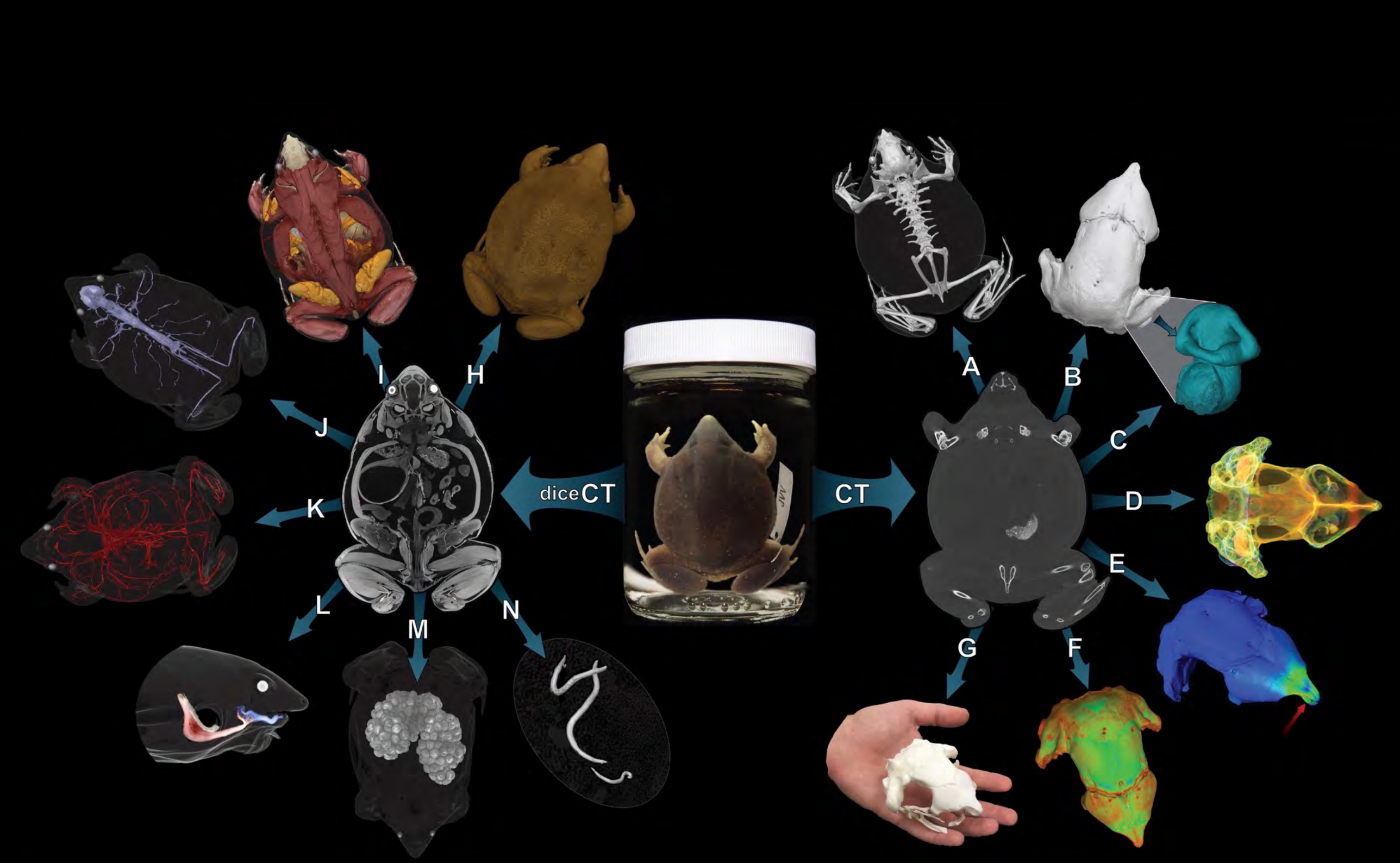
VIMS | WILLIAM & MARY
VIRGINIA INSTITUTE OF MARINE SCIENCE
1940-2015 75 YEARS



<u>extant vertebrates</u>
~10,500 genera
~1,100 families

<u>“pre-oVert” scanning by *just* UW & UF</u>
>1,500 genera in ~430 families

oVert

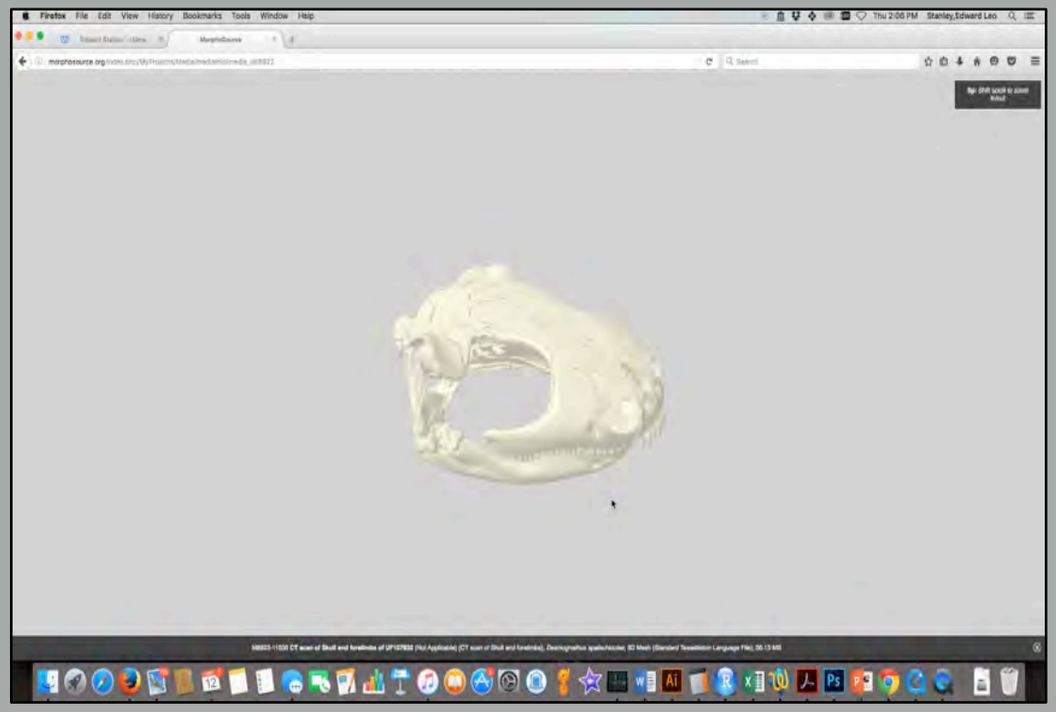


resolution of scans: ~20–80 µm

Hemisus
family Hemisotdae

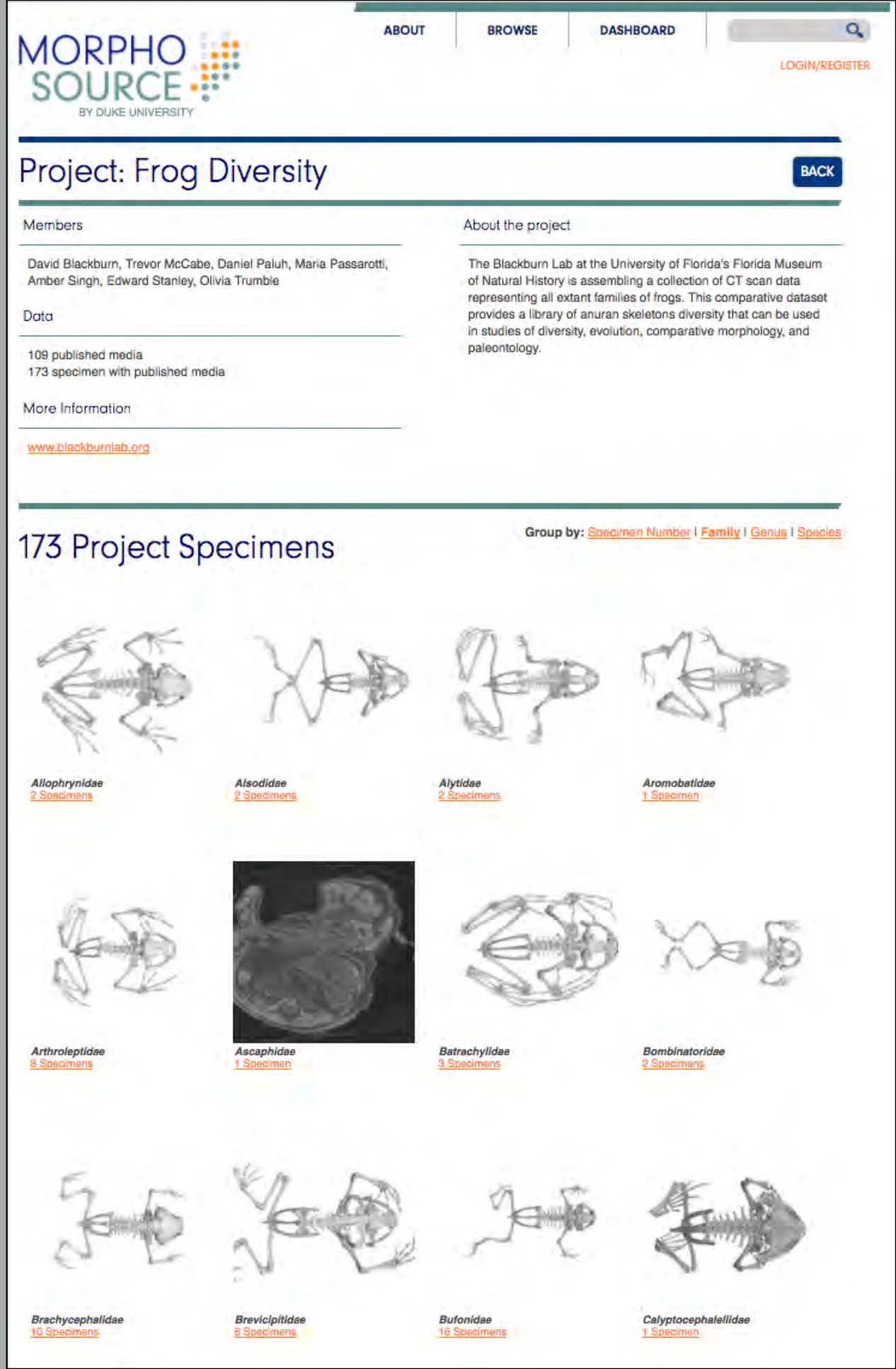
oVert

Data deposited in MorphoSource
- 3D mesh files (.stl)
- image stacks (.zip of .TIFF)



Download or view in browser

bit.ly/3DFrogs



oVert

132 UF Herpetology specimens on MorphoSource since ~March 2016
>15,000 media views, and >2,600 downloads

example: *Shinisaurus crocodilurus*
>880 views on MorphoSource, 20+ downloads in Australia, UK, and US

Stats on *Shinisaurus* Specimens

202 records in iDigBio
176 specimens in US
47 skeletons in 4 US institutions

oVert

>50% download requests are for ‘non-research’
most state an intention to 3D print

K12 classrooms

Academy of Holy Names
Tampa, Florida

Undergrad Teaching

Chris Sheil
John Carroll University

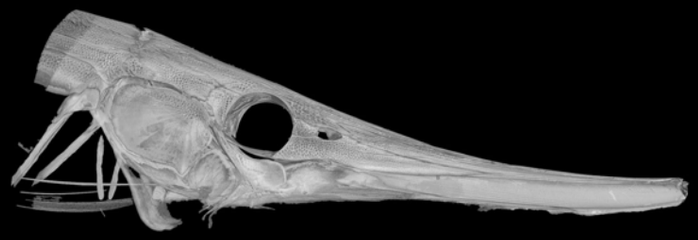
Art: “Creature Design” class

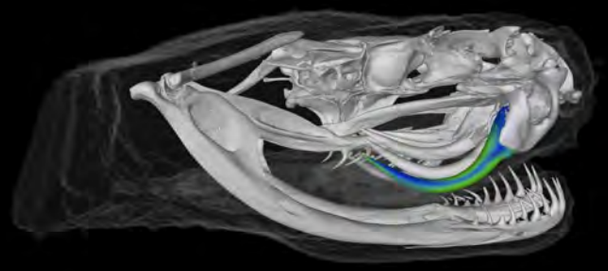
Lars Grant-West
Rhode Island School of Design

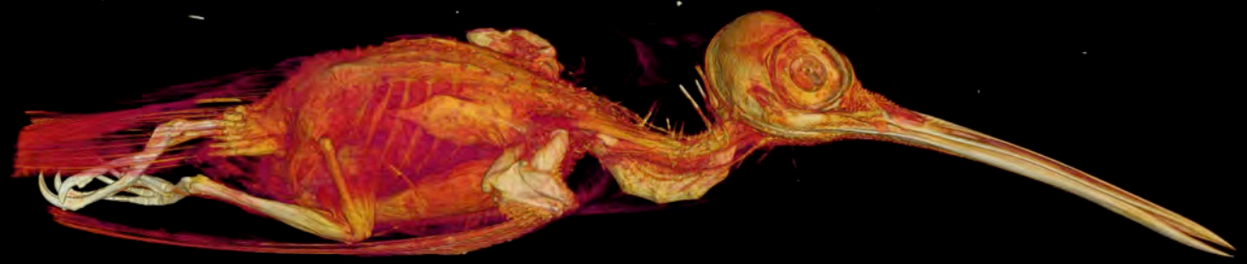
Goals for broader impacts:

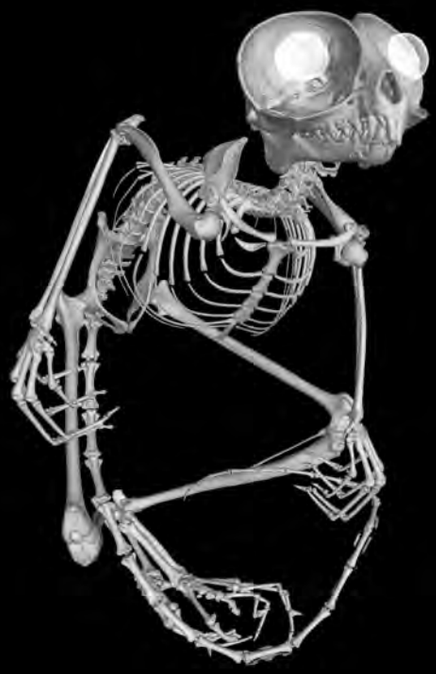
engage high school teachers in lesson plan development

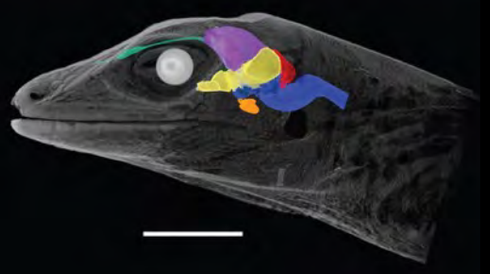
develop on-line tutorials for using 3D data in research and education

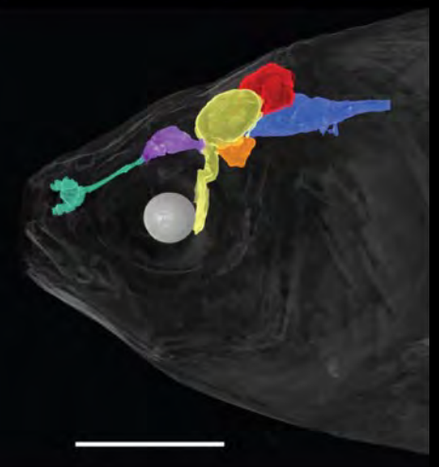












oVert

Southern Rocky Mountain TCN

ADBC Summit 2017

November 2nd 2017

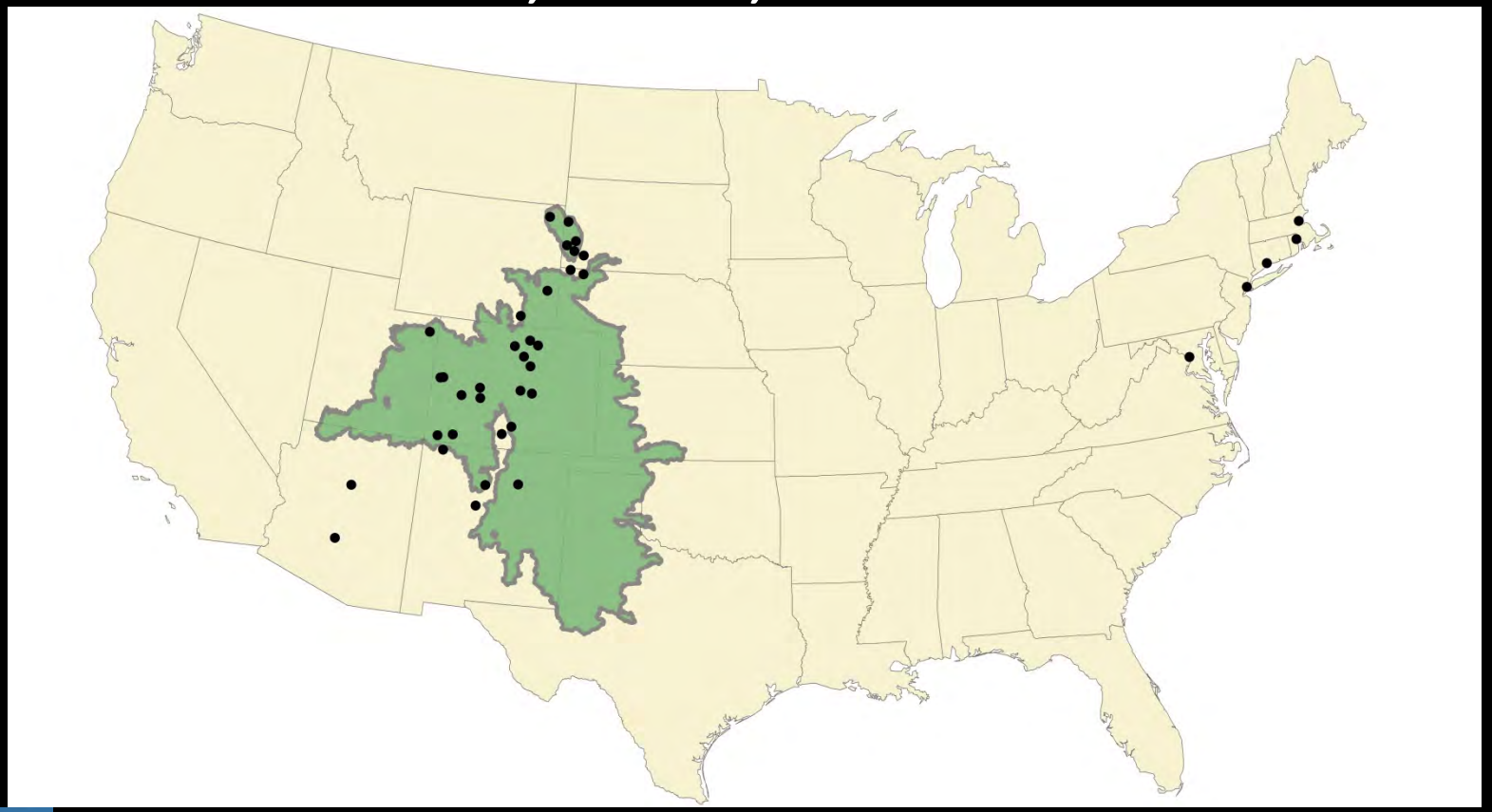
Ryan Allen

Erin Tripp

University of Colorado Herbarium

NSF

Using Herbarium Data to Document Plant Niches in the High Peaks and High Plains of the Southern Rockies - Past, Present, and Future



Project Scope

- 38 Partners (including non-digitizing federal partners)
- 19 Partners Digitizing new records
- 1.7 million specimens from the Southern Rocky Mountain Region
- 503,000 new database entries
- 814,000 new specimen images
- 560,000 new georeferences

Outreach

- Workshops through NAVA, SJNM and BHSC will train and give museum experience to Native American students
- Education module to be developed at FLD to create undergraduate course material using museum specimens

Project Progress

- GREE, CSCN, COCO and ALAM added to SEINet in preparation for data migration
- Subaward budgets being finalized
- 25 staff/student positions have been filled
- 3,333 Database entries completed
- 15,587 Specimens barcoded
- 12,566 Specimens imaged
- 933 specimens georeferenced

Lessons Learned

- Skeletal and controlled data (dropdown menus) help to filter data, reduce keystroke errors and create a searchable database
- Students thrive when working on various tasks
- Change tasks every 2-3 hours

The Cretaceous World TCN: Digitizing Fossils to Reconstruct Evolving Ecosystems in the Western Interior Seaway

Bruce S. Lieberman

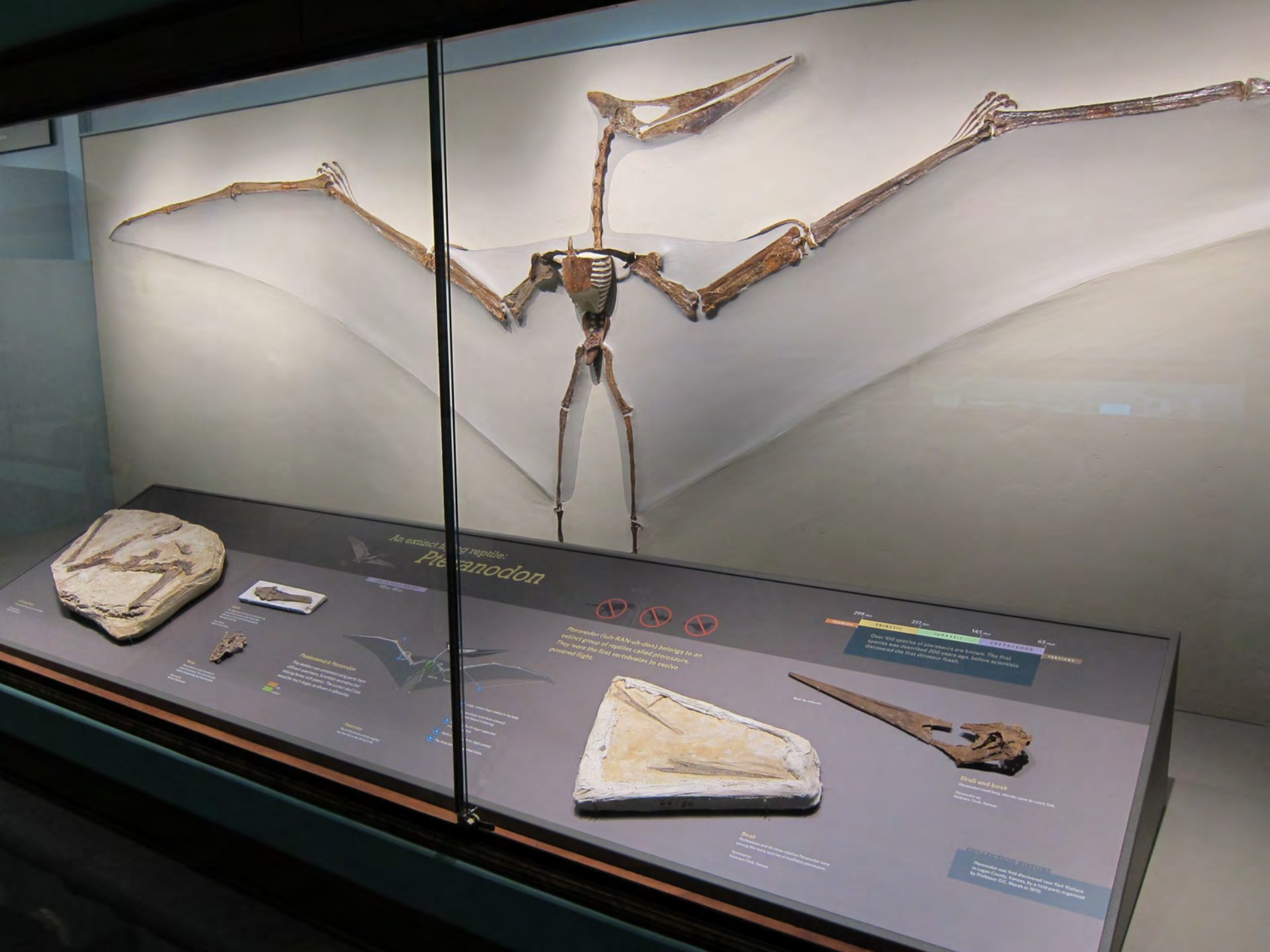
Dept. of Ecology & Evolutionary Biology and Biodiversity Institute, U. of Kansas

The Cretaceous World - TCN


Western
Interior
Seaway
Late Santonian (Desmoscaphites bassleri) -- 84.0 Ma
© Colorado Plateau Geosystems


MOSASAUR


Xiphactinus audax
Sternberg Museum of Natural History


An extinct flying reptile:
Pteranodon
Pteranodon (tuh-RAN-uh-don) belongs to an extinct group of reptiles called pterosaurs. They were the first vertebrates to evolve powered flight.
Over 100 species of pterosaurs are known. The first species was described 200 years ago, before scientists discovered the first dinosaur fossil.
299 mya
251 mya
145 mya
65 mya
PERMIAN
TRIASSIC
JURASSIC
CRETACEOUS
TERTIARY
Skull and beak
Beak
COLLECTION HISTORY

Cretaceous World – TCN : Participants and Institutions

University of Kansas – Bruce S. Lieberman, Chris Beard & Jim Beach

Paleontological Research Institution – Jonathan Hendricks

American Museum of Natural History – Neil Landman & Ruth O'Leary

University of Texas– Ann Molineux, Rowan Martindale & Matt Brown

Cretaceous World – TCN : Participants and Institutions, cont.

Yale University Peabody Museum of Natural History – Susan Butts & Chris Norris

University of Colorado – Talia Karim

South Dakota School of Mines & Technology – Laurie Anderson & Maribeth Price

University of New Mexico – Corinne Myers

Sternberg Musem / Fort Hays State University – Laura Wilson

Cretaceous World – TCN: Outreach

Digital Atlas of Ancient Life

Guide to Ordovician, Pennsylvanian, and Neogene fossils

www.digitalatlasofancientlife.org

@PaleoDigAtlas

Digital Atlas App

Free for iPhone/iPad

Cretaceous World – TCN : Data and Research Goals

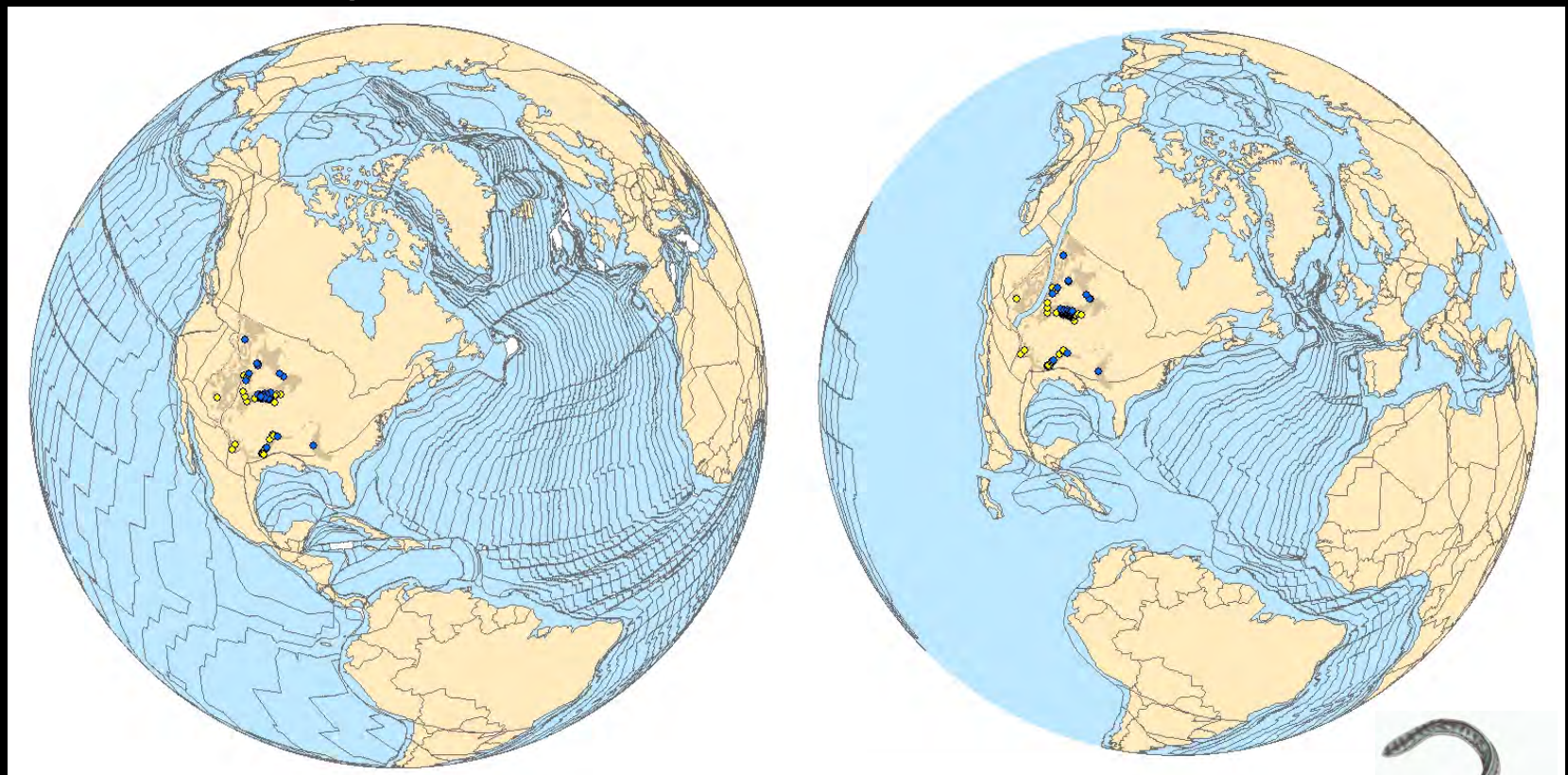
- ~ 165,000 specimens databased
- ~ 7,000 fossil localities georeferenced
- ~1,600 fossil species imaged (> 3,200 images)
- Data shared/published via iDigBio and institutional websites

Cretaceous World – TCN : Data and Research Goals, cont.

Focus on GIS and ecological niche modeling

Present Day

~87Ma



◆ ***Cretoxyrhina mantelli***

◆ ***Tylosaurus s***

Myers & Lieberman. 2011. Proceedings of the Royal Society

Lesson Learned

Recruit high quality collections staff and students

Thanks to:

iDigBio
Julien Kimmig (U. of Kansas)
Jon Hendricks (PRI)
Alycia Stigall (Ohio U.)
Cori Myers (U. of New Mexico)
Harry Dowsett (USGS)
Roger Portell (U. of Florida)

Funding
NSF Advancing the Digitization of Biological Collections

Lepidoptera of North America Network (LepNet)

$3.2 million over 4-Years

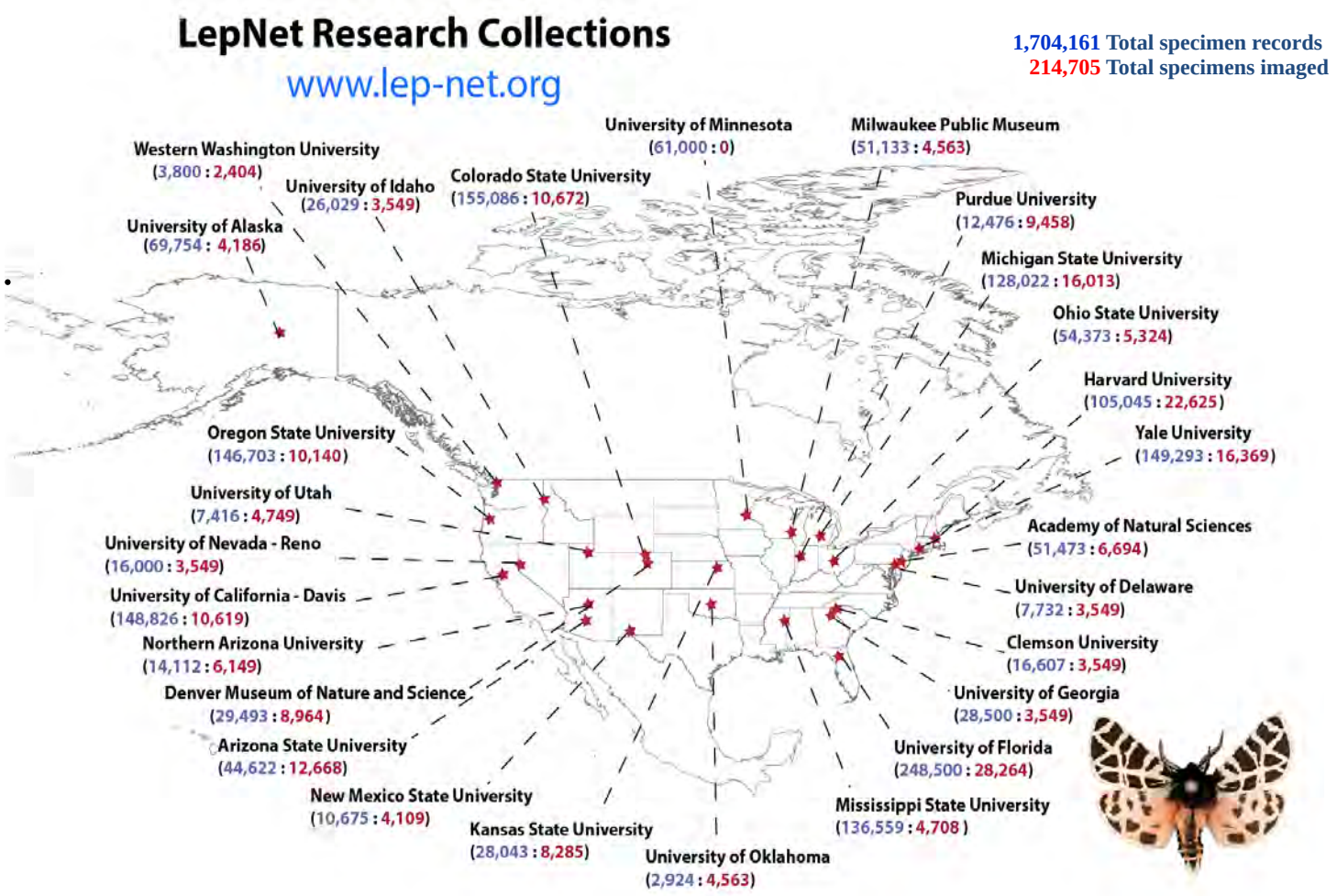
Project Goals – On Target!!

(1) Transcribe **1.7 million** specimens labels**,** integrate >1 million existing lepidopteran records, totaling **2.7 million** occurrence records.

(2) Produce **81,000** high-resolution images and >**160,000** smartphone images **(LepSnap)** for **240,000 total,** representing at least **60%** of the 14,300+ North American Lepidoptera species.

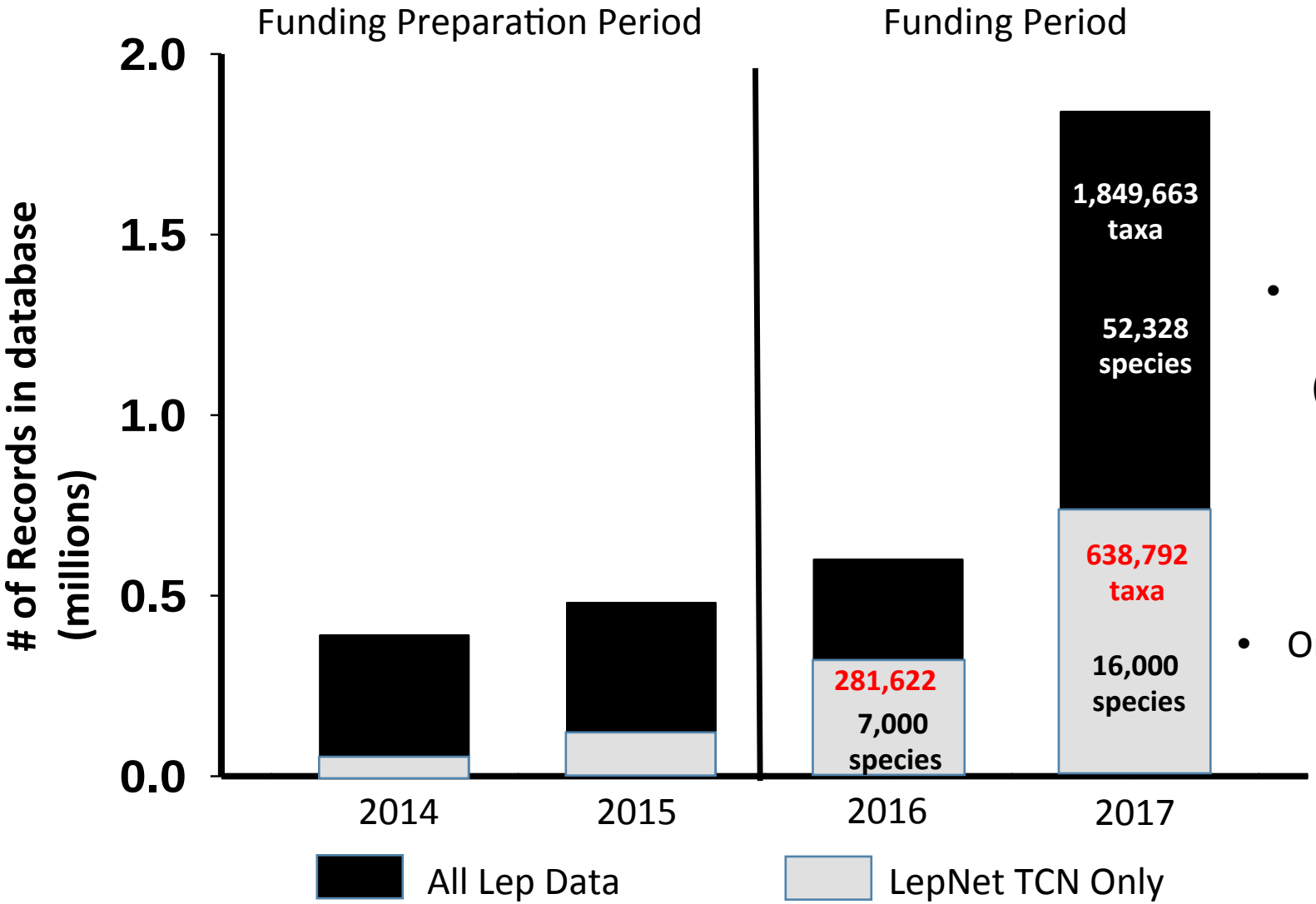
(3) Computer vision taxonomic identification available via smartphone apps & Laptop biodiversity portal (**Fieldguide**)

(4) **LepXlor** – Education-Outreach program



LepNet
Lepidoptera of North America Network

TCN vs Broader Impact Goals

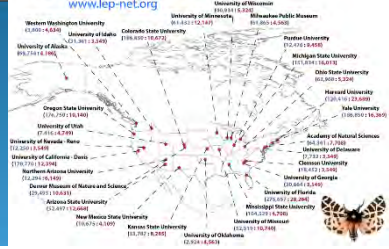


- ADBC Digitization increases **unfunded efforts** and mobilizes **dark data** (51 Broader Impact collections)
- On track to reach goal (26 TCN collections)

LepNet

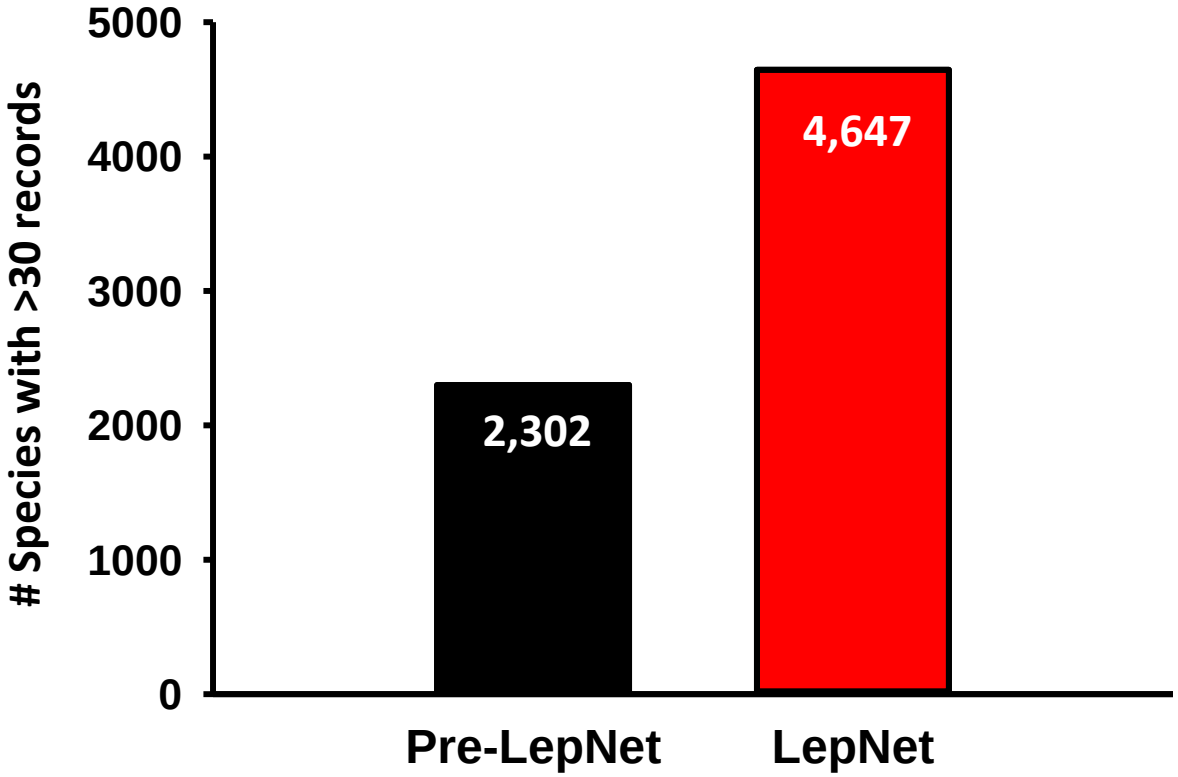
Lepidoptera of North America Network

Research Ready Data

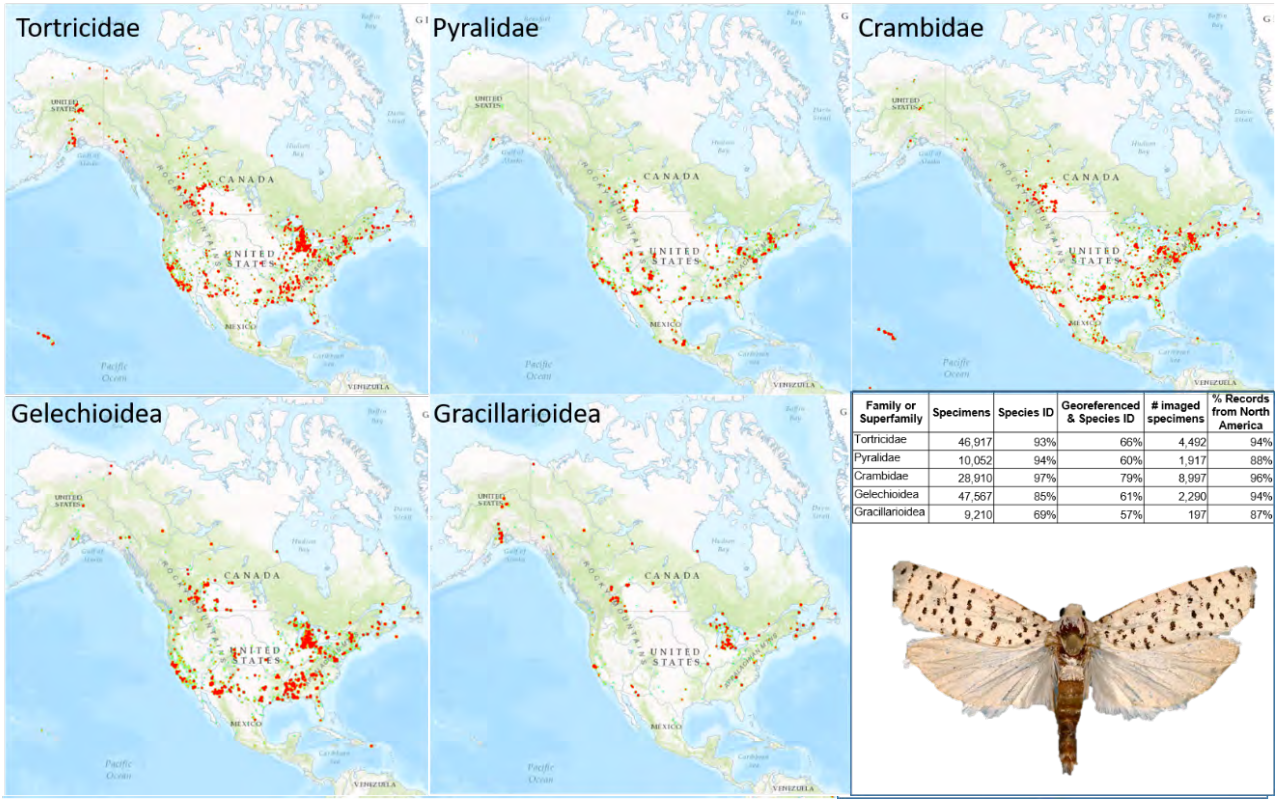


Ecological Niche Modeling (≥ 30 records per species)

Goal: 5,000 more species for modeling



Microlepidoptera



Family or Superfamily	Specimens	Species ID	Georeferenced & Species ID	# imaged specimens	% Records from North America
Tortricidae	46,917	93%	66%	4,492	94%
Pyralidae	10,052	94%	60%	1,917	88%
Crambidae	28,910	97%	79%	8,997	96%
Gelechioidea	47,567	85%	61%	2,290	94%
Gracillarioidea	9,210	69%	57%	197	87%

Computer Vision: Automated Identification of Taxa

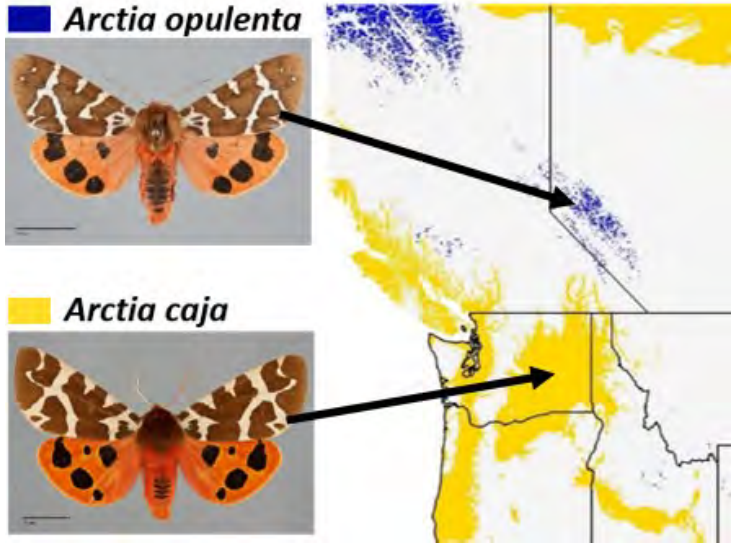
Huge Potential for Identification from Images

6,870 North American species (40%) can be identified to species through images

Smartphone + Computer Vision

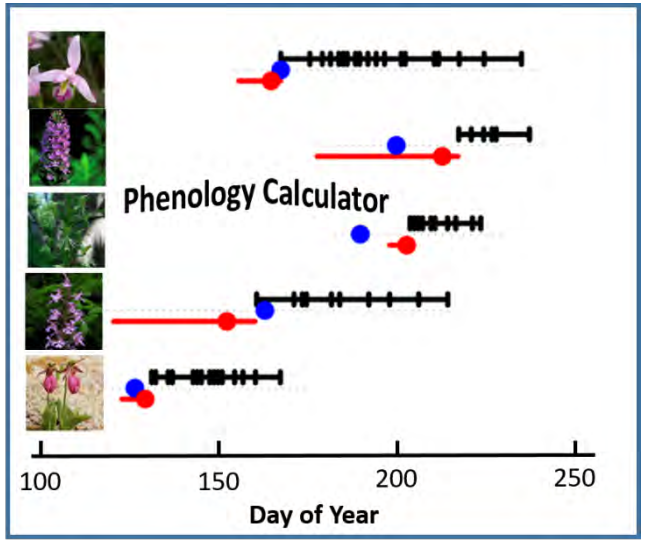
+

Geographic Filter



+

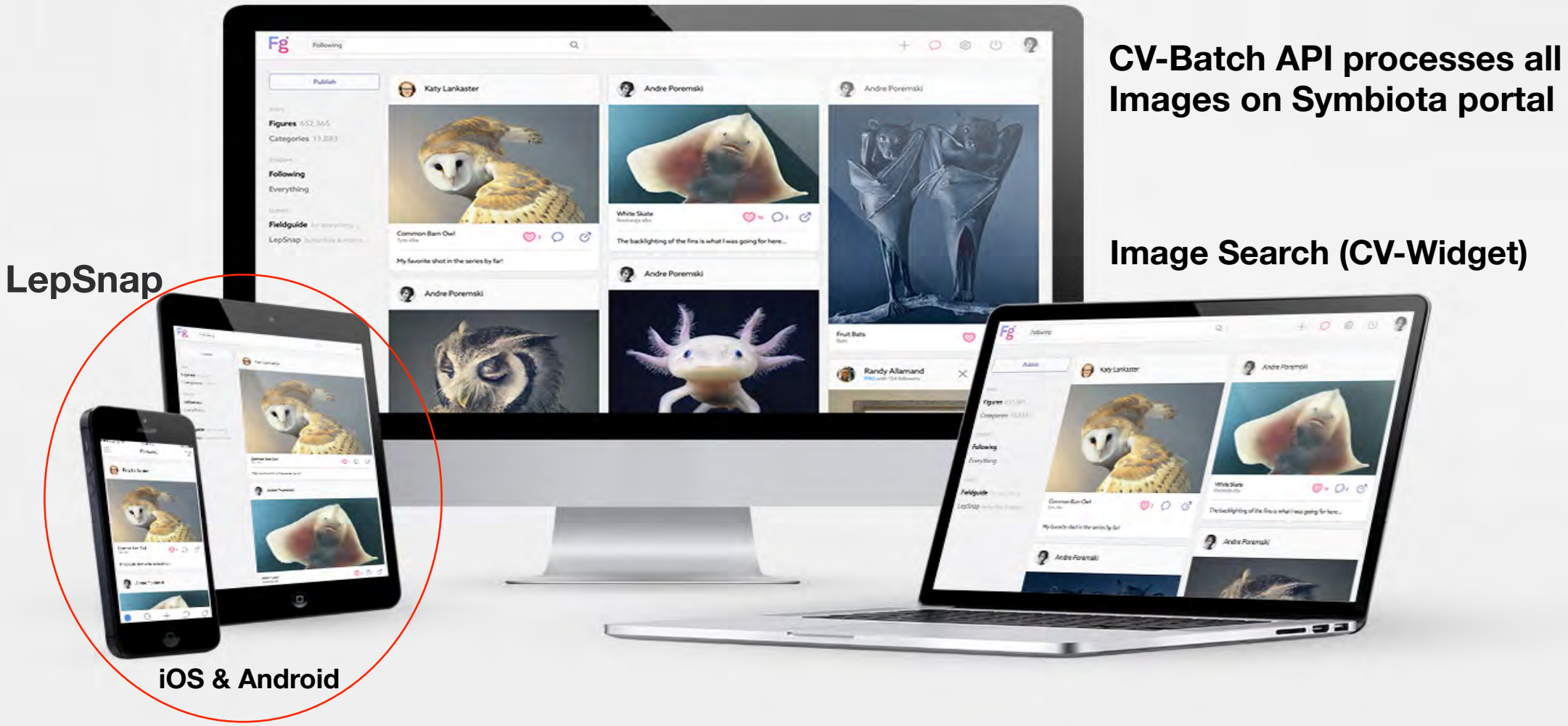
Phenology Filter



Fieldguide

Computer vision for biodiversity

Andre Poremski overview in Symbiota Meeting Nov 2, 3:30PM, Harn Chandler Auditorium



CV-Batch API processes all Images on Symbiota portal

Image Search (CV-Widget)

Paper Models of Lepidoptera

*Anne Basham, Project Director LepXplor

Papered Benefits

- 2D nature of leps allows for creation of life-like models.
- Handled and manipulated in K-12 classrooms.
- Linked with databases and applications.
- Can represent holotypes or rare species not normally used in education & outreach.
- Parks & education centers can order reference collection from checklist and place on public display.

*Presentation at Symbiota Meeting, Nov 2 3:45 Harn Auditorium

Thanks to LepNet Collaborators!

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Correspondence

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LepNet: The Lepidoptera of North America Network

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Casting a LEP-NET

HI-RES IMAGES OF BUTTERFLIES AND MOTHS COMING TO A COMPUTER NEAR YOU

Arctia caja subsp. ulahensis, taken from Roan Plateau, Garfield County, Colo., dir. 1996. Donated by C.P. Slater.

Butterflies and moths can't take selfies – at least not yet. But pictures of them can be incredibly compelling and insightful, which is why the National Science Foundation has awarded nearly $4 million to 24 institutions, including Colorado State University, to capture hi-resolution images of Lepidoptera, the order of insects that includes butterflies and moths. The project, Lep-Net, will take place over four years, with the ultimate goal of digitizing more than 1.7 million specimen records and integrating those images with the more than 1 million records already in place.

Paul Opler, a professor in CSU's Department of Bioagricultural Sciences and Pest Management and associate director of CSU's C.P. Gillette Museum of Arthropod Diversity, will spearhead the University's contribution to the image database, which will account for 10 percent of the total number of images. The primary focus of the project is databasing almost 160,000 butterfly and moth specimens in the museum's holdings, which are estimated to be about a half million.

The NSF funding allowed the team to purchase a high-resolution sophisticated camera system, dubbed "The Little Kahuna," which captures images at six times the resolution of those previously cataloged.

"Images of North American butterflies and moths have never before been cataloged in this way," said Opler. "Importantly, this image database will not simply be a resource for scientists, but we fully expect the database to be used for community outreach, since the images will be available for teachers, educators, and the general public."

An additional component of the project is Lep-Snap where users of an app designed for mobile phones can take pictures of butterflies and moths, upload them, and have them identified. The identification is not done by experts but rather by the program itself, which uses the vast array of images collected to compare and analyze new pictures uploaded by individuals.

The project is relying heavily on the work of research associates drawn from the local community. Chuck Harp, an acknowledged expert on butterflies and moths, serves as a full-time research associate for the project, and he leads the day-to-day work of 11 or more students and citizen scientists who do most of the databasing work.

"The Lep-Net project, funded through the NSF grant and iDigBio, allows us to document and to preserve vital biological data from specimens housed in the C.P. Gillette Museum from several scientific pioneers from the past 100 years," said Harp. "I accepted this job to honor their efforts for the public and for further scientific studies. It has been my pleasure to be a part of this project to ensure the specimens and data contained on the labels are shared for all to use."

"Importantly, this image database will not simply be a resource for scientists, but we fully expect the database to be used for community outreach, since the images will be available for teachers, educators, and the general public."

Paul Opler, professor in CSU's Department of Bioagricultural Sciences and Pest Management and associate director of CSU's C.P. Gillette Museum of Arthropod Diversity

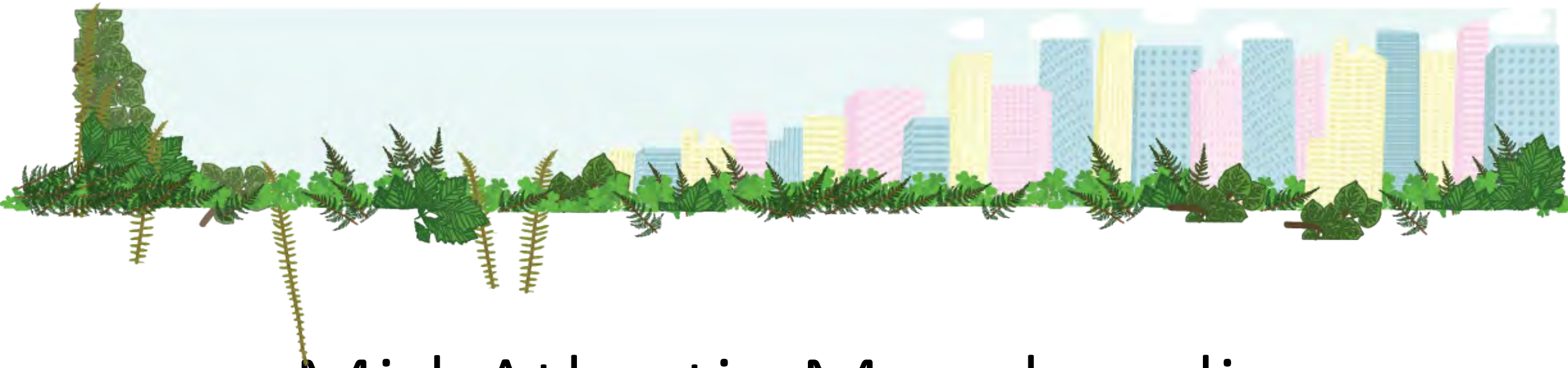
Pam Plombino is volunteer associate who is focused primarily on butterfly identification. "Many people describe Lepidoptera as the glamour insects because they are so beautiful, especially when viewed up close and at high resolution," said Plombino. "But Lepidoptera also perform many essential functions in nature including pollinating plants and serving as a protein source for predators."

The team is hopeful that the project may someday expand to other arthropods, but the immediate plans are to continue documenting Lepidoptera. The database currently has approximately 32,000 images with 1,500 uploaded onto the website, which can be accessed at:

http://symbiota4.acis.ufl.edu/scan/portal/index.php.

Papilio canadensis, taken from Yukon Territories, dir. 1969. Donated by R.E. Stanford.

Megathymus yuccae subsp. reubeni, taken from nr. Carrizozo, N.M., dir. 2007. Donated by C.E. Harp.



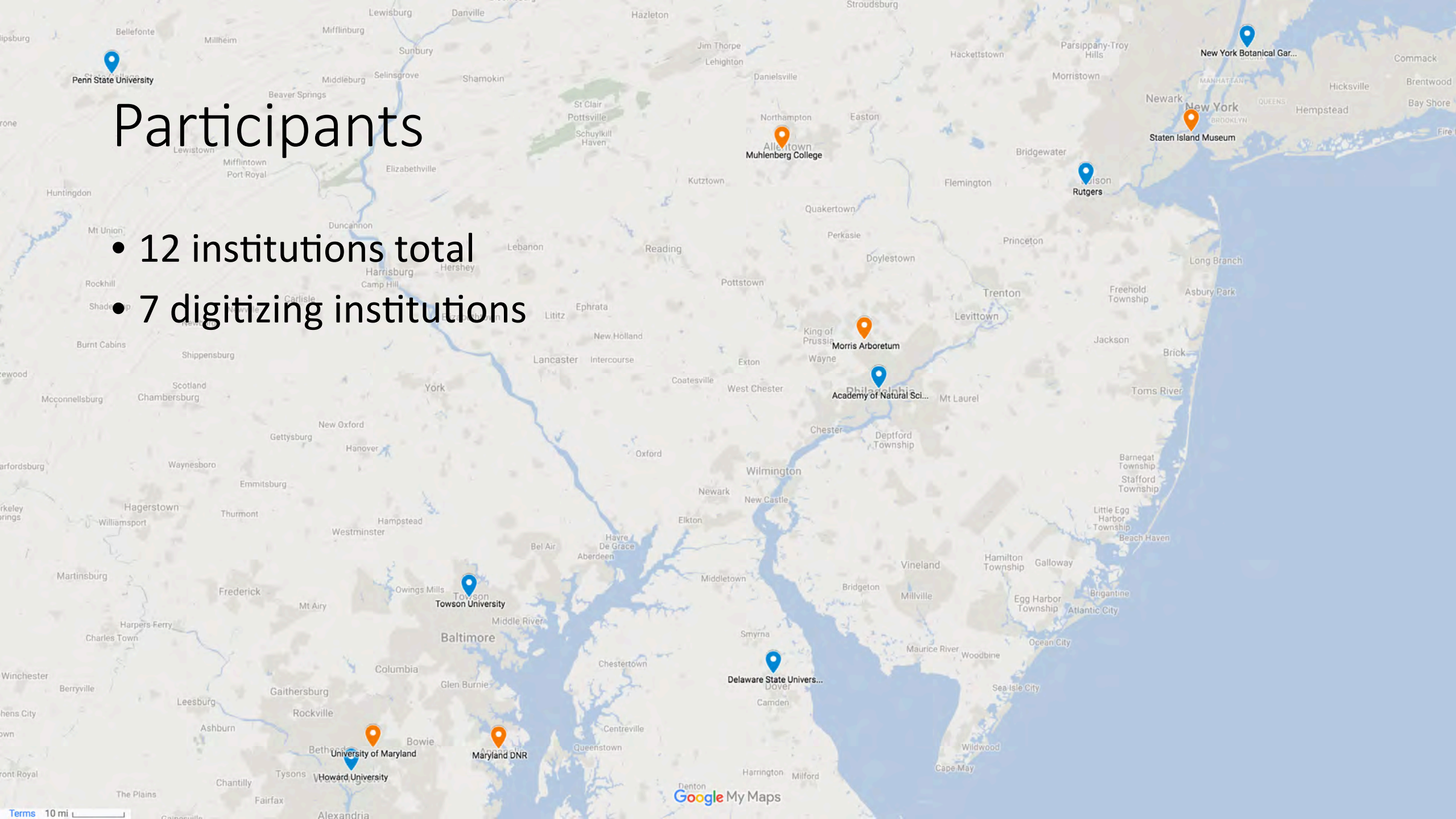
Mid-Atlantic Megalopolis

Digitizing botanical specimens from the Mid-Atlantic urban corridor

Morris Arboretum
University of Pennsylvania
Official arboretum of the Commonwealth of Pennsylvania

Participants

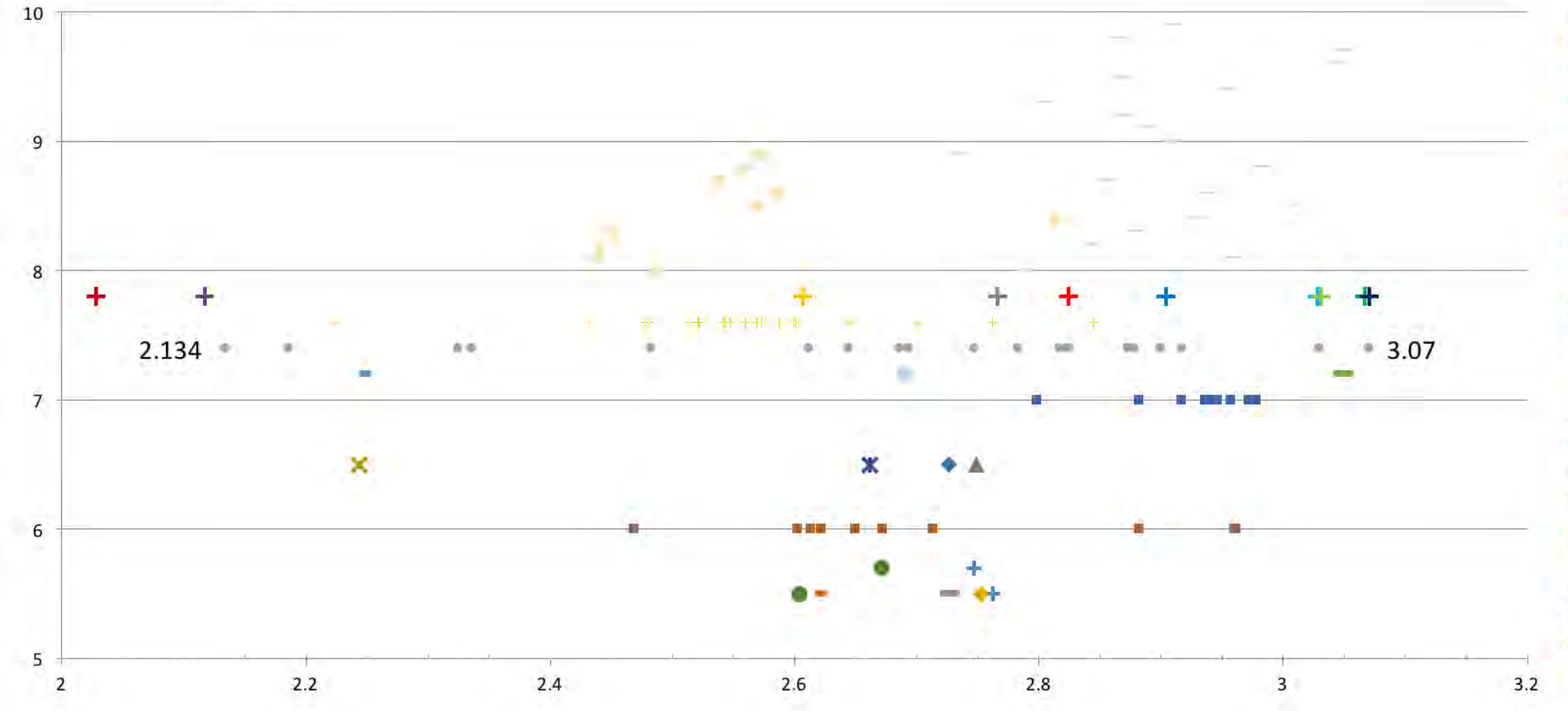
- 12 institutions total
- 7 digitizing institutions



Accomplishments

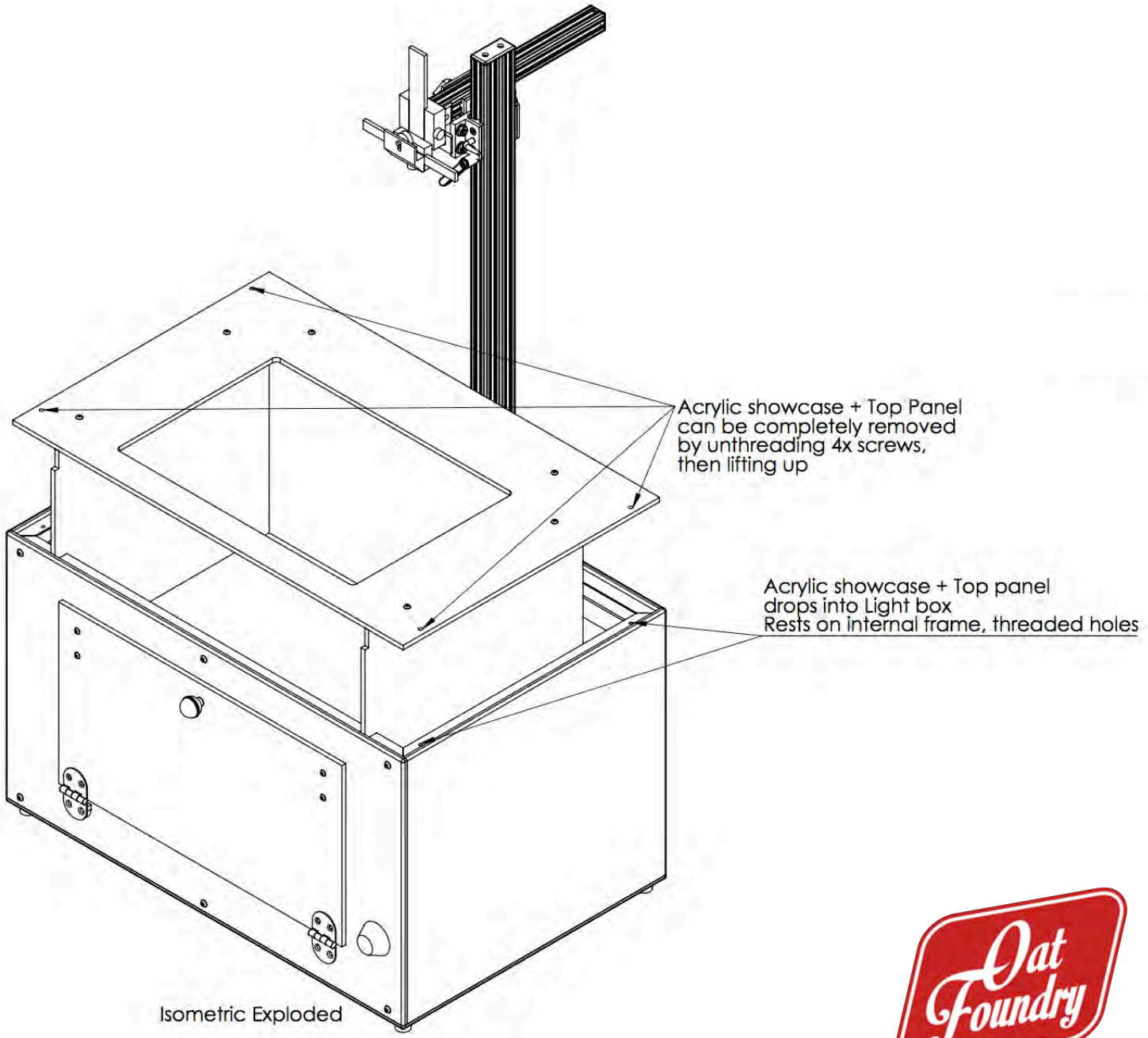
Fine Focus

Accomplishments



Lessons Learned

- OR Tech Photo-eBox Bio discontinued
- Contracted with design and build firm to manufacture a new lightbox
- Available in December



Thank You

MAM Collaborators: Academy of Natural Sciences, Delaware State University, Howard University, Maryland Department of Natural Resources, Morris Arboretum, Muhlenberg College, New York Botanical Garden, Pennsylvania State University, Rutgers University, Staten Island Museum, Towson University, University of Maryland

National Science Foundation Awards: 1601697, 1600981, 1601393, 1600976,1601429, 1601101, 1601503, 1702441

The Microfungi Collections Consortium:

A Networked Approach to Digitizing Small Fungi with Large Impacts on the Function and Health of Ecosystems

Andrew N. Miller

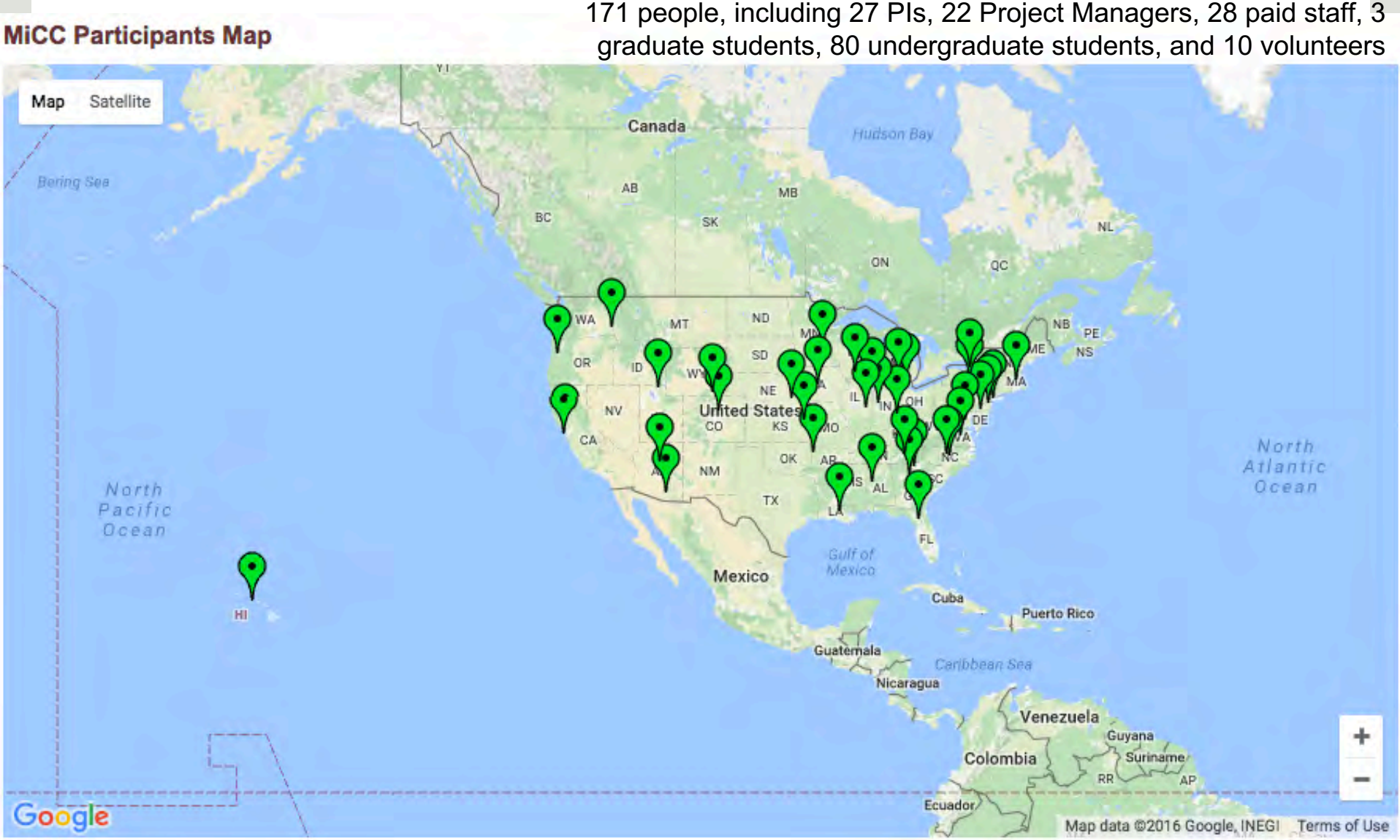
University of Illinois Urbana-Champaign

Illinois Natural History Survey

iDigBio is funded by a grant from the National Science Foundation's Advancing Digitization of Biodiversity Collections Program. 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.

Participants (38 institutions)

171 people, including 27 PIs, 22 Project Managers, 28 paid staff, 3 graduate students, 80 undergraduate students, and 10 volunteers



Management of the network

INHS Team

Andrew Miller
PI

Rhianna Baldree
Data Curator

Teresa Iturriaga
Data Curator

Phil Anders
Biological
Informatician

Alexander Kuhn
Data Curator

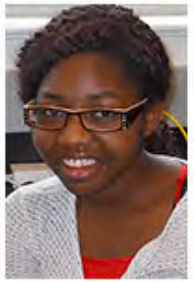
Scott Bates
Project
Consultant

Lee Crane
Exsiccati and
Nomenclature
Expert

Tiffany Bone
Digitization
Expert

Lauren Hoover
Transcriber

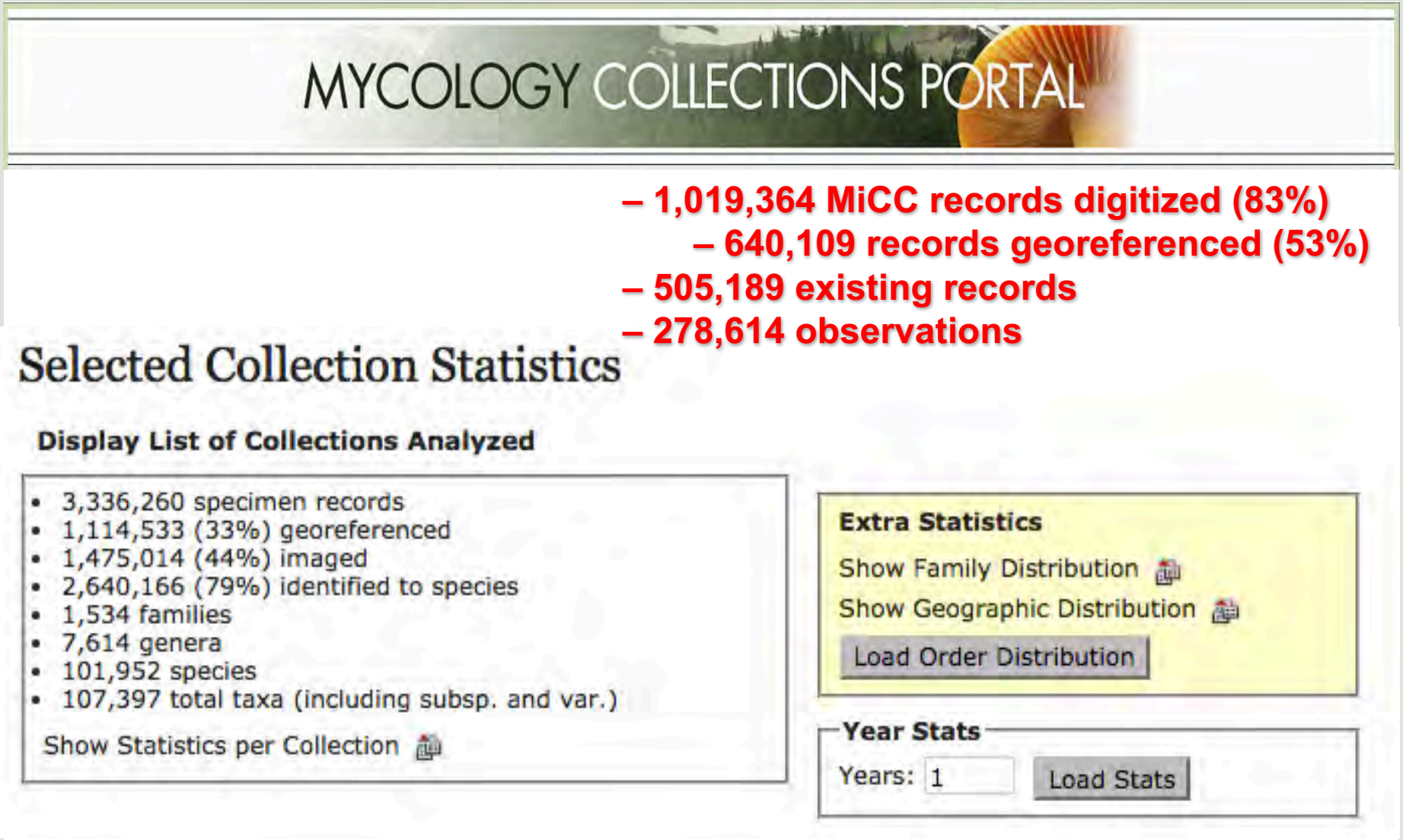
Sylvia Genont
Transcriber



Olamide
Oyeyemi
Transcriber

help@mycoportal.org

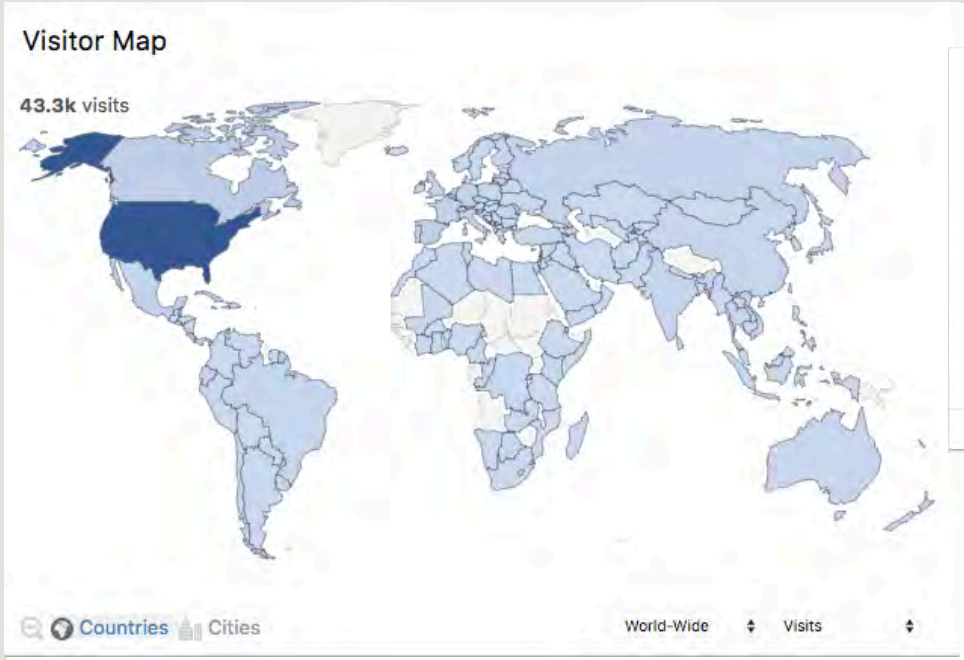
Progress

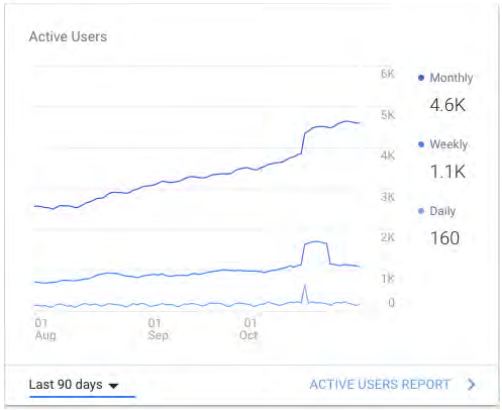


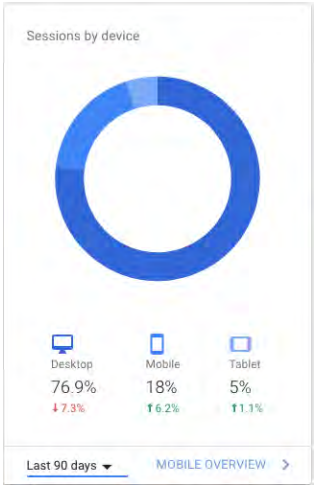
– 1,019,364 MiCC records digitized (83%)
  – 640,109 records georeferenced (53%)
– 505,189 existing records
– 278,614 observations

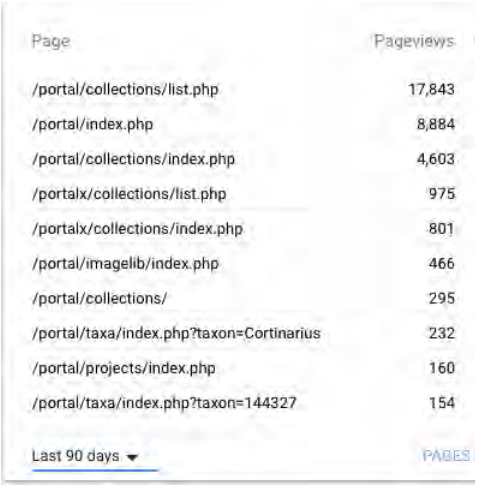
***including 118,359 type specimens**

Analytics





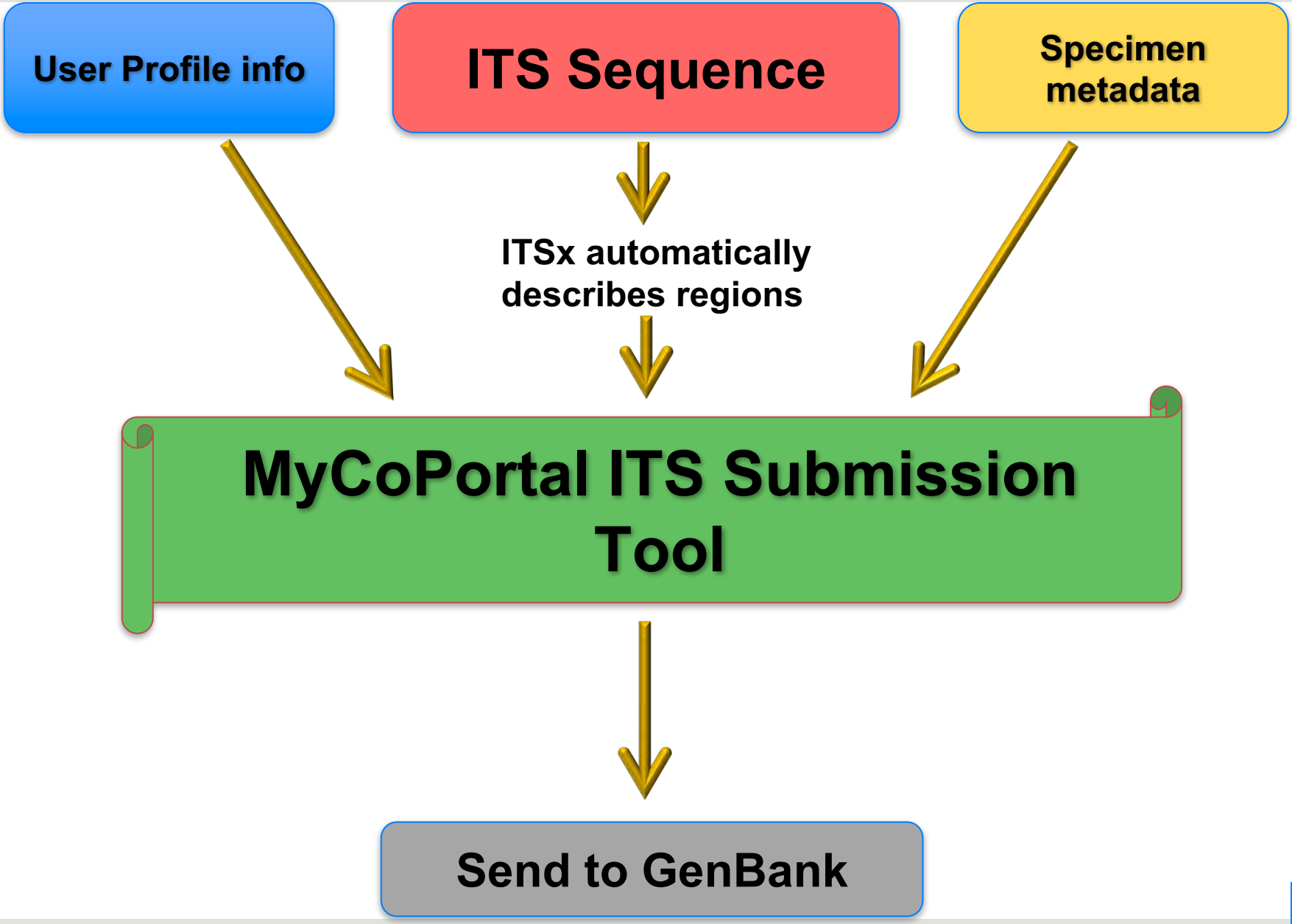




Google Scholar

MyCoPortal.org cited 39 times
– 16 peer-reviewed publications

Highlight


User Profile info
ITS Sequence
Specimen metadata
ITSx automatically describes regions
MyCoPortal ITS Submission Tool
Send to GenBank

PLOS Paleo Top 10 Taxa of 2017

Vote for Your Favorite Open Access Taxa of 2017

Invitation to PLOS Paleo Community members

fossil insect COLLABORATIVE

Macrofungi Collection Consortium

☑ *Gondwanagaricites magnificus* , from the article The oldest fossil mushroom

http://www.surveygizmo.com/s3/3018953/Top-Ten-Taxa-2017

EPICC TCN

Erica Clites, TCN Project Manager
University of California Museum of Paleontology

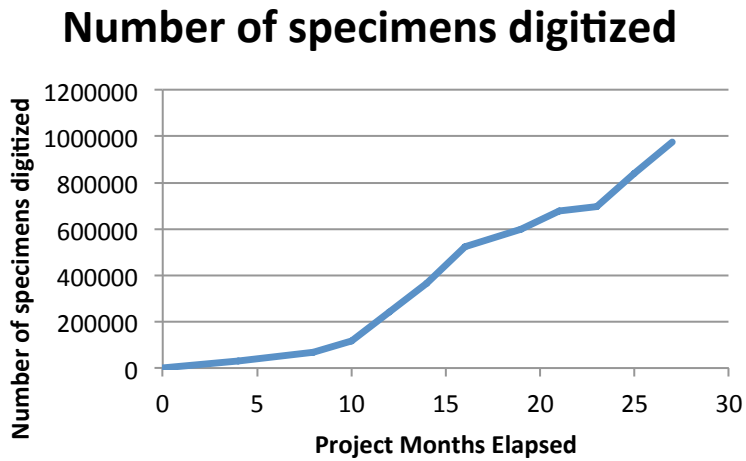

EPICC
epicctcn.org

Collaborators

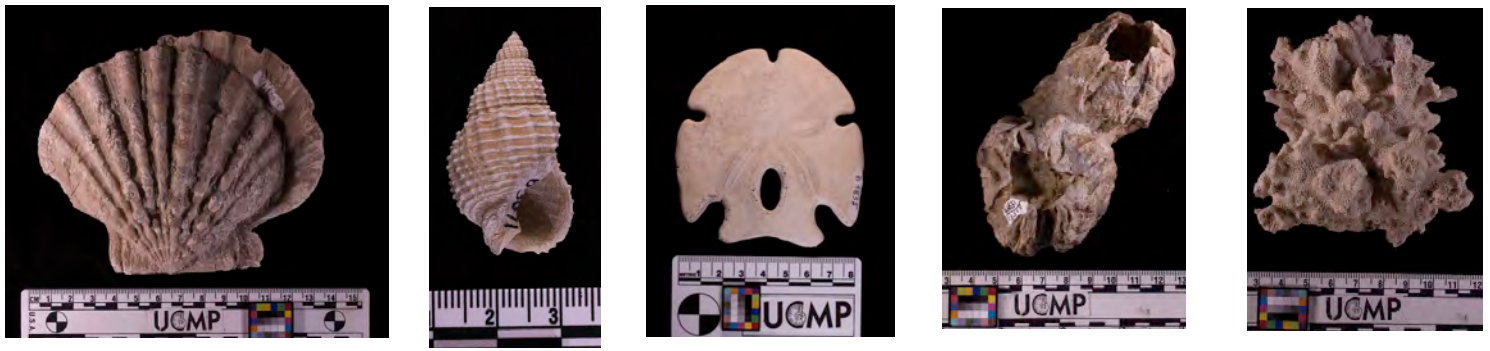
Progress

- Specimens digitized:

  975k/1.5M; 62%



- Specimens photographed: 26k/83k; 30%
- Localities georeferenced: 22k/35k; 60%

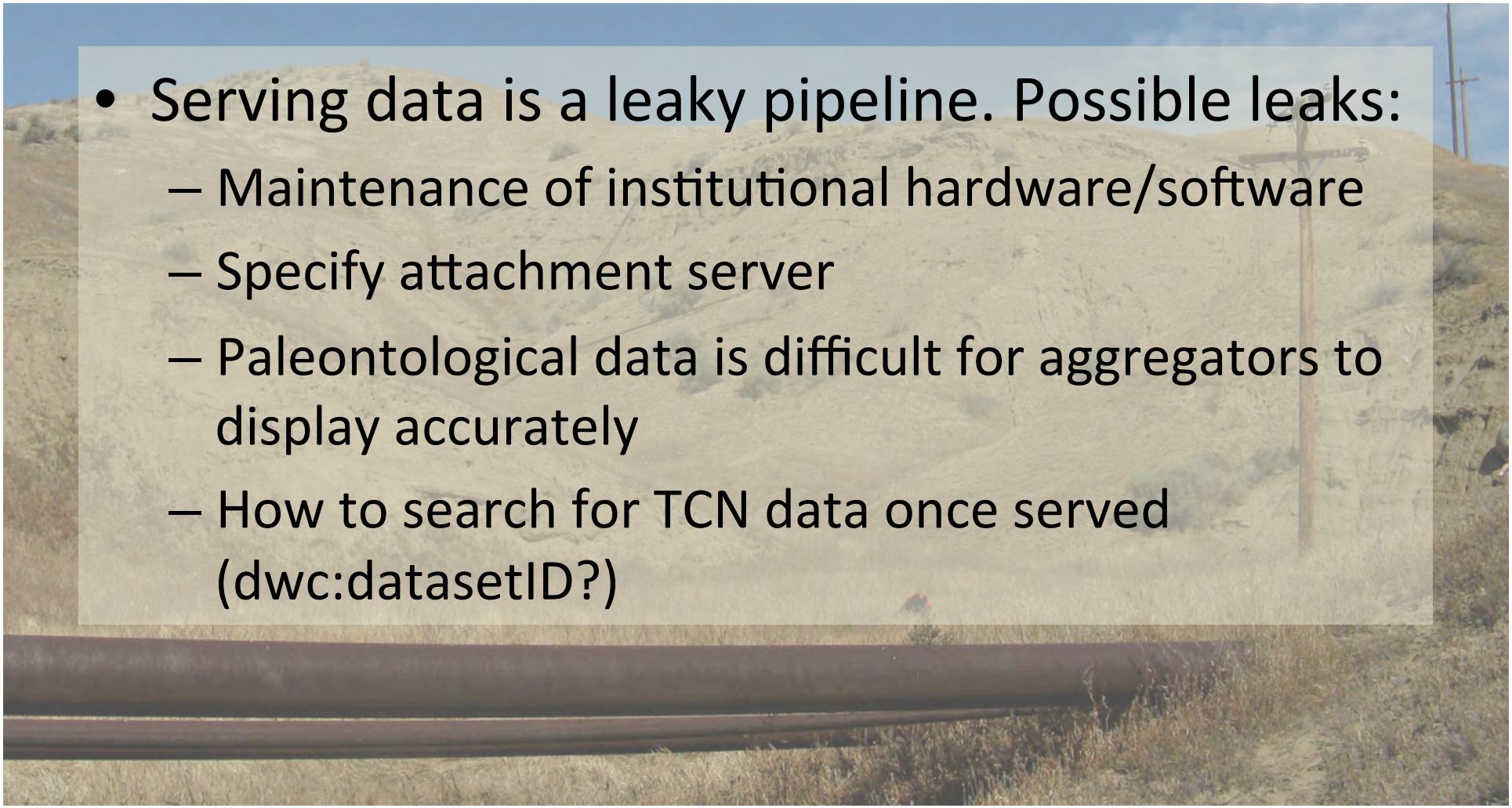


Building a Taxonomic Dictionary

- Existing sources of paleontological taxonomy incomplete, not intended for use as backbone
- Building dictionary based on primary literature
- Can be incorporated in GBIF backbone as checklist upon completion
- A.J.W. Hendy and C. Souto et al.; 6400 rows currently

KINGDOM	PHYLUM	CLASS	ORDER	FAMILY	GENUS	SUBGENUS	SPECIES	AUTHOR	ORIGINAL	SYNONYMS
Animalia	Mollusca	Gastropoda		Acmaeidae	*Acmaea*		*mitra*	Rathke, 1833	*Acmaea mitra*	*Acmaea mitra*
Animalia	Mollusca	Gastropoda	Cephalaspide	Acteocinidae	*Tornastra*		*cerealis*	(Gould, 1853)		*Tornastra cerealis*
Animalia	Mollusca	Gastropoda	Cephalaspide	Acteocinidae	*Tornastra*		*culcitella*	(Gould, 1853)		*Acteocina culcitella,*
Animalia	Mollusca	Gastropoda	Cephalaspide	Acteocinidae	*Acteocina*		*eximia*	(Baird, 1863)		*Acteocina eximia*
Animalia	Mollusca	Gastropoda	Cephalaspide	Acteocinidae	*Acteocina*		*harpa*	(Dall, 1871)		*Coleophysis harpa*
Animalia	Mollusca	Gastropoda	Cephalaspide	Acteocinidae	*Acteocina*		*inculta*	(Gould, 1855)		*Acteocina inculta*
Animalia	Mollusca	Gastropoda	Cephalaspide	Acteocinidae	*Tornastra*		*infrequens*	(Adams, 1852)		*Acteocina anomala*
Animalia	Mollusca	Gastropoda	Cephalaspide	Acteocinidae	*Acteocina*		*oldroydi*	Dall, 1925	*Acteocina oldr*	*Acteocina oldroydi*

Lesson learned



- Serving data is a leaky pipeline. Possible leaks:
  - Maintenance of institutional hardware/software
  - Specify attachment server
  - Paleontological data is difficult for aggregators to display accurately
  - How to search for TCN data once served (dwc:datasetID?)

Acknowledgements

- PIs, students, staff and volunteers of EPICC
- iDigBio staff and trainings
- NSF DBI awards 1502500, 1503065, 1503545, 1503611, 1503613, 1503628 and 1503678

Great Lakes Aquatic Invasives TCN:

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

Richard K. Rabeler (MICH)
Ken Cameron (WIS)
Aaron Goldberg (WIS)
Diego Barroso (MICH)

rabeler@umich.edu

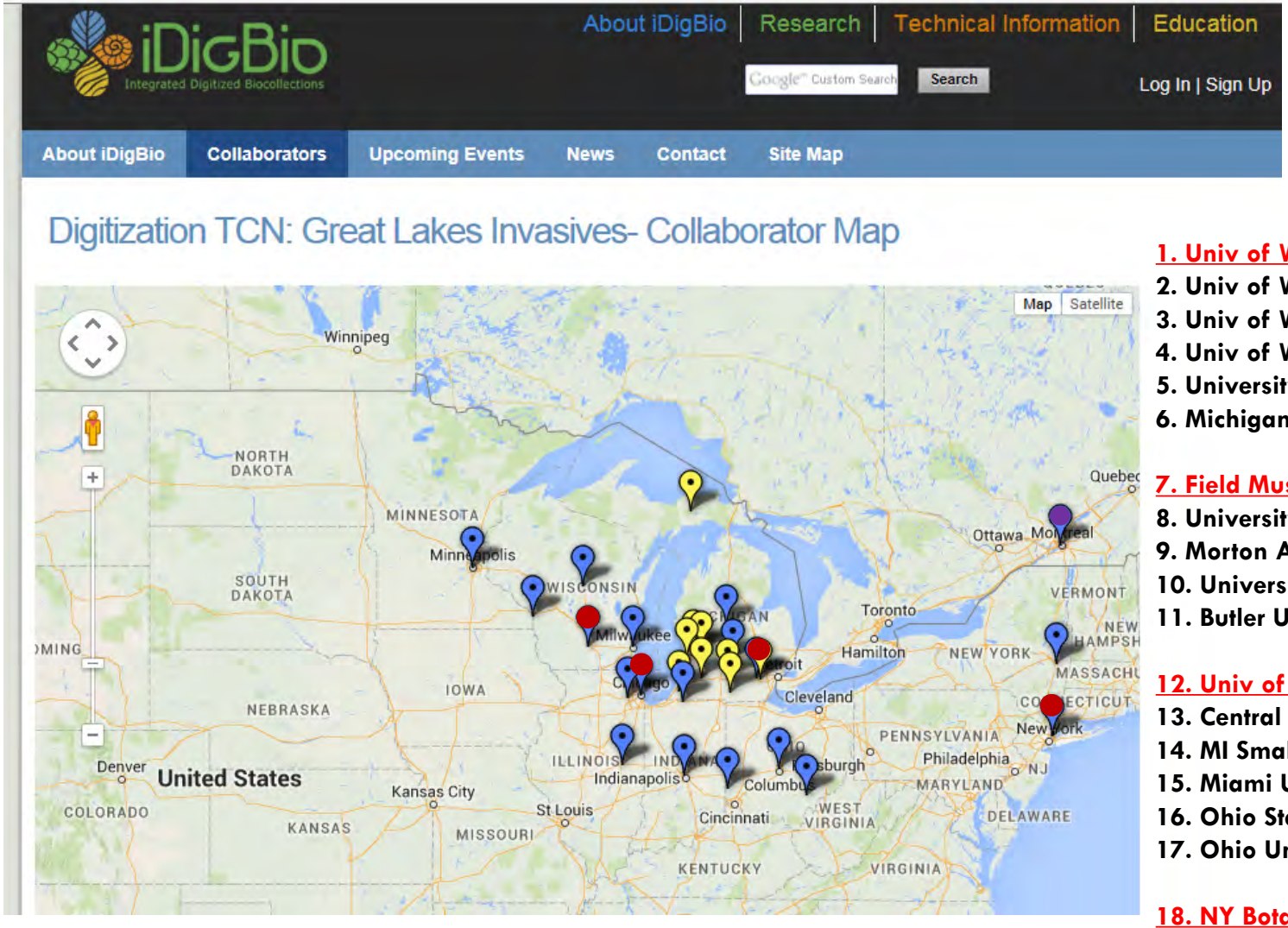
IdigBio Summit - 2017

BASIS OF THE PROJECT:

GLANSIS maintains a Database of invasive and potentially invasive genera and species of plants, fish, and mollusks

- ***plants: 49 genera (2147 sp. in North America)***
- ***fish: 38 genera (290 sp.)***
- ***mollusks: 14 genera (113 sp.)***

= 2,550 Species in 101 Genera



1. Univ of WI-Madison (WIS)
2. Univ of WI-Steven's Point
3. Univ of WI-Milwaukee
4. Univ of WI-LaCrosse
5. University of Minnesota
6. Michigan State University

7. Field Museum (F / FMNH)
8. University of Illinois / ILNHS
9. Morton Arboretum ***
10. University of Notre Dame
11. Butler University

12. Univ of Michigan (MICH)
13. Central Michigan University
14. MI Small Herbaria Network ++
15. Miami University
16. Ohio State University
17. Ohio University

18. NY Botanical Garden (NY)
19. New York State Museum

20. Université de Montréal /Canadensys

(21. Arizona State Univ / Symbiota)

NETWORK OVERSIGHT & PROCESS

http://GreatLakesInvasives.org

GREAT LAKES
INVASIVES NETWORK

Aquatic Invasives Homepage

- Fish Collections
- Mollusk Collections
- Plant Collections
- Map Search
- Species Lists
- Dynamic Checklist
- Browse Images
- Search Images

- Log in
- New Account
- Sitemap

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 bi-national thematic collections 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, algae, plants, and their look-alikes documented to occur in the Great Lakes Basin. Others have been placed on watchlists because of their potential to become aquatic invasives.

Several initiatives are already in place to alert citizens to the dangers of spreading aquatic invasives among our nation's waterways, but this project will develop complementary scientific and educational tools for scientists, wildlife officers, teachers, and the public who have had little access to images or data derived directly from preserved specimens collected over the past three centuries. This award is made as part of the National Resource for Digitization of Biological Collections through the Advancing Digitization of Biological Collections program and all data resulting from this award will be available through the national resource (iDigBio.org).

Join the network as a regular visitor and please send your feedback to Ken Cameron

Français

Canadensys

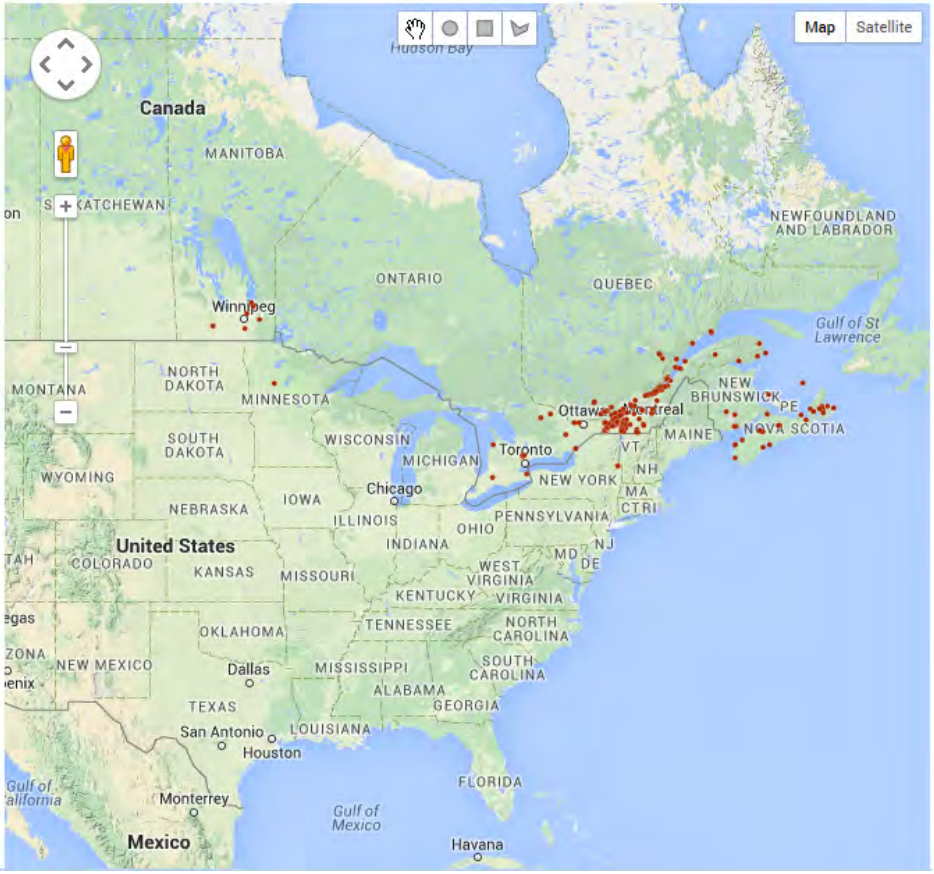
data | community

explorer repository tools vascan

726 Results

Map view | Table view | Stats view

(showing only georeferenced records: 354)



GREAT LAKES INVASIVES NETWORK

Home >> Collections

- [ ] Albion College (ALBC) more info
- [ ] Central Michigan University (CMC) more info
- [ ] Field Museum of Natural History (F) more info
- [x] Green Plant Herbarium (TRT) more info
- [x] Herbarium, Biodiversity Centre of Ontario (OAS) more info
- [x] Herbier du Québec (QUE) – Collection de plantes vasculaires (QUE) more info
- [x] Herbier Louis-Marie (QFA) - Collection de plantes vasculaires (QFA) more info
- [ ] Illinois Natural History Survey (ILLS) more info
- [ ] J. F. Bell Museum of Natural History Herbarium (MIN) more info
- [x] Jardin Botanique de Montréal (JBM) more info
- [x] Marie-Victorin Herbarium (MT) more info

PROGRESS TO DATE: SPECIMENS IN INVASIVES PORTAL

	Specimens	Georeferenced	Imaged	Original goals
27 US Herbaria	737546	246123	685540	
10 Canadensys Herbaria	122195	57296	13946	
total plants:	859741	303419	699486	637000
	Lots			
6 Fish Collections	107728	61787	45565	102000
6 Mollusk Collections	45002	22240	15099	44000
Grand Totals	**1012471**	**387446**	**760150**	783000

% Georeferenced	% Imaged	% over goals
38.26	75.08	**29.31%**

INNOVATION: REDUNDANCY OF RECORDS

Our project structure has some built-in redundancy.

Plant records from US institutions are available:

- via the source institution
- via the Consortium of Midwest Herbaria portal
- iDigBio
- Our project portal: http:// GreatLakesInvasives.org.

An advantage for sustainability – not all is lost if a site eventually goes away.

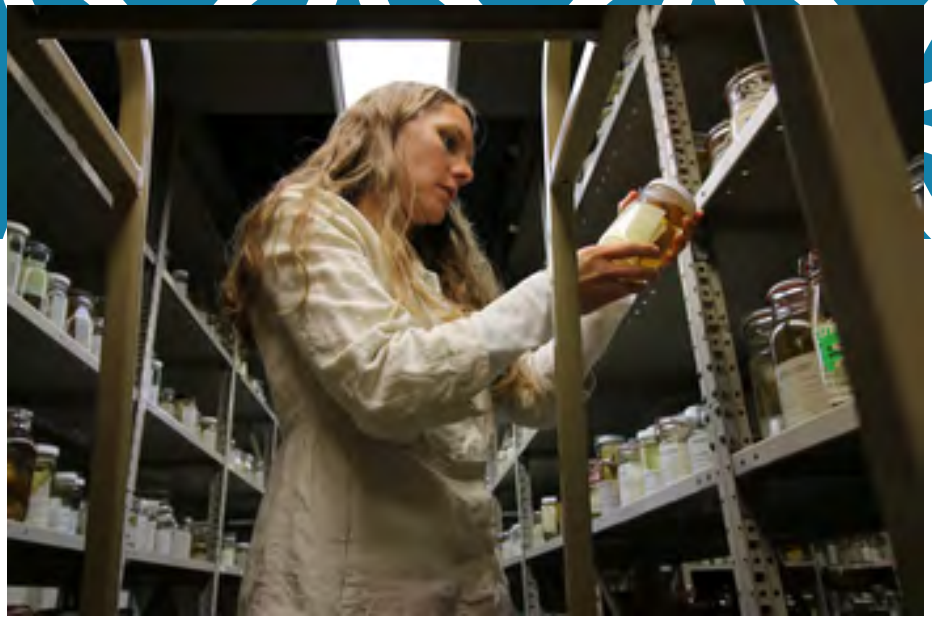
LESSONS LEARNED

1. Media interest: may be greater than one might think. We discovered that if one approaches them with a story they are likely to be excited and will help promote the project. One of our PI's was especially helpful in getting our TCN some radio, newspaper, and even online video coverage.
2. Maintaining interest among collaborators over the course of the project takes more work than we originally assumed.

GREAT LAKES INVASIVES NETWORK

http:// GreatLakesInvasives.org

http:// MidwestHerbaria.org



iDigBio
Integrated Digitized Biocollections

NSF

iDigBio
Integrated Digitized Biocollections

InvertEBase

Reaching Back to See the Future:

Species-rich Invertebrate Faunas Document Causes and Consequences of Biodiversity Shifts in North America

Petra Sierwald, PI
Rudiger Bieler, Co-PI
Field Museum of Natural History, Chicago

Invert·E·Base

The Field Museum

iDigBio
Integrated Digitized Biocollections

Four –Year Project: Six institutions, 10 collections

The Field Museum — EF 14-02667, Petra Sierwald, Rudiger Bieler

The Frost Entomological Museum — EF 14-00993, Andy Deans

Delaware Museum of Natural History — EF 14-02697, Elizabeth Shea

AUBURN UNIVERSITY — EF 14-01176, Jason Bond

LSA MUSEUM OF ZOOLOGY, UNIVERSITY OF MICHIGAN — EF 14-04964, Diarmaid O'Foighil, Taehwan Lee

Cleveland Museum of NATURAL HISTORY — EF 14-02785, Gavin Svenson

Museum of Comparative Zoology, Harvard University — **FilteredPush** EF 14-01450, James Hanken

PEN 2016: Chicago Academy of Sciences

Chicago Academy of Sciences / Peggy Notebaert Nature Museum — EF 16-01700, **Dawn Roberts**

InvertEBase Portal:
Additional collections posting their data

More Collections on InvertEBase Portal

California Academy of Sciences
Colorado Plateau Biodiversity Center
Denver Museum of Nature & Science
University of Alaska Museum
Florida Museum of Natural History
North Carolina Museum of Natural Sciences
Sam Noble Oklahoma Museum
Yale University Peabody Museum

iDigBio
Integrated Digitized Biocollections

North American Invertebrates

- Terrestrial and aquatic mollusks: 2014 first inclusion of mollusks in ADBC
- Terrestrial and aquatic insects, arachnids, myriapods
- Digitize, mobilize, georeference up to 3Mill specimen data
- Three museums will serve data first time online (DMNH, AUMNH, CMNH)
- **Arthropod data served on**

SCAN
Symbiota Collections of Arthropods Network

Invert·E·Base

Digitization Progress :

- Total digitized in 5 of the 6 collaborating Institutions: 600,000 specimen records
- Frost Entomological Museum: completed 40,000 specimen/label images
- 4 year-period expected: 2,3mill
- Mobilization: DMNH completed transfer of all digitized DMNH specimens records to *Specify,*
- Auburn University: Will get their data onto InvertEBase in the near future
- **Year 4 challenge: georeferencing**
- **Cleaning the on-line iDigBio files**

Development of taxonomic authority files:

- MolluscaBase/WoRMs file uploads (5,000+ name combinations) PI Bieler
- Collaboration with SCAN: North American Arthropod names in progress
- MilliBase/WoRMs: global millipedes species database currently transferred to publicly accessible platform, PI Sierwald

Lessons learned

Workflows, sustainability, collaboration, broader impacts, and/or research use of data

Large collections are heterodox:
Constitutes many collections
different labels, various identifications, accuracy, various specimen sizes,

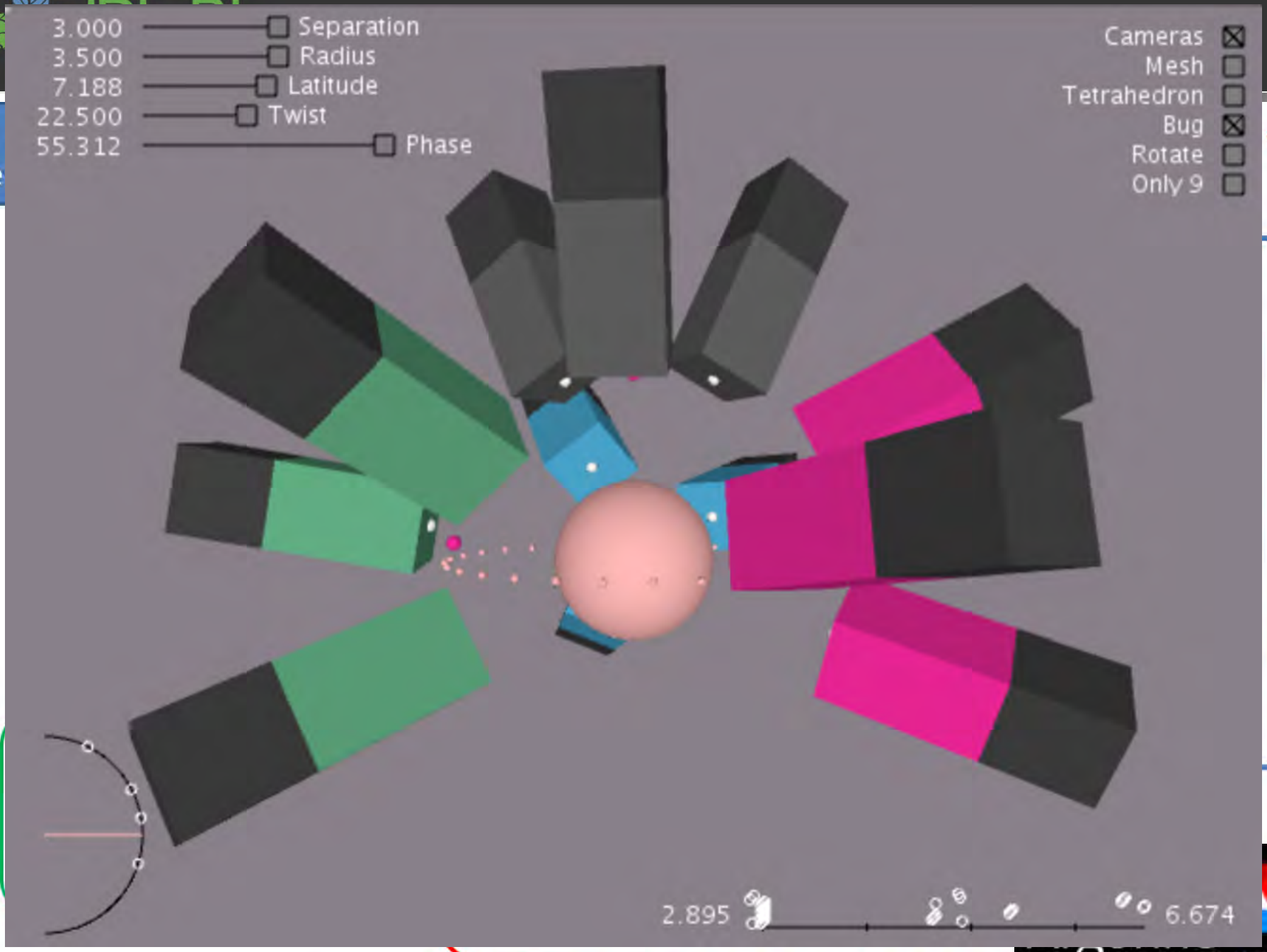
Pre-curation is a must.

Data entry so far has NOT benefitted from crowed sourcing, various collections in different status, when digitization work begins. Nobody wants to try Voice recognition
Double sided barcode labels

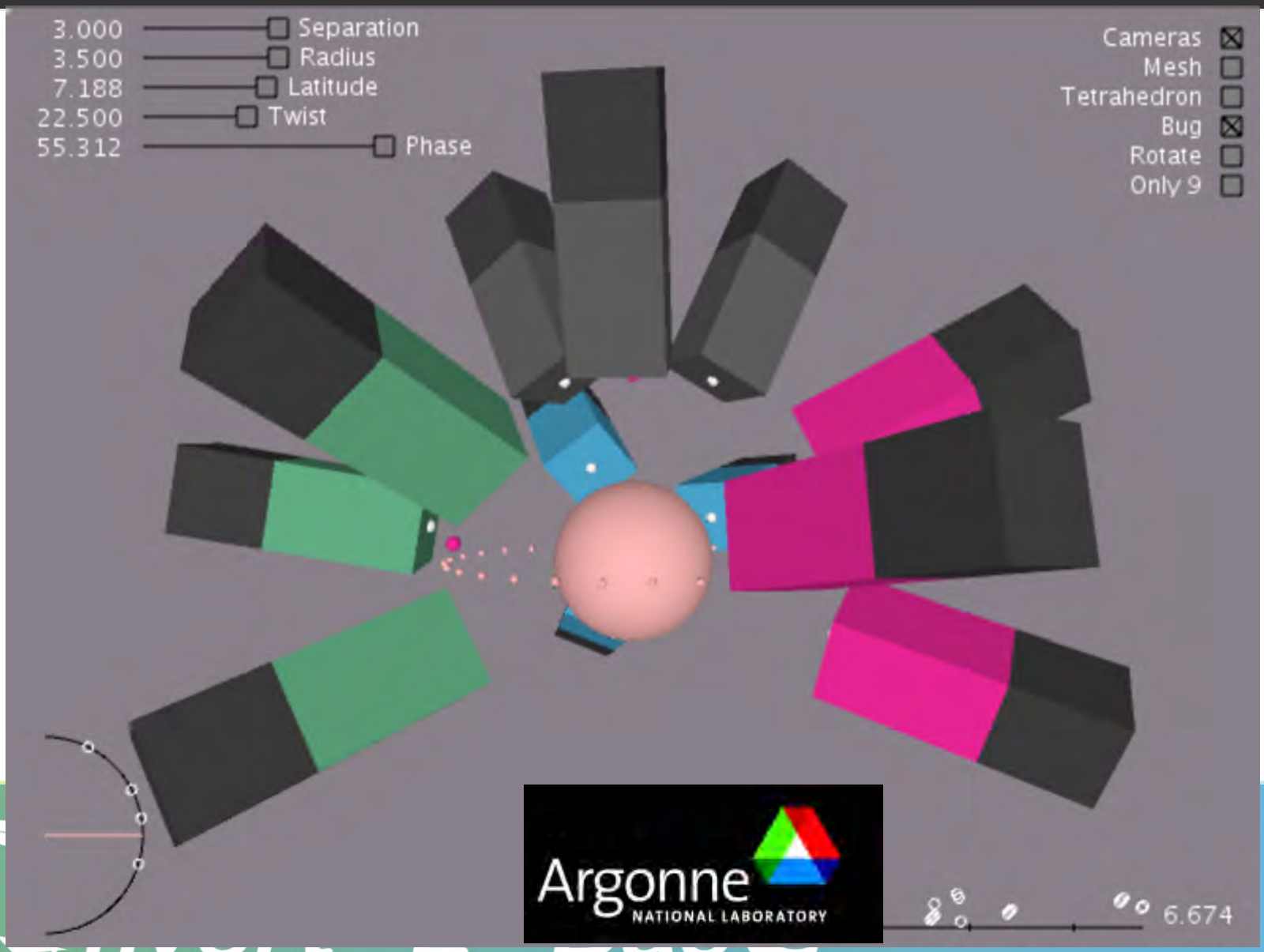
Argonne NATIONAL LABORATORY

Developing a high-throughput inexpensive imaging system for pinned insects and vials

1. image pinned specimen with all labels on the pin
2. Software stitches labels together and produces one clear image of the label data.
3. If the original label was printed, OCR may be used.
4. Crowd sourcing for data transcription



iDigBio
Integrated Digitized Biocollections



Looking at Year 5:

Two PEN proposals submitted from collections in

- Virginia
- Arizona

More Collections on InvertEBase Portal

- California Academy of Sciences
- Colorado Plateau Biodiversity Center
- Denver Museum of Nature & Science
- Florida Museum of Natural History
- North Carolina Museum of Natural Sciences
- Sam Noble Oklahoma Museum
- University of Alaska Museum
- Yale University Peabody Museum

Data enhancement:

- Georeferencing

Sustainability

Additional Digitization projects

- FMNH: inhouse funded
- UMZ Michigan: Insects

Outreach:

- Exhibit development

SERNEC – TCN: Keys to the cabinets: Building and Sustaining a Research Database for a Global Biodiversity Hotspot

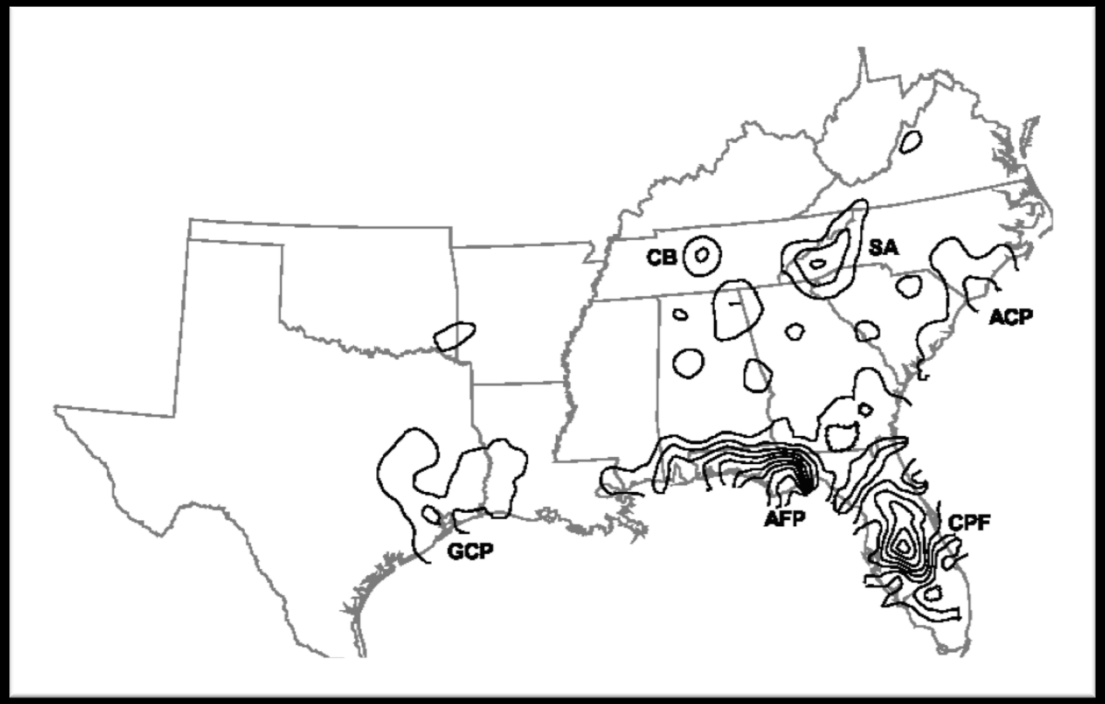
M.W. Denslow, Herrick Brown & Zack Murrell

iDigBio Summit 2017

NSF Award 1410069

The Project

- Southeastern U.S. vascular plants
- 93 collections
- 12 states
  - 28 hubs
- 6 partners
- 4.5M specimens



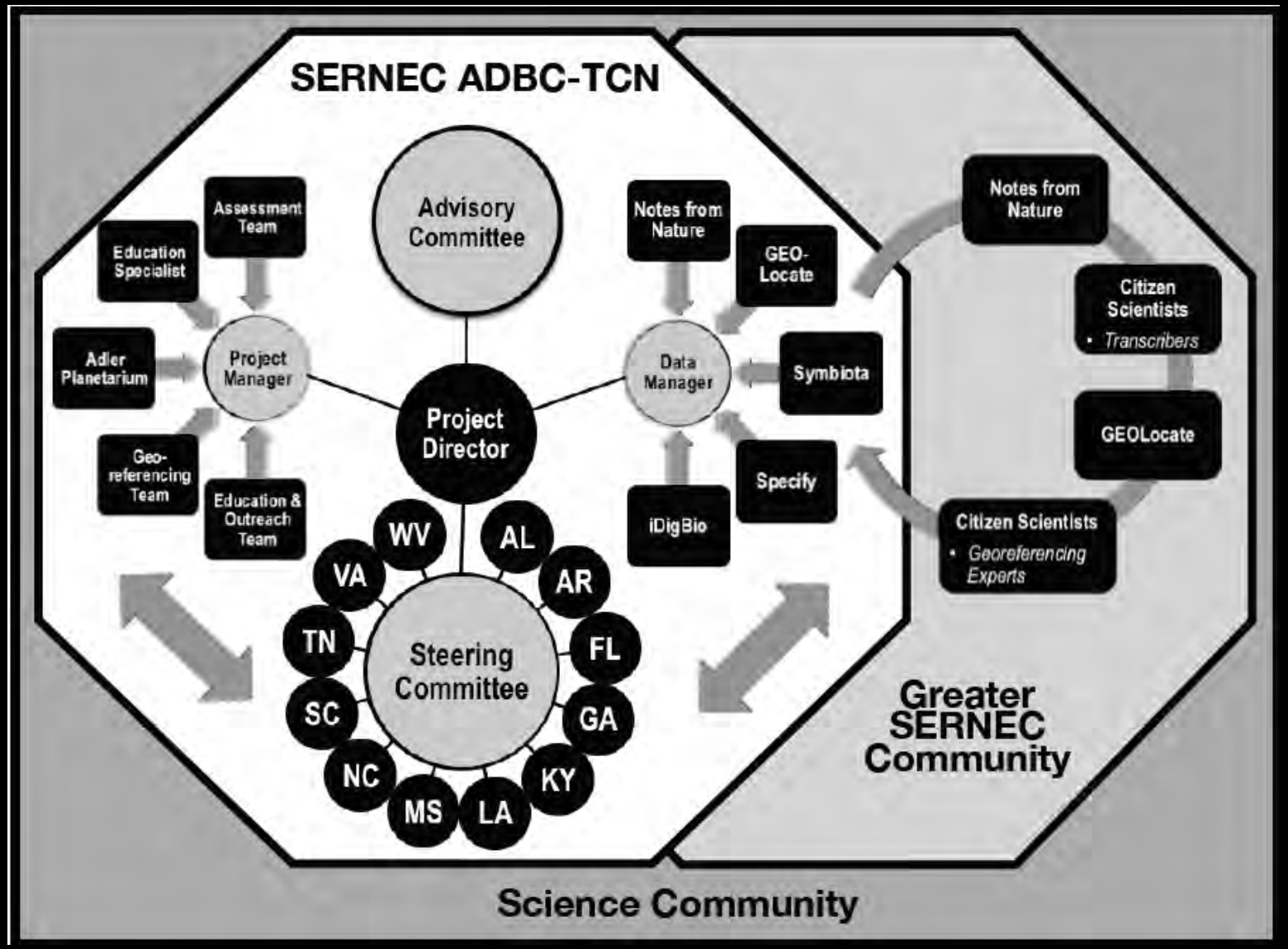
Workflow

Image / Skeletal Data Capture

Transcription / Georeferencing

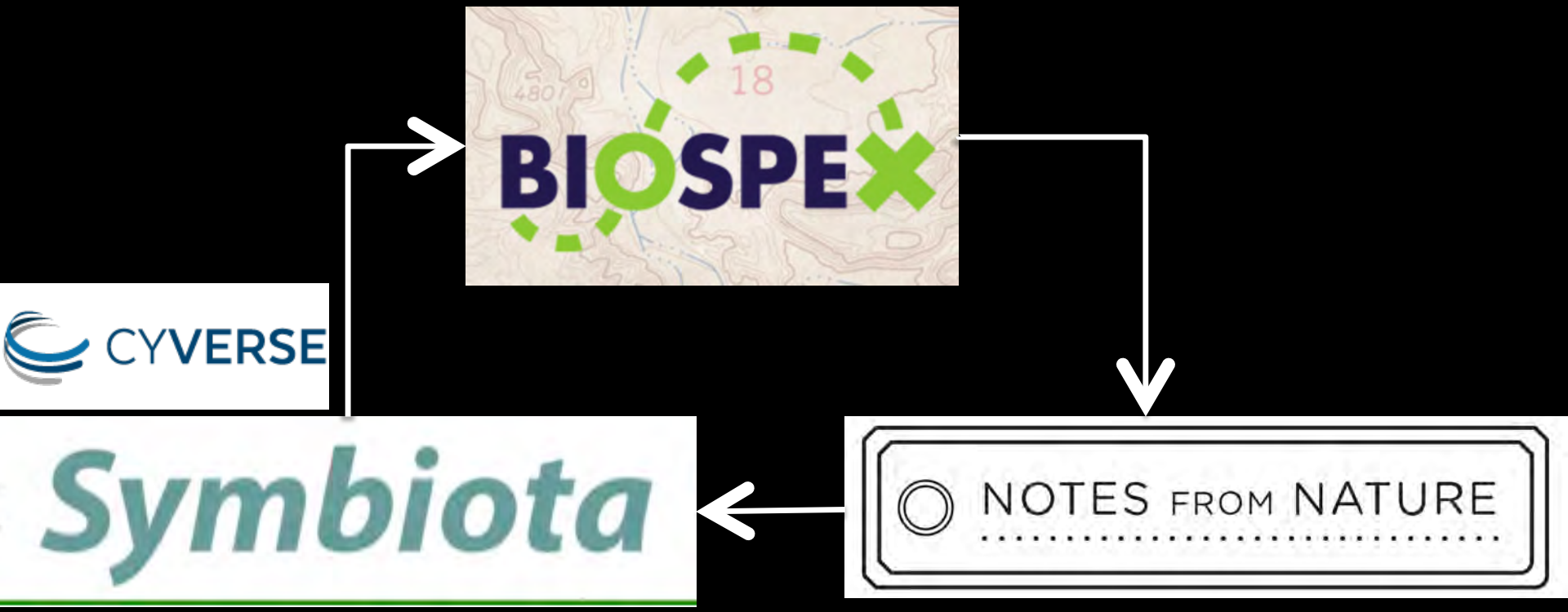
Mobilization / Repatriation

Management & Oversight



A Story

- Citizen Science Activities
- Label transcription
  - Enhanced workflow
  - Collaboration with BioSpex
  - Participation in WeDigBio


BIOSPEX
CYVERSE
Symbiota
NOTES FROM NATURE

A Story

- Participation in WeDigBio
  - 19,000 transcriptions
  - 15 SERNEC expeditions
  - Two onsite events with over 2,000 transcriptions in a single day

Lesson Learned

- Workflow development
  - Valdosta, 2015
  - http://dx.doi.org/10.3732/apps.1500065
- Support for multiple workflows and variations
  - Troubleshooting
  - Variations

Thank you!

Notes from Nature

CYVERSE

GEOLocate

Symbiota Promoting Bio-Collaboration

- TCN PRESENTATIONS (via powerpoint) Each TCN will give a 5-minute lightning presentation that covers: 1. A short overview of your TCN
- 2. One story that highlights your efforts/ accomplishments in workflows, sustainability, collaboration, broader impacts, and/or research use of data, and
- 3. One lesson learned (from something that didn't go as expected) that you think could help other TCNs/PENs, especially those that are just beginning their projects.

fossil insect COLLABORATIVE

Talia Karim, University of Colorado

Fossil Insect Collaborative

University of Colorado Boulder

Yale Peabody Museum

American Museum of Natural History

Illinois Natural History Survey

Virginia Museum of Natural History

Museum of Comparative Zoology
Harvard University

Natural History Museum
Los Angeles County

University of California Museum of Paleontology

Smithsonian
National Museum of Natural History

2 mm

UCMP 400938
Loc. -7139

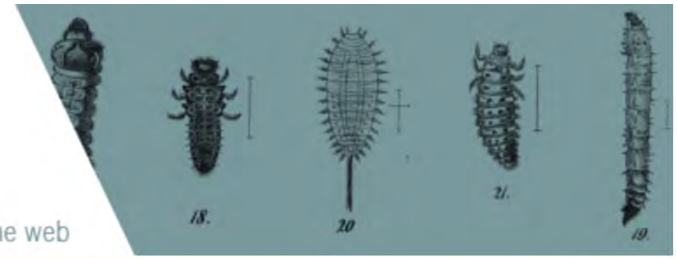
iDigPaleo

Education and outreach using digitized museum specimens

Break out Group on Friday 10:25am

iDigPaleo

Making data and images of millions of insect specimens available on the web



BROWSE ABOUT REGISTER EDUCATORS

Search

108362 SPECIMEN RESULTS

HAS MEDIA: HAS MEDIA

FILTER BY

- FOSSIL/MODERN
- COMMON NAME
- PERIOD
- CONTINENT
- GENUS
- FOSSIL DEPOSIT
- SOURCE
- PROJECT

UCM IP 73772
Diptera
Common Name: True flies, Mos...
Fossil Deposit: Green River For...

UCM IP 78924
Coleoptera
Common Name: Beetles
Fossil Deposit: Green River For...

UCM IP 84078
Hymenoptera
Common Name: Ants, bees, and...
Fossil Deposit: Green River For...

UCM IP 83664
Ichneumonidae
Common Name: Ichneumon wasps...
Fossil Deposit: Green River For...

UCM IP 78923
Coleoptera
Common Name: Beetles
Fossil Deposit: Green River For...

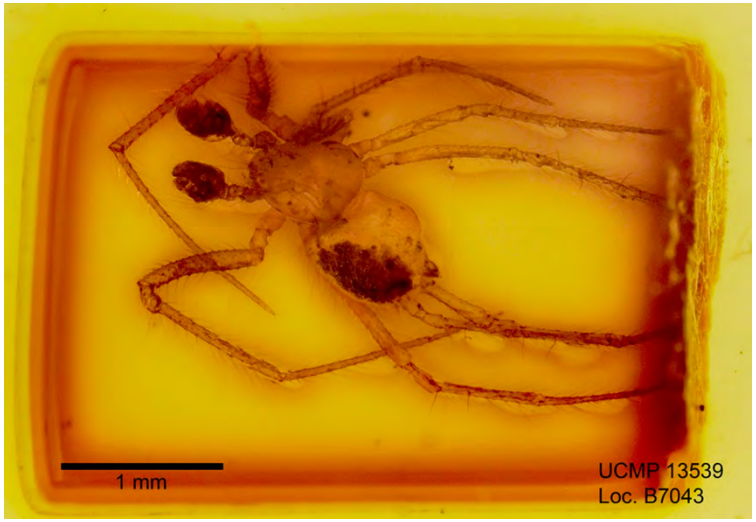
UCM IP 82740
Orthoptera
Common Name: Crickets and gr...
Fossil Deposit: Green River For...

UCM IP 78578
Curculionidae
Common Name: Weevils
Fossil Deposit: Green River For...

UCM IP 78866
Curculionidae
Common Name: Weevils
Fossil Deposit: Green River For...

Lesson Learned:

- Budget Extra Time for Imaging:
  - Workflow testing and optimization
  - Equipment failures
  - Student turnover and training
  - Utilize new software (e.g., Inselect)



Acknowledgements

Development of iDigPaleo is supported through NSF EF 1305027: Digitization TCN: Collaborative Research: Fossil Insect Collaborative: A deep-time approach to studying diversification and response to environmental change

@FossilInsectTCN

Vouchered Animal Communication Signals

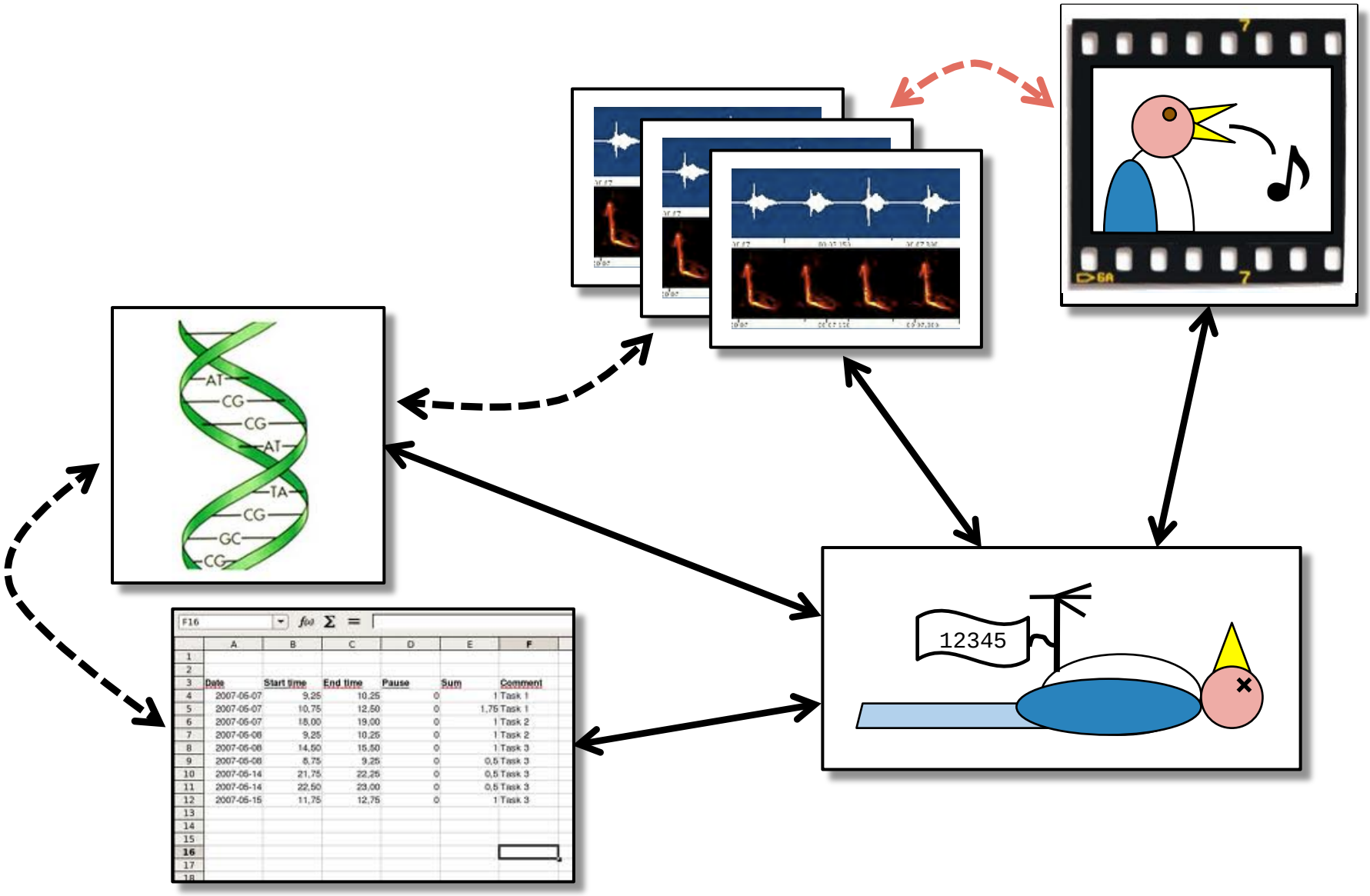
Michael Webster

Dept. of Neurobiology & Behavior, Cornell

The Cornell Lab of Ornithology

Macaulay Library

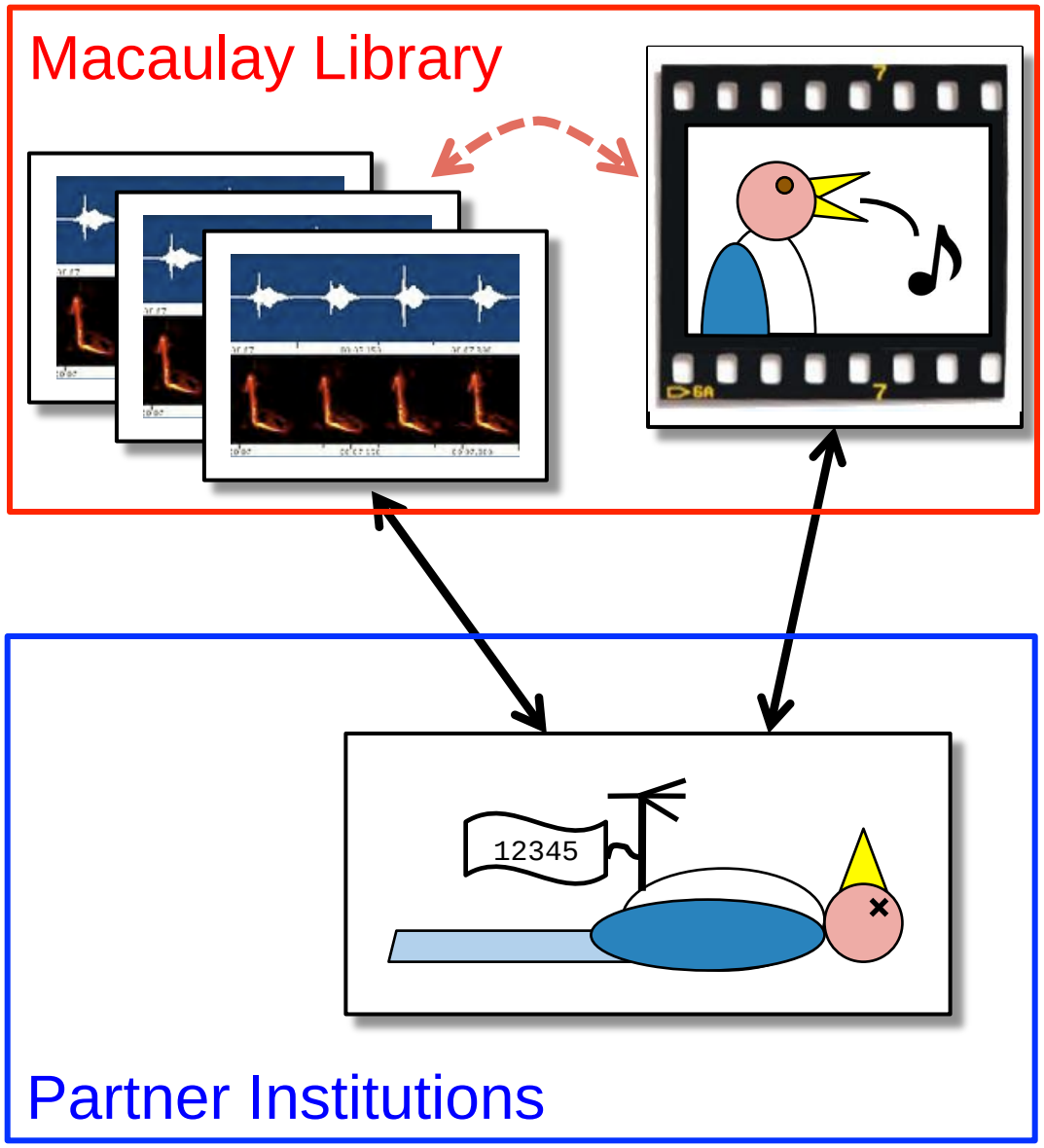
Connections across specimens/data



Digitization Progress to Date

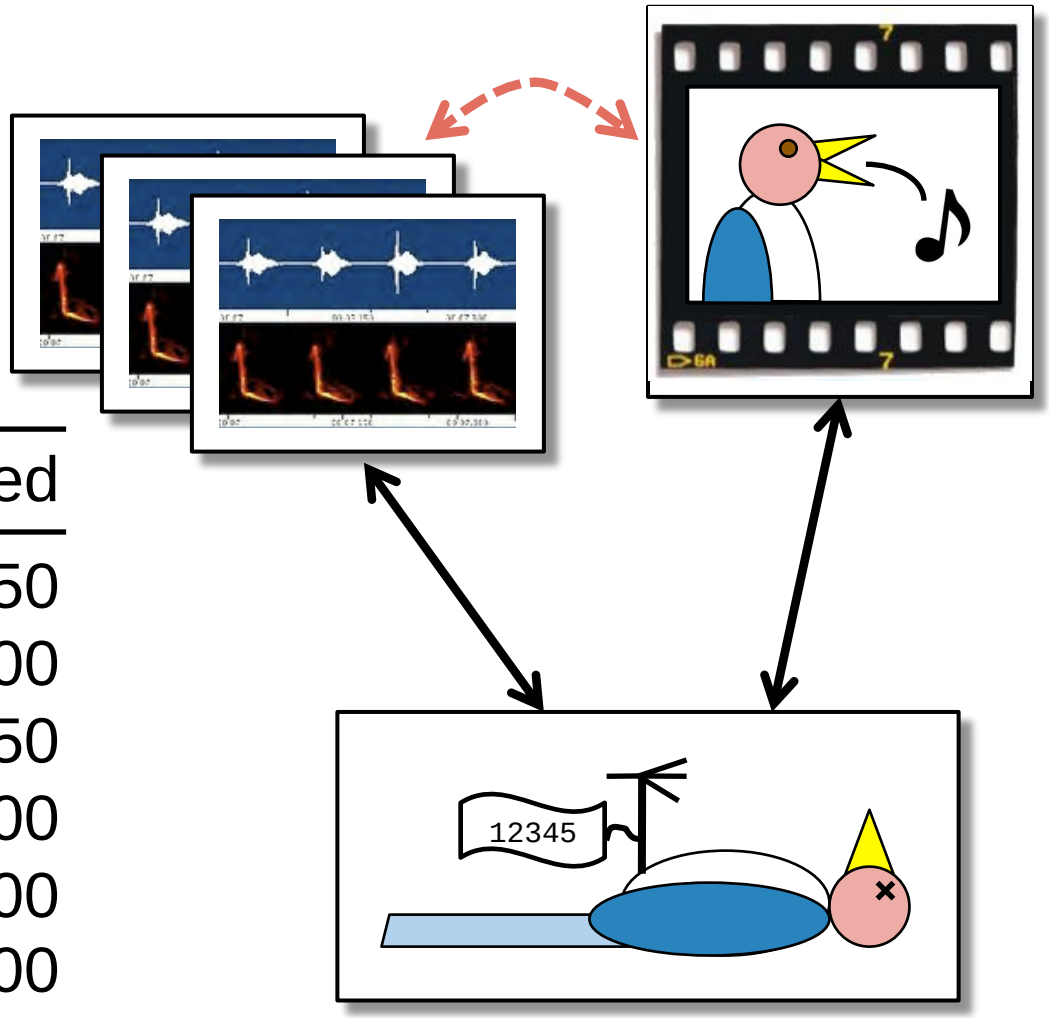
Square peg, round hole

1. Digitizing for a while
2. Specialization (most digitizing at one site)
3. Connections across collections
4. Specimen/media connection is not 1-1



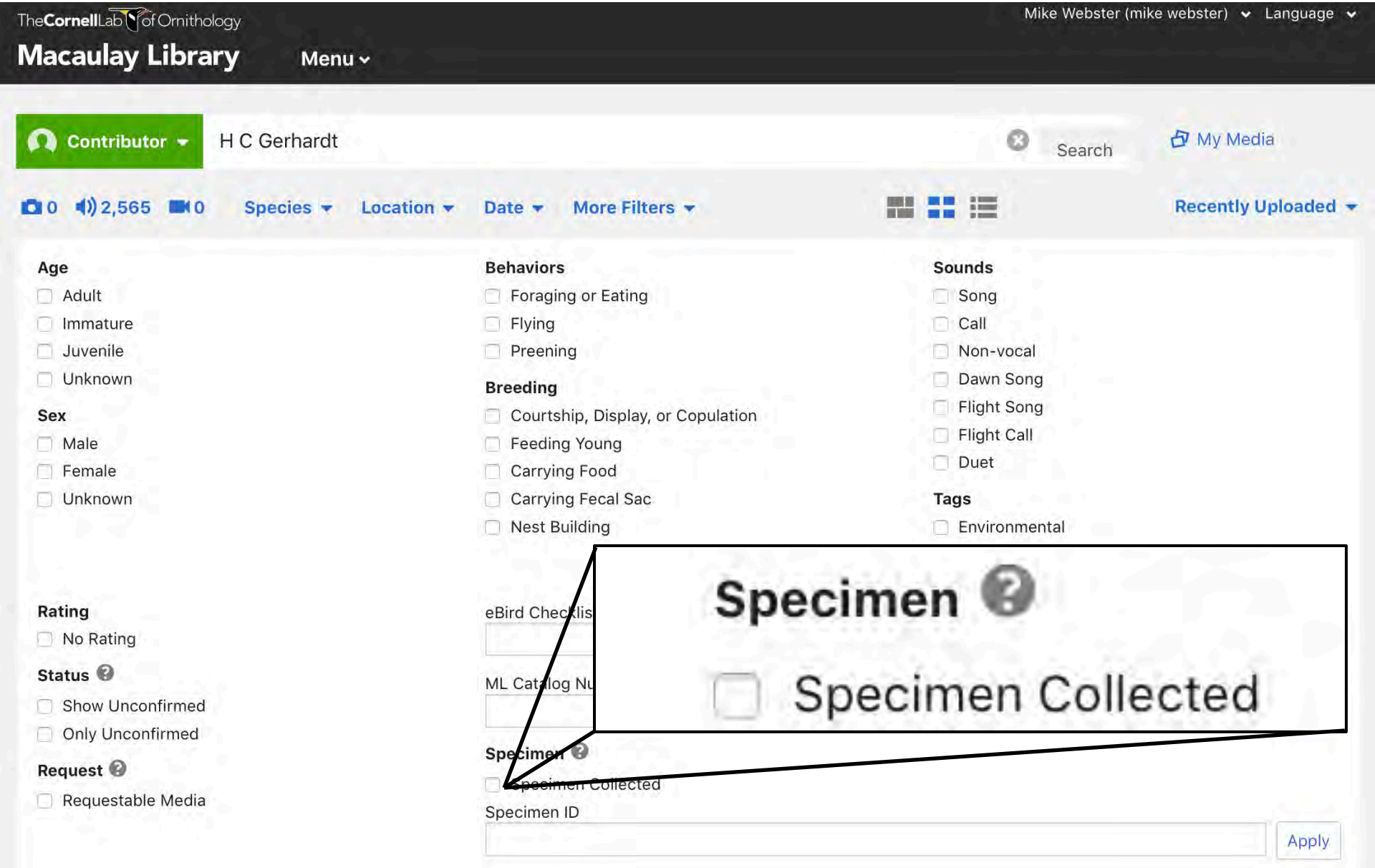
Digitization Progress to Date

Institution	# Digitized
Univ. of Kansas	10,750
Cal Academy	4,600
Smithsonian	2,750
LSU	17,700
TNHC	2,300
Yale	1,000
Museu Goeldi	400
TOTAL	39,500

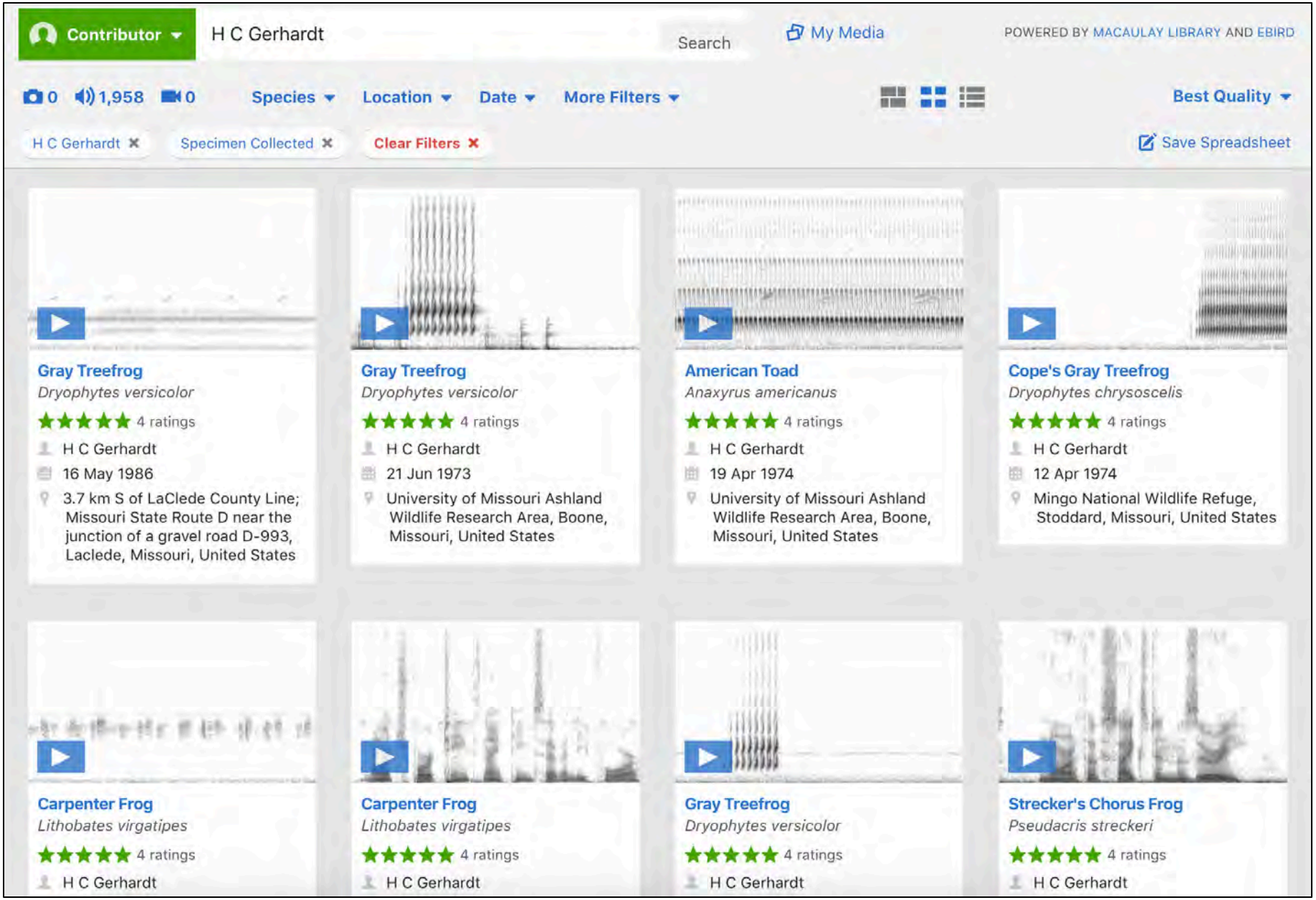


← 3.5K with specimens

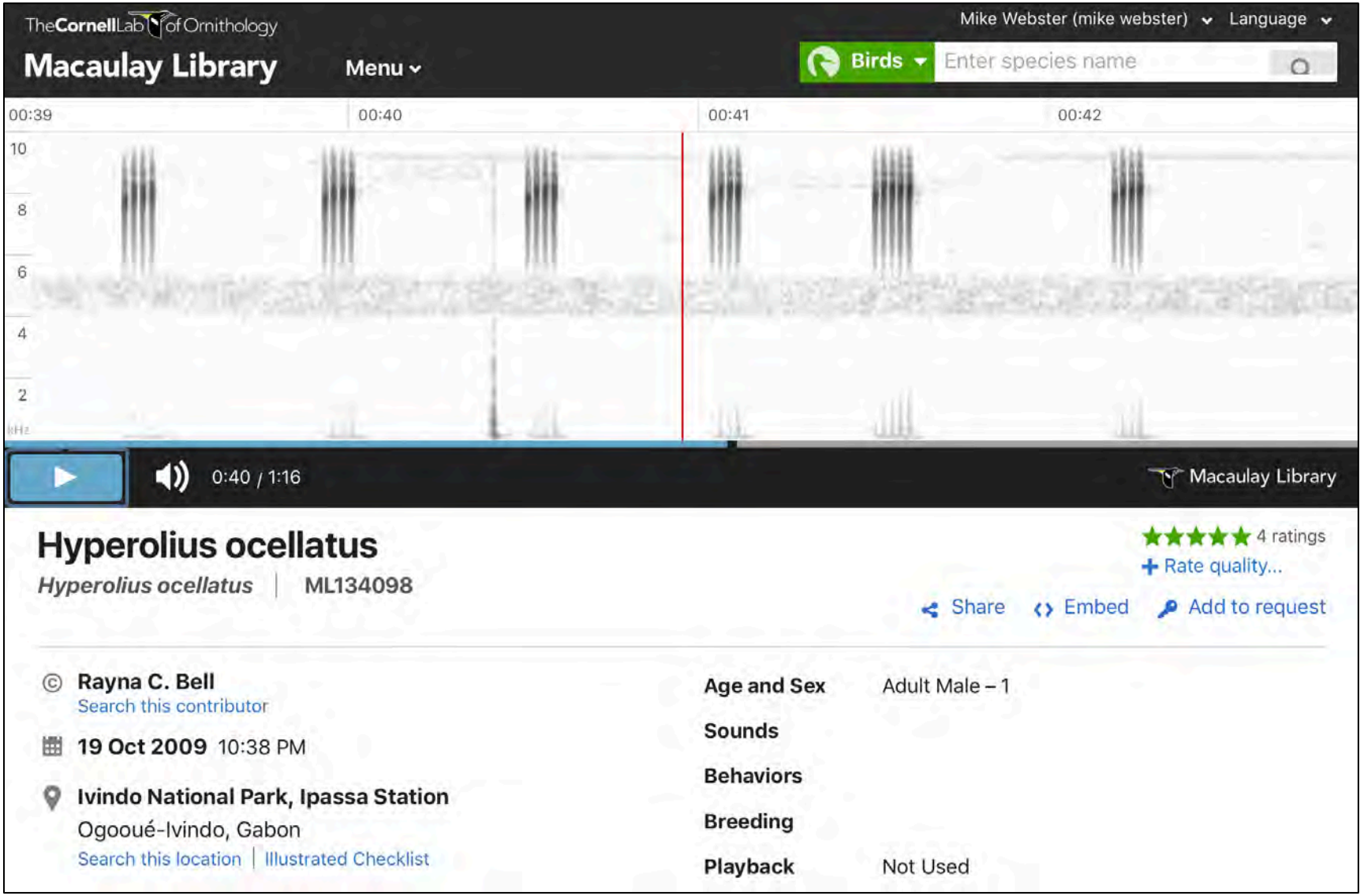
New Advanced Search



New Advanced Search



New Specimen Pages



New Specimen Pages

Hyperolius ocellatus

Hyperolius ocellatus | ML134098

© **Rayna C. Bell**
Search this contributor

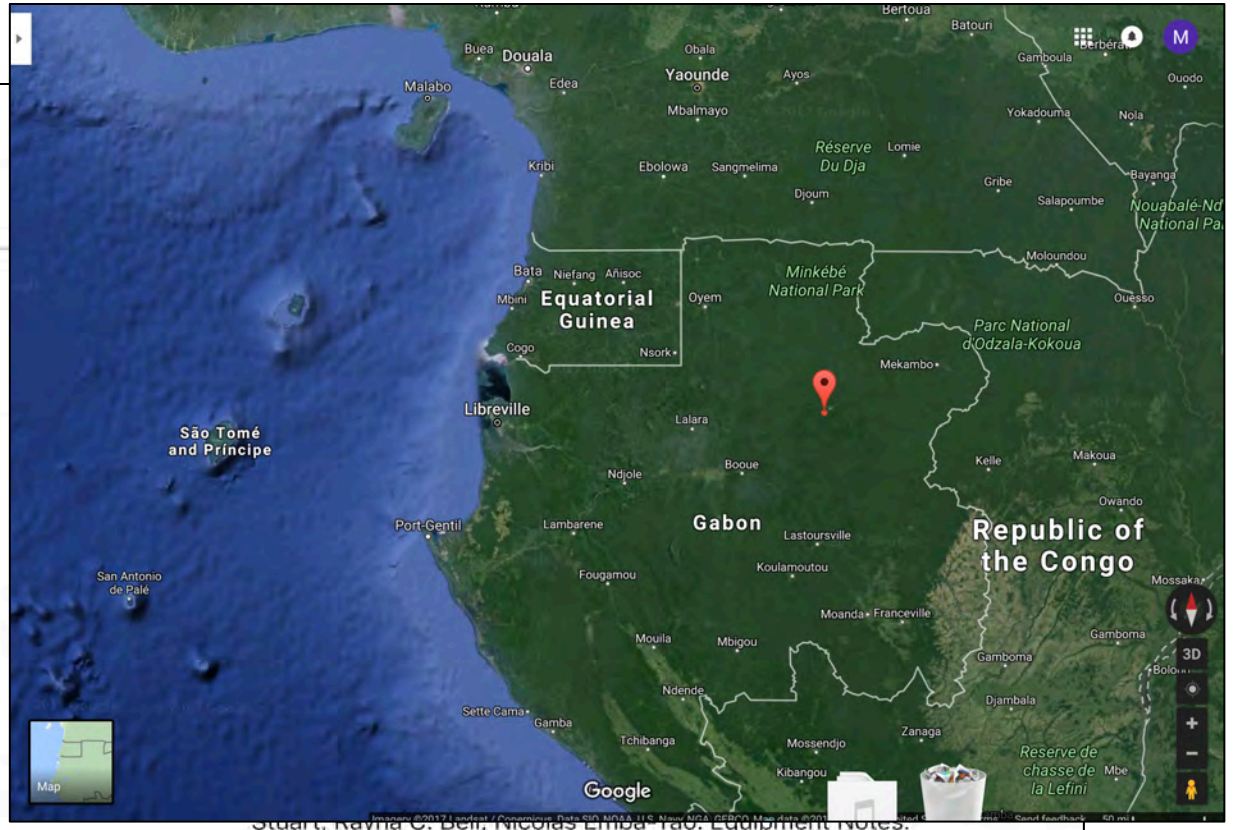
19 Oct 2009 10:38 PM

Ivindo National Park, Ipassa Station
Ogooué-Ivindo, Gabon
Search this location | Illustrated Checklist

0.5162, 12.7946 Map

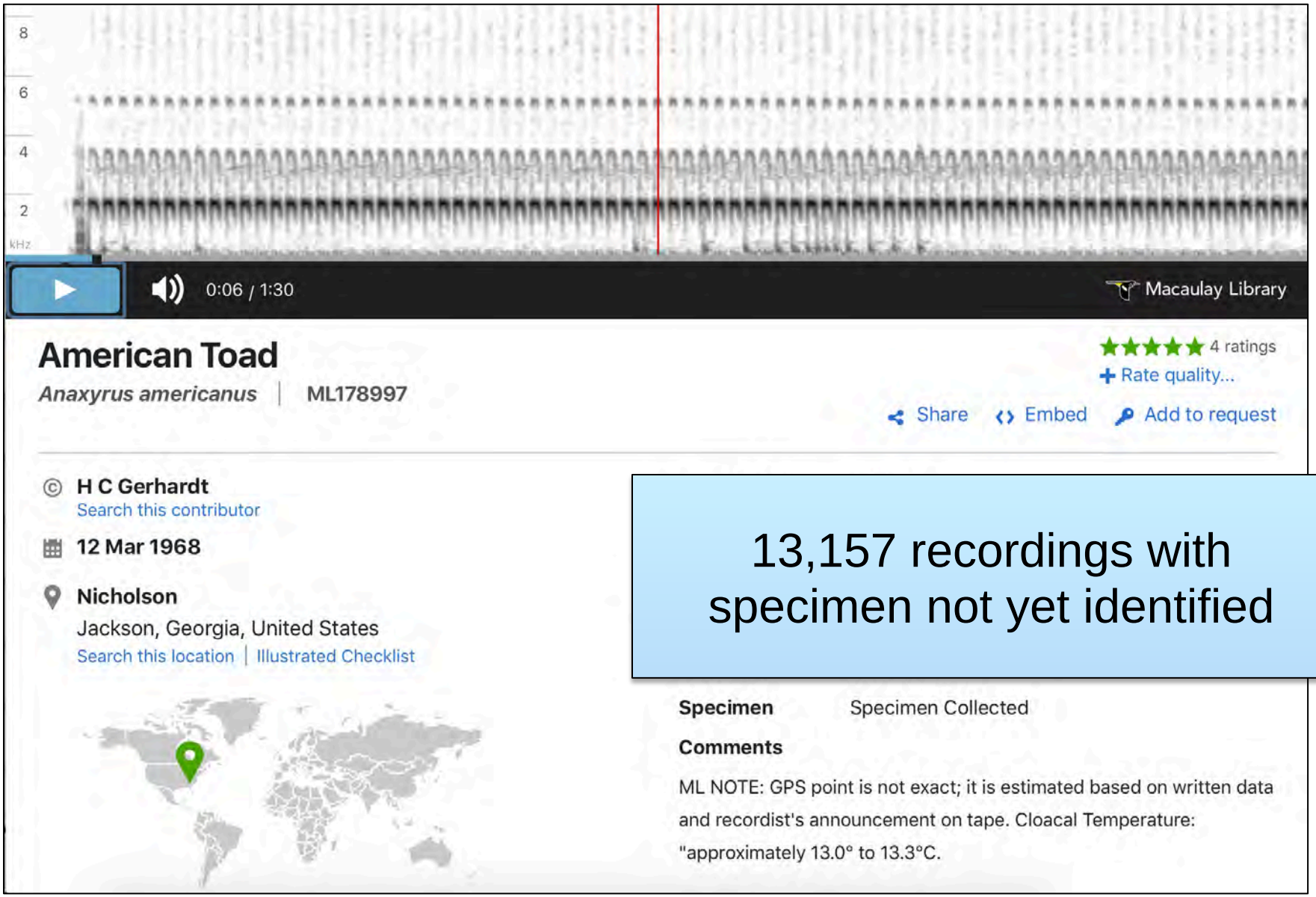
Technical Information

Recorder	EDIROL R-09
Microphone	
Accessories	



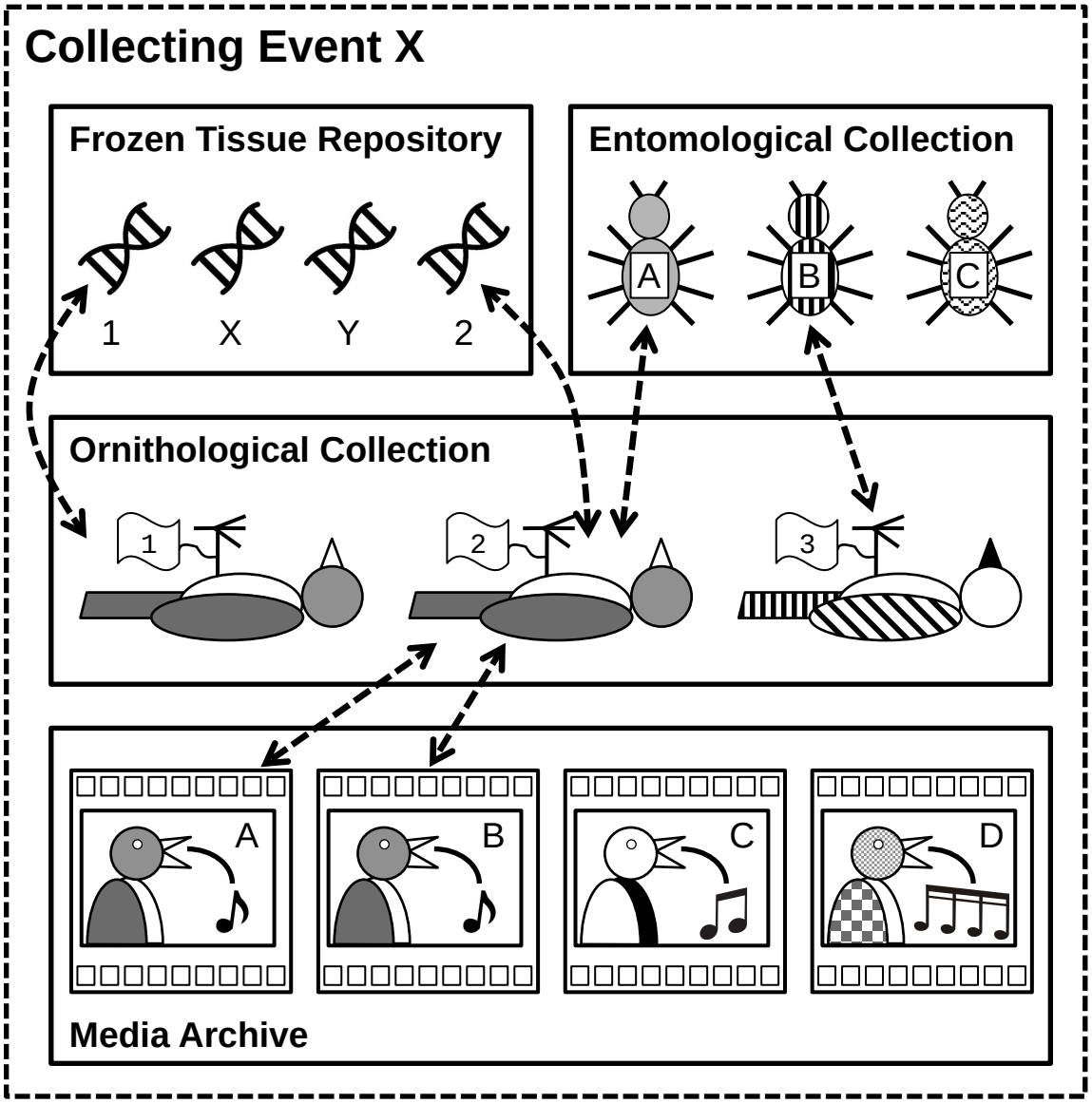
Microphone: Rode NTG-2 condenser, shotgun microphone.

New Specimen Pages



13,157 recordings with specimen not yet identified

Connections across specimens/data



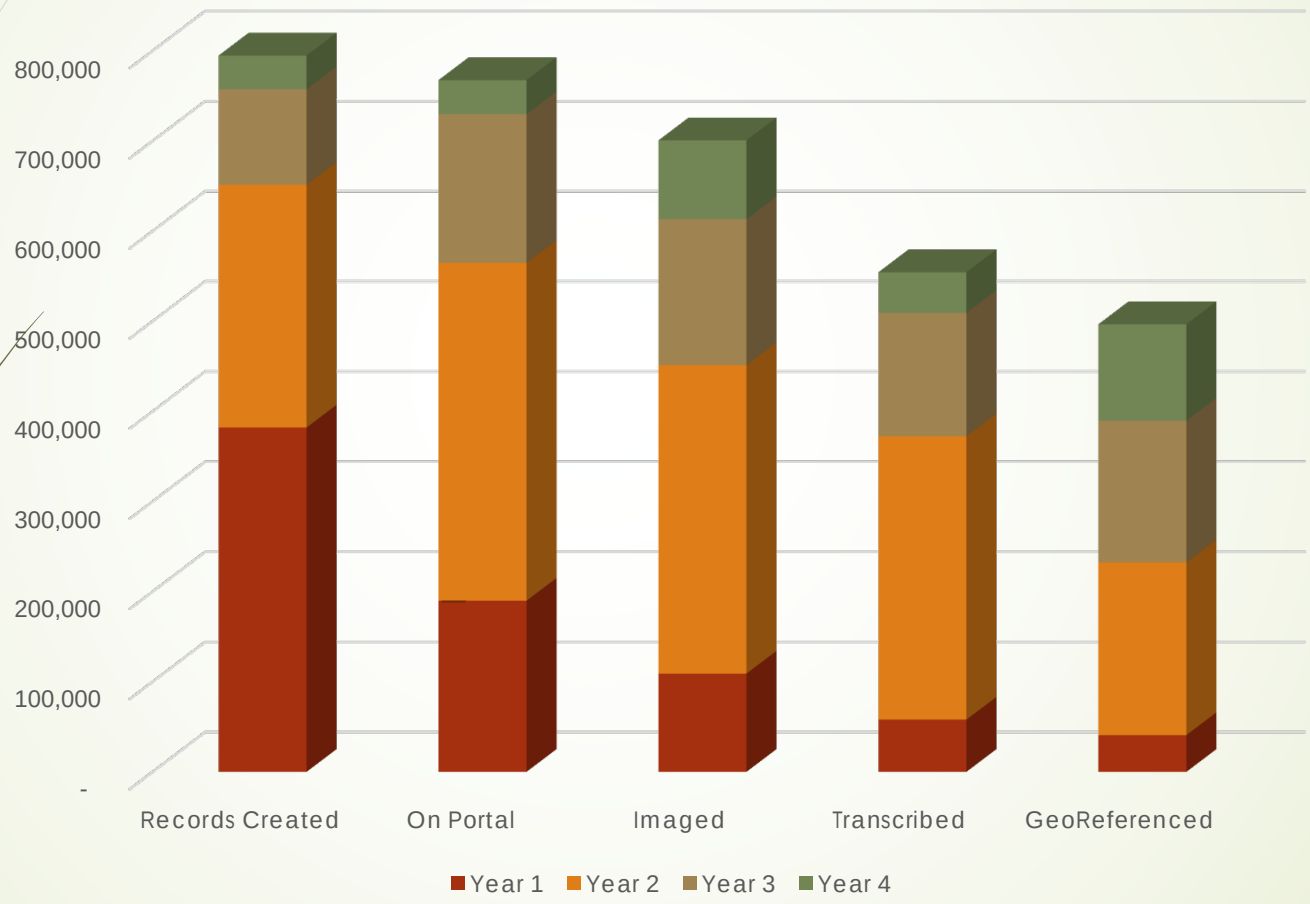
1. Specialization of collections
2. Specimens/data connected within & across collections
3. Strategic approaches to growing digital collections

The Macroalgal Herbarium Consortium

Accessing 150 Years of Specimen Data to Understand Changes in the Marine/Aquatic Environment

Chris Neefus, Lead P.I.

Progress in Digitization Efforts

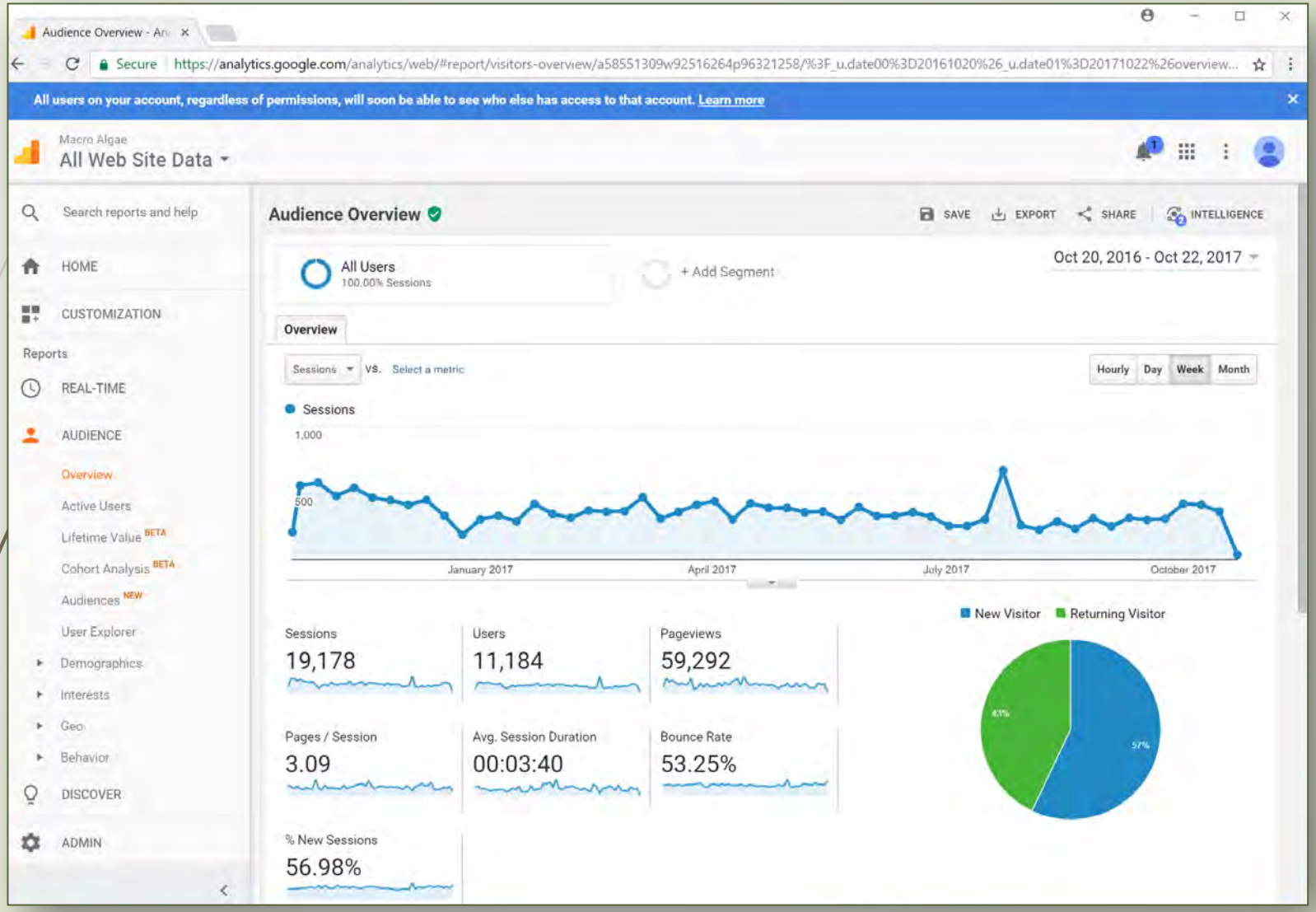


Progress in Digitization Efforts

				Percent Complete				
Digitizing Institution	**Start**	**Collections**	**Specimens**	**Records Created**	**On Portal**	**Imaged**	**Transcribed**	**Geo-referenced**
University of New Hampshire	Year 1	10	140,106					
New York Botanical Garden	Year 1	5	172,613					
University of North Carolina	Year 1	7	58,075					
University of Michigan	Year 1	5	95,589					
University of Washington	Year 1	3	25,775					
Duke University	Year 1	1	17,828					
University of Alaska SE	Year 1	1	9,889					
Bishop Museum	Year 1	1	65,000					
Field Museum	Year 1	1	48,058					
Oregon State University	Year 1	1	12,120					
University of Guam	Year 1	1	13,600					
University of California - Berkeley	Year 2	9	230,869					
University of Hawaii	Year 2	1	4,730	1	1	0	1	1
Harvard University	Year 2	1	150,000	0	0	0	0	0
Academy of Natural Sciences	Year 3	1	37,816					
University of Vermont	Year 3	1	3,062					
	Totals	49	1,085,130	794,763	767,535	700,664	554,347	496,605
				1	1	1	1	0

Who is Using the Data?

- Google Analytics for Macroalgae.org



Who is Using the Data?

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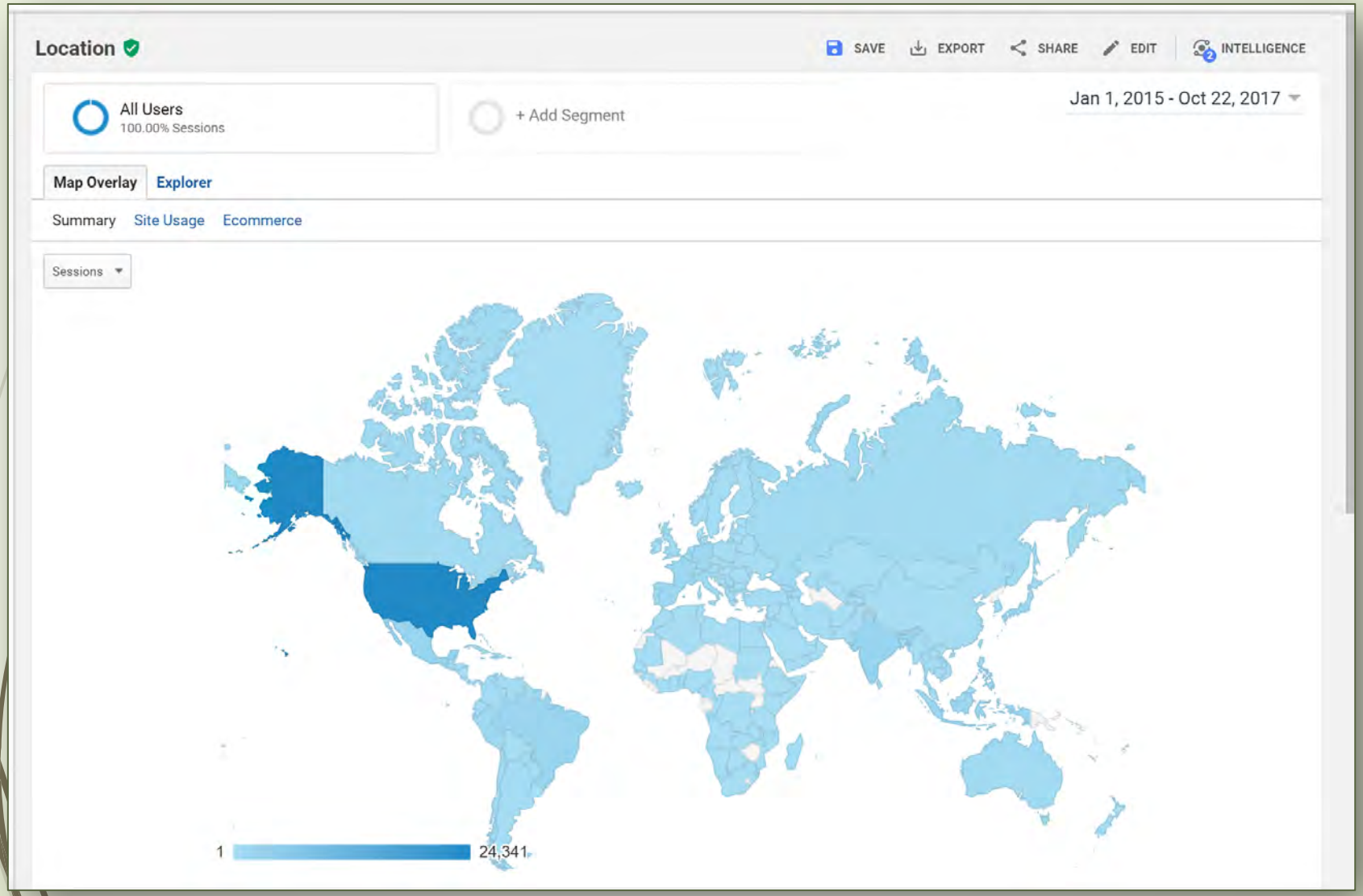
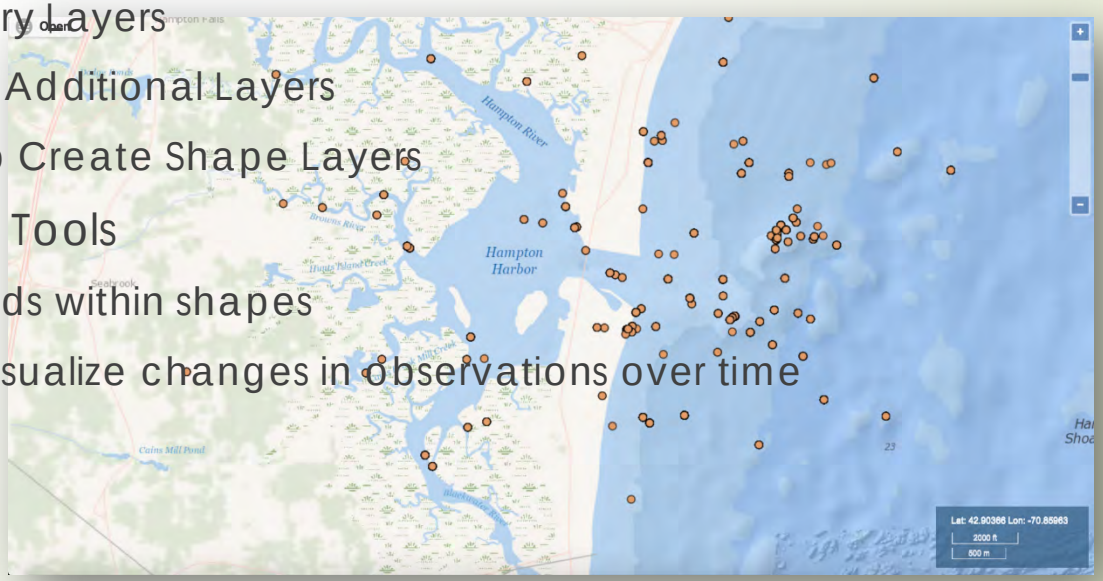


How is the Data Being Used?

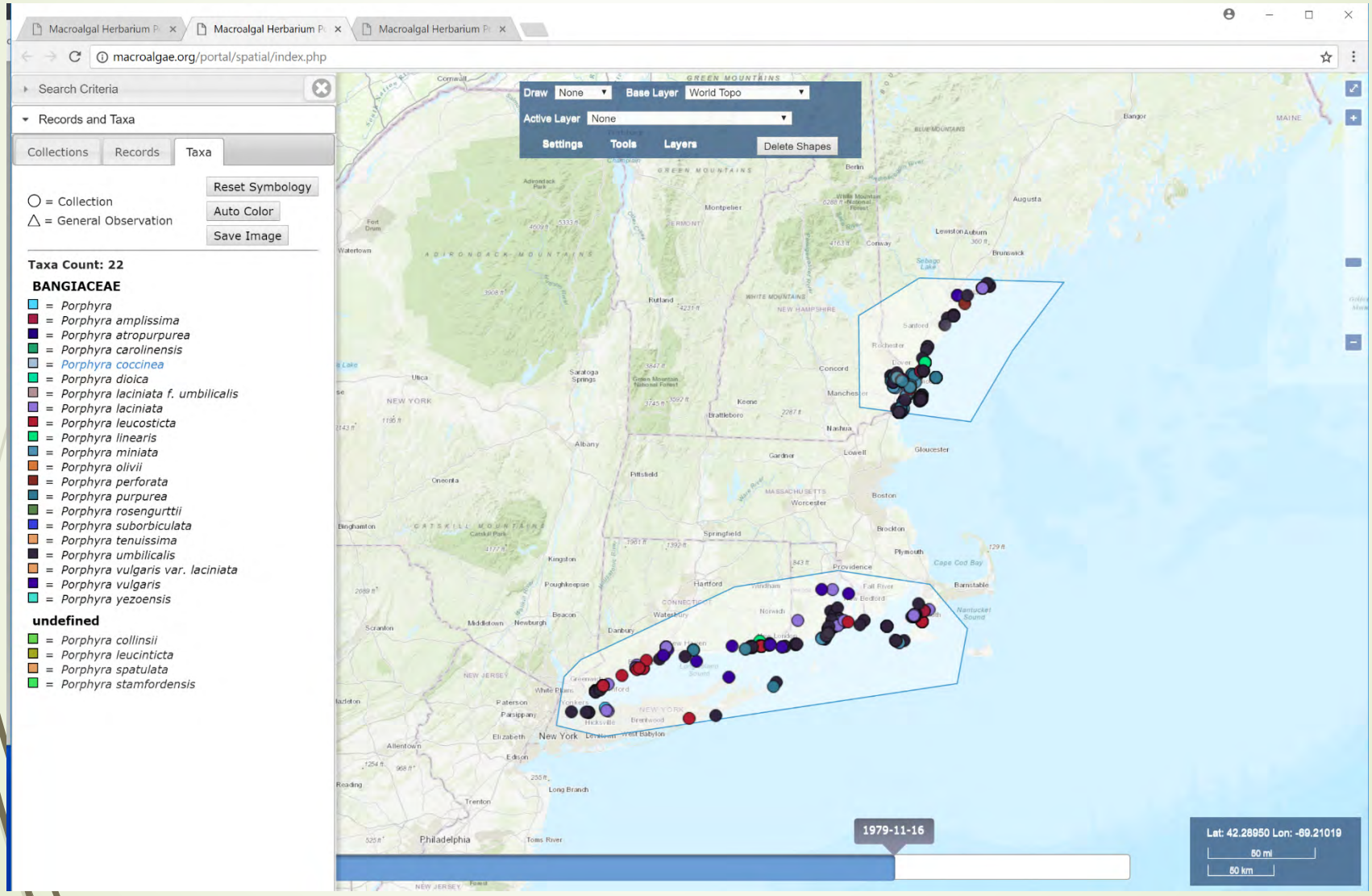
- Determine when and where a species can be collected
- Taxonomic studies
- Biogeographic studies
  - Effects of environmental changes or disturbances on species distribution and community structure
  - Track progression of invasive species and loss/displacement of native species

Spatial Analysis Module

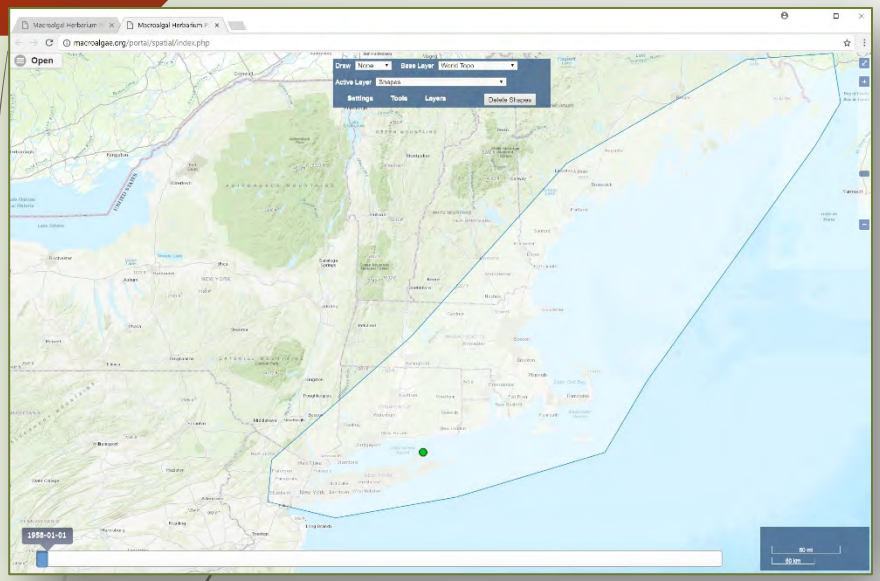
- Modeled after the Atlas of Living Australia Spatial Module
- Integrated with Symbiota
- Far more capabilities than the current Symbiota Map Search
- GIS Layers
  - Choice of Base Map Layers
  - World Climatological Layers
    - Average and Monthly Temperature, Precipitation, Solar Radiation, Wind
  - Political Boundary Layers
  - Ability to Import Additional Layers
  - Drawing Tools to Create Shape Layers
- Enhanced Search Tools
  - Search for records within shapes
  - Date sliders to visualize changes in observations over time

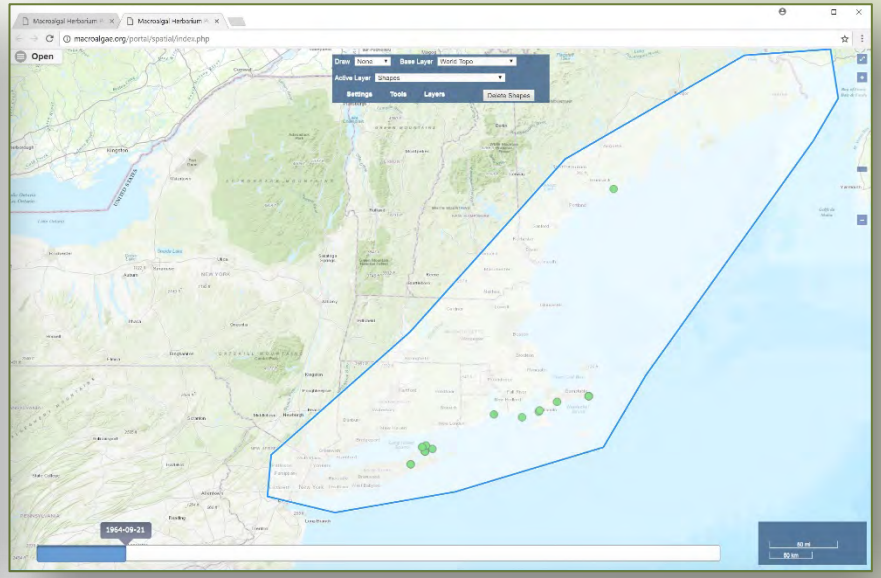


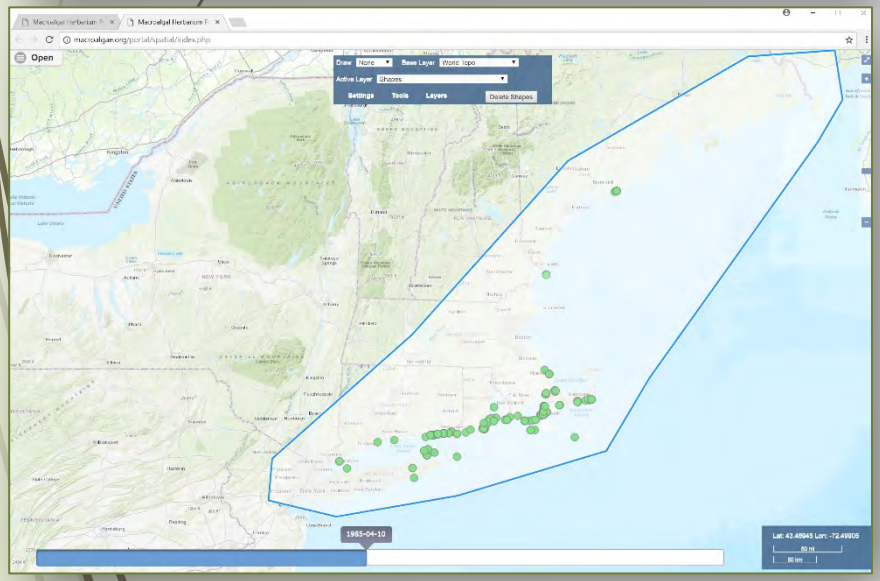
Spatial Analysis Module

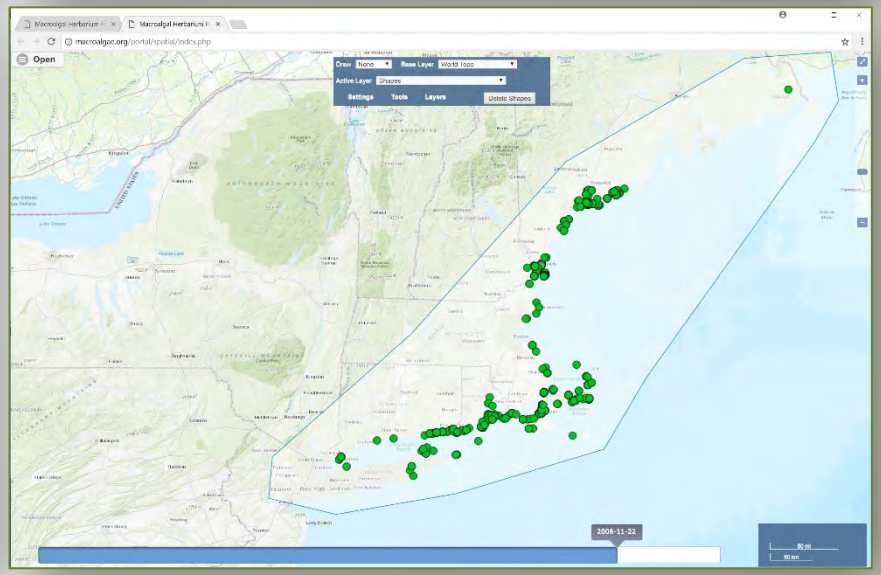


Spatial Analysis Module









One Lesson Learned?

- Small Herbaria Are Easier to Digitize than Large Ones

Acknowledgments

This material is based upon work supported by the National Science Foundation under Grant Number (NSF Grant Number:1304924) 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.

Mobilizing New England vascular plant data to track environmental change

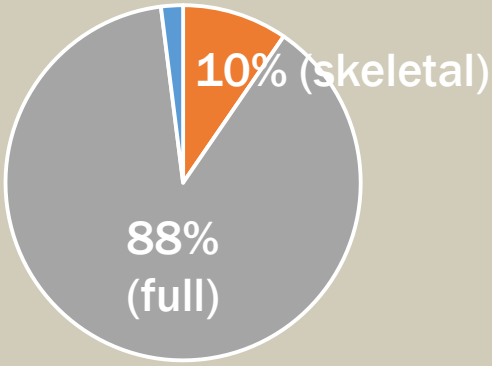
Patrick W. Sweeney

Mobilizing New England Vascular Plant Specimen Data to Track Environmental Changes

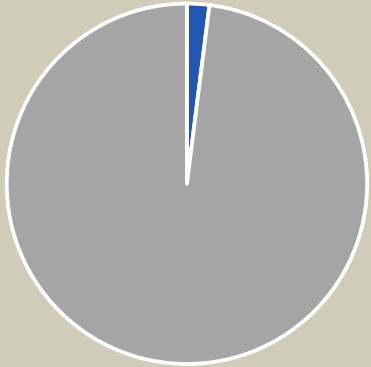
PROGRESS

98% New England specimens complete

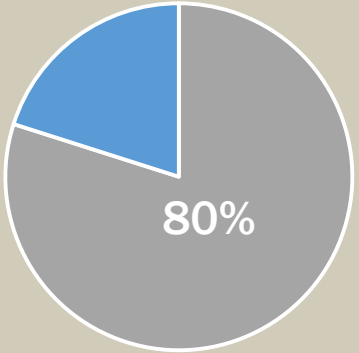
Occurrences



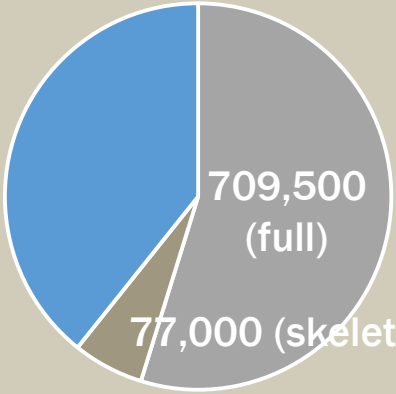
Images



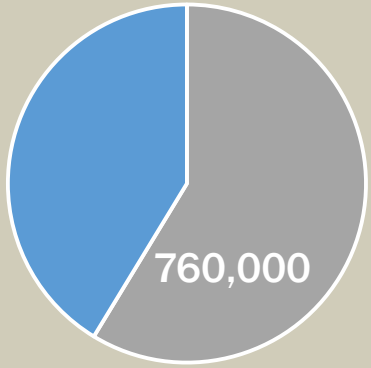
Georeferencing



Occurrence Records



Images



$1.80 per specimen
($1.07)

1.3 million records/images

Mobilizing New England Vascular Plant Specimen Data to Track Environmental Changes

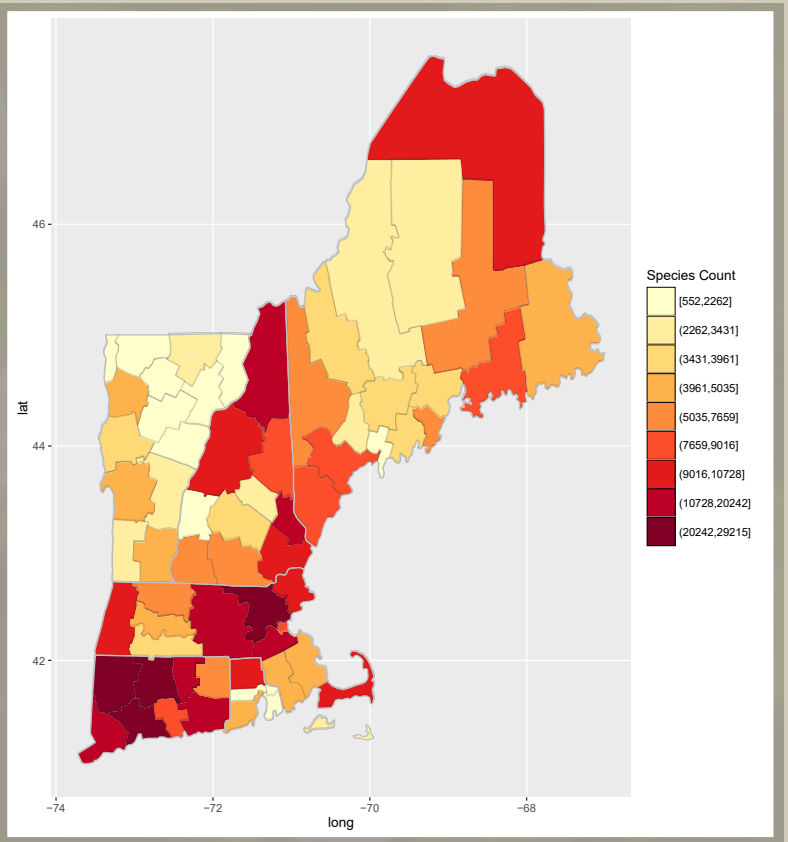
DATA MANAGEMENT & ACCESS

- All images on CyVerse (iPlant)
- Digitizing institutions data managed in authoritative database
  - some are collecting/managing data via an intermediary application
- Smaller partner institutions are managing data directly in Symbiota
- All project data mobilized through CNH portal (Symbiota)
  - data imported via rdf/XML, direct push from Specify, spreadsheets
  - additional data capture in Symbiota
  - 90% in portal
- Project data shared with iDigBio
  - DwC-A ingest from Symbiota, IPT
  - 90% in iDigBio portal

Mobilizing New England Vascular Plant Specimen Data to Track Environmental Changes

RESEARCH USE

- **Data demographics**
  - Assessing fine-scale sampling bias in herbarium specimens
  - Assessing additional patterns
- **Papers**
  - Bellemare, J., & Deeg, C. (2015) Spalink, D. et al. (2016)
  - Gallinant, A. et al. (in prep)
  - …
- **Phenology scoring**



Mobilizing New England Vascular Plant Specimen Data to Track Environmental Changes

MANAGEMENT & OVERSIGHT

- Collaborators managing activities at their institutions
  - mostly in contact with lead via email
  - some face-to-face site visits
- Lead institution manages overall project
  - monitors upload of images to CyVerse
  - monitors import of data into the portal
  - monitors upload to iDigBio
- Yearly in person meetings
- Portal managed under umbrella of CNH
  - Steering committee with individuals from member institutions
  - Member institutions committed to maintain portal (contribute staff member time)

Mobilizing New England Vascular Plant Specimen Data to Track Environmental Changes

LESSONS

- Fail early and fail often
  - Software/hardware/workflow development, execution, etc.
- Don't reinvent the wheel
  - lot's of great software, workflows, and expertise out there – use it

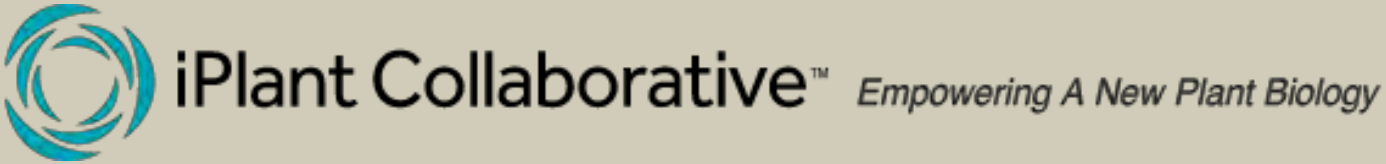
Mobilizing New England Vascular Plant Specimen Data to Track Environmental Changes

ACKNOWLEDGEMENTS

National Science Foundation (EF1208829, EF1208835, EF1208972, EF1208973, EF1208975, EF1208989, EF1209149).

Symbiota Project

FilteredPush



Biota of North America

The PALEONICHES - TCN

Ordovician
Cincinnati Region

Pennsylvanian
Midcontinent U.S.

Neogene
Southeastern U.S.

B.S. Lieberman, J.R. Hendricks, A.L. Stigall, U.C. Farrell, S. Butts, A. Molineux, J.H. Beach, R. Portell, B. Hunda, K. Hauer

U. of Kansas, Paleontological Research Institution, Ohio U., U. of Texas, Yale U., Cincinnati Museum, Miami University, Florida Museum

PALEONICHES – TCN : Data

> 975,000 specimens databased, original goal 450,000

> 9,200 fossil localities georeferenced

> 1,200 images of fossil species

Data shared/published via iDigBio and institutional websites

PALEONICHES – TCN: Outreach

Digital Atlas of Ancient Life

Guide to Ordovician, Pennsylvanian, and Neogene fossils

www.digitalatlasofancientlife.org

@PaleoDigAtlas

Digital Atlas App

Free for iPhone/iPad

PALEONICHES – TCN: Outreach

Digital Atlas of Ancient Life Website:
www.digitalatlasofancientlife.org

Described in Hendricks, Stigall, and Lieberman. 2015. Palaeontologia Electronica

More than 1,200 species represented with information, images, and maps

> 700,000 visits; > 3,200,000 hits

Digital Atlas of Ancient Life
Electronic Field Guide

Explore taxonomic information, images and maps for three Paleontological time periods.

START

BROWSE

TIME PERIOD

PALEONICHES – TCN: Research

Scientific publications in various journals including:

Global Ecology and Biogeography, *Proceedings of the Royal Society, Series B*, *Journal of Biogeography*, and *Paleobiology*

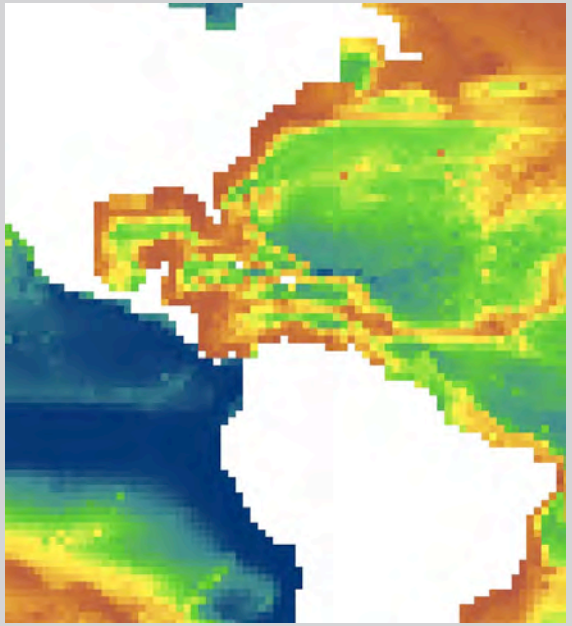
Used GIS and Ecological Niche Modeling to study macroevolutionary effects of climate change

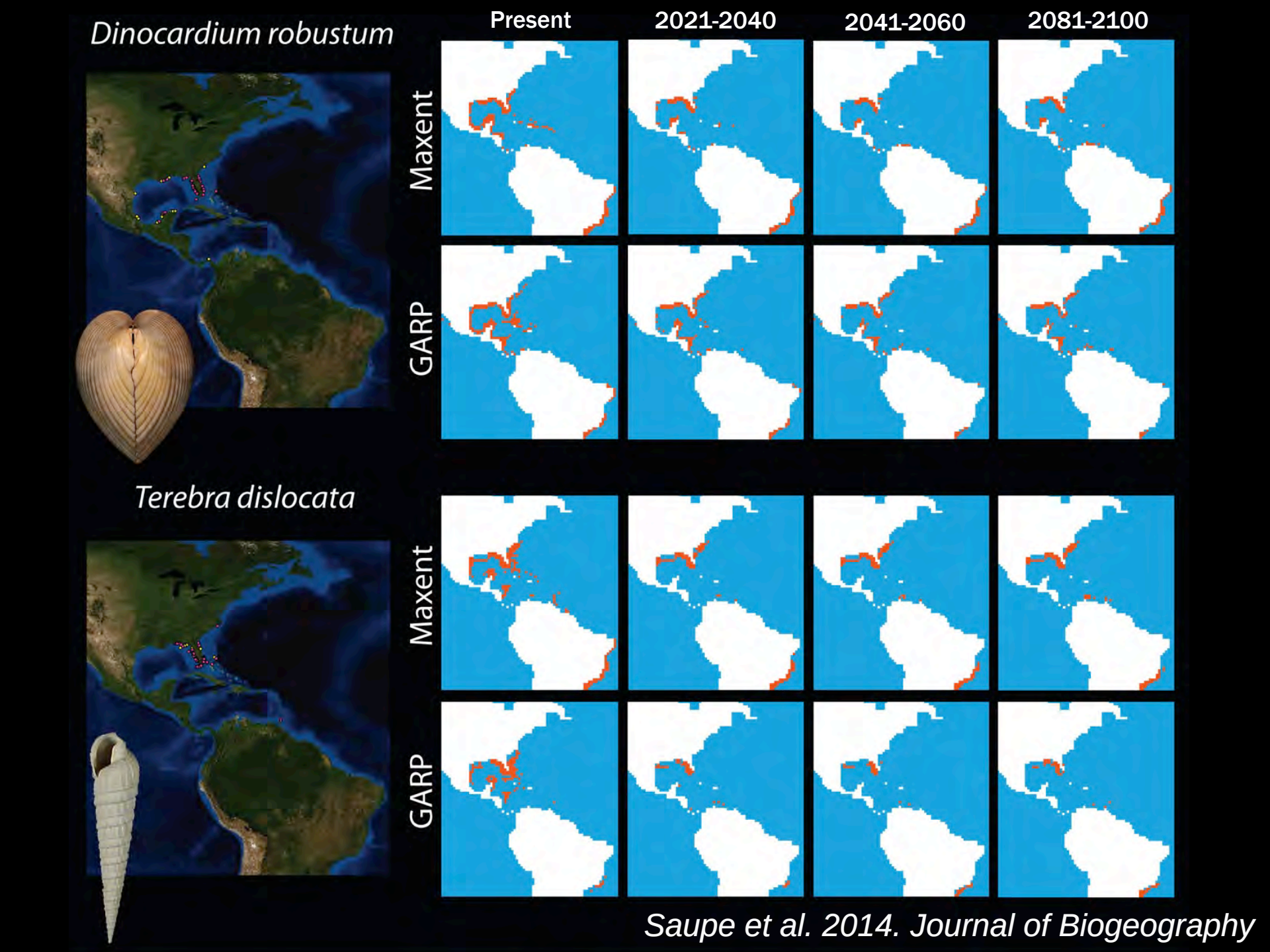
SSS

$$p(x) = e^{(\lambda_1 x_1 + \ldots + \lambda_n x_n)}$$

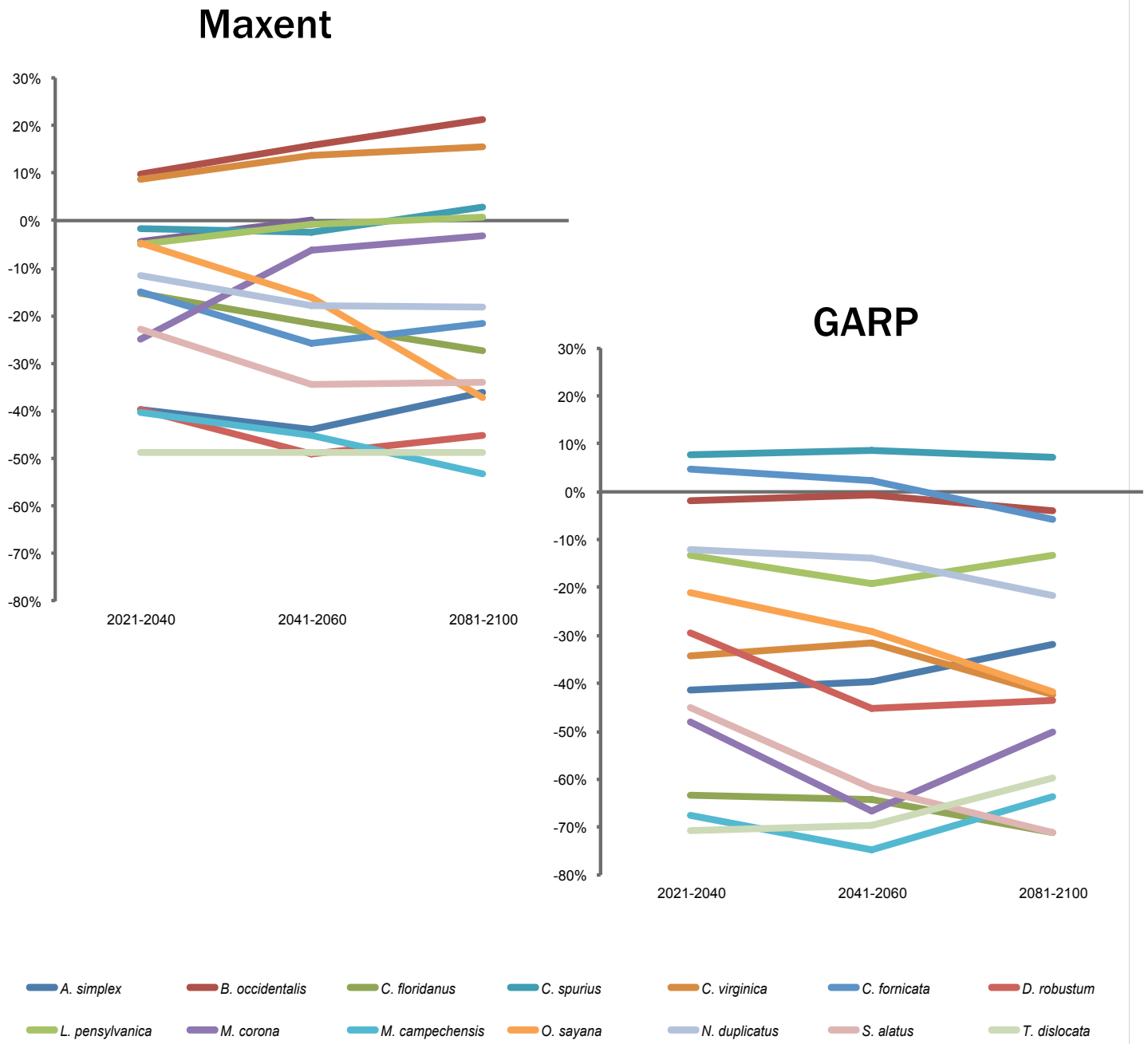
Nitrogen

Diatom Phytoplankton





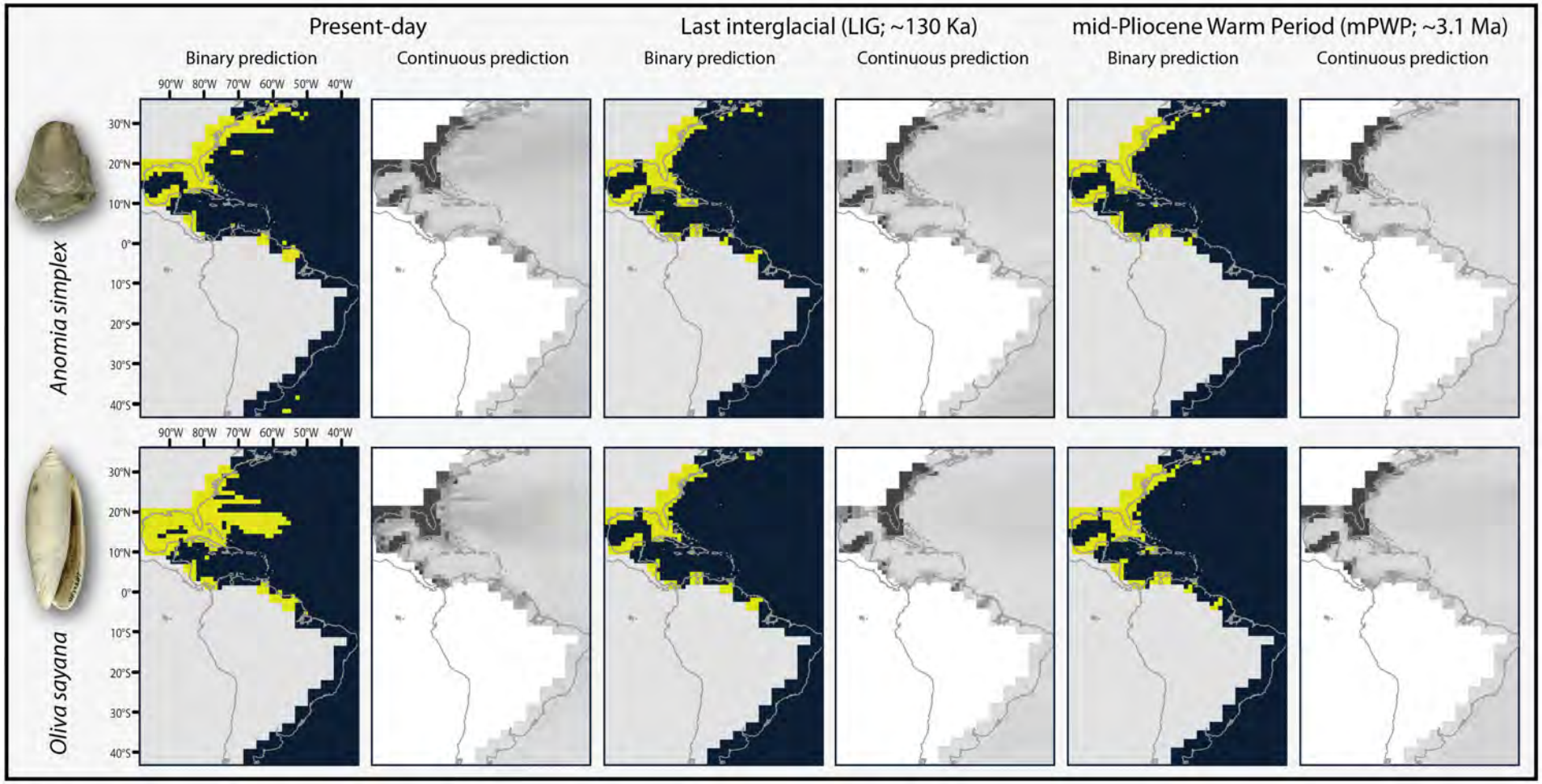
Saupe et al. 2014. Journal of Biogeography



% CHANGE FROM PRESENT

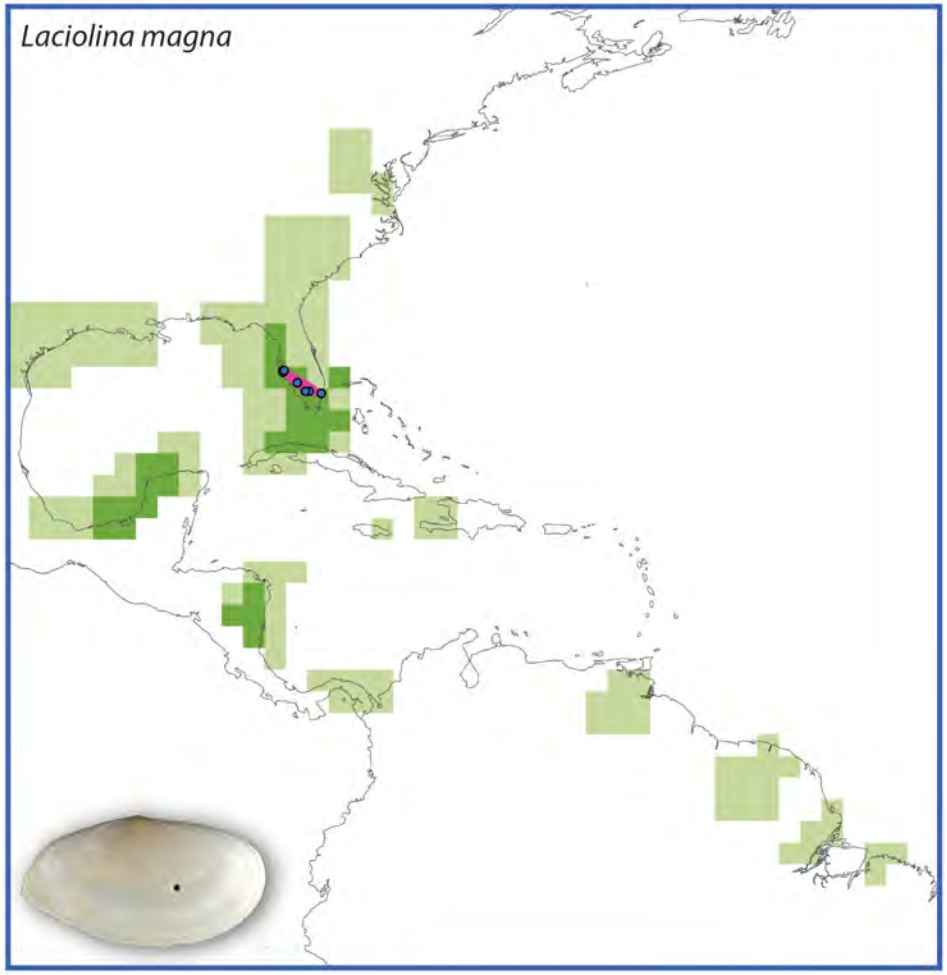
Saupe et al. 2014. Journal of Biogeography

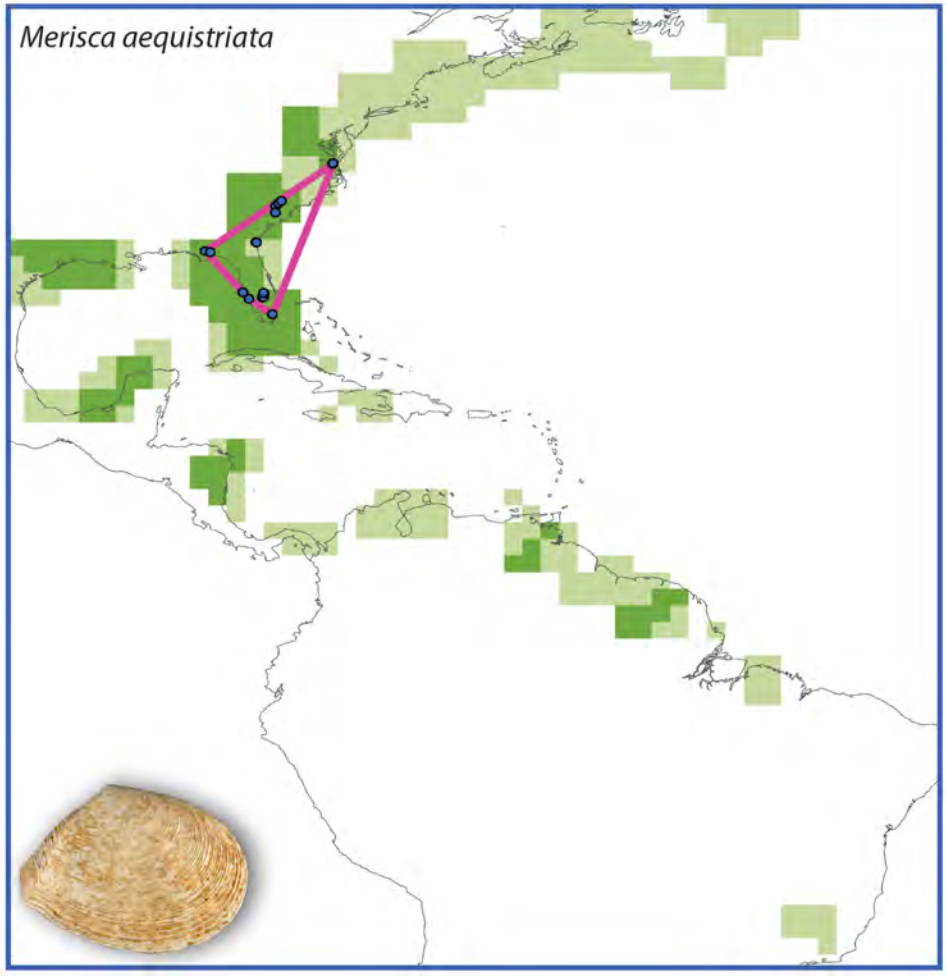
Species Niches Conserved Over Millions of Years and Major Climate Changes



Saupe et al. 2015. Proceedings of the Royal Society

The Major Factor that Determines Where Species Occur is Climate, with Biotic Factors Playing a Much More Limited Role





Saupe et al. 2015. Global Ecology & Biogeography

PALEONICHES – TCN: Research

Species niches conserved over millions of years and through major climate changes

Climate is the primary factor controlling geographic distributions over millions of years, with biotic factors playing a much more limited role

Many species of modern marine mollusks, some of them pivotal to marine ecosystems and the human economy, are at significant risk of extinction by 2100

Lesson Learned

Approach digitization of fossils same way you would digitization of extant taxa

Thanks to:

iDigBio
Julien Kimmig (U. of Kansas)
Jon Hendricks (PRI)
Alycia Stigall (Ohio U.)
Cori Myers (U. of New Mexico)
Harry Dowsett (USGS)
Roger Portell (U. of Florida)

Funding
NSF Emerging Frontiers
NSF Advancing the Digitization of Biological Collections

The Macrofungi Collections Consortium 2012--2017




Barbara M. Thiers & Roy E. Halling,
Lead P.I.s

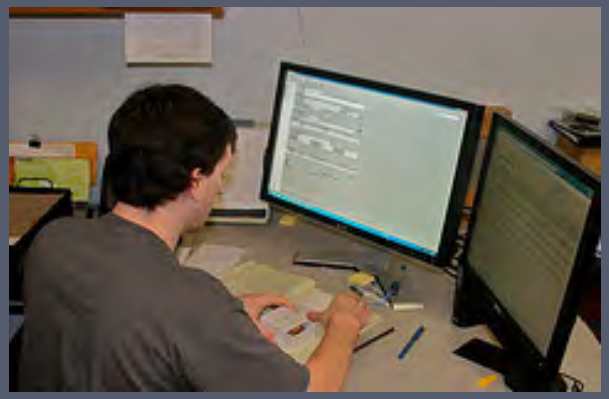
The New York Botanical Garden

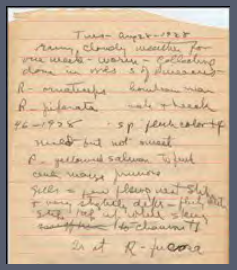
Goals and scope of MaCC

- 37 institutions will digitize 700,000 herbarium specimens of macrofungi, as will as field notes and photographs
- Aggregate digitized data through the Mycoportal (Symbiota)
- Engage citizens
  - Amateur mycologists who provide biodiversity data
  - Crowdsourcers (data transcription)

Accomplishments 2011-2015

- **Work Completed**:
  - Ca. 1,250,000 specimens digitized.
  - All digitized data shared through MycoPortal
  - 284 participants: 40 PIs/ SPs, 35 salaried staff, 200 students, 9 volunteers





Research Facilitated

- 30 article citations for the MaCC project, macrofungi in the MycoPortal (Google Scholar, October 2017)
  - Genus or species level taxonomic treatments
  - Large scale phylogenetic projects
  - Ecological studies in native vs. invasive range comparisons of ectomycorrhizal fungi
  - Field guides for the Rocky Mountain region and Northeastern N. America

Broader Impacts: Mycoflora

MUSHROOM CITIZEN SCIENCE: From Species Lists to Mycoflora 2.0

The Citizen Scientist's Guide to
Mycoflora 2.0
Collecting and Documenting a Voucher Specimen

Southwest Collections of Arthropods Network (SCAN)

A Data Portal Built to Visualize, Manipulate, and Export Species Occurrences

July 2012 to 2016 and onward to 2024

This project made possible by National Science Foundation Award EF 1207371

iDigBio Integrated Digitized Biocollections

Symbiota Collections of Arthropods Network (SCAN)

A Data Portal Built to Visualize, Manipulate, and Export Species Occurrences

July 2012 to 2016 and onward to 2024

This project made possible by National Science Foundation Award EF 1207371

iDigBio Integrated Digitized Biocollections

SCAN
Symbiota Collections of Arthropods Network

SCAN Digitization Goals

1. 10 museums digitize **750,000 records** for Southwest ground-dwelling arthropods,

   >1,100,00 with 4 existing PEN projects.

2. Produce **16,000 high-resolution images** of species

SCAN Progress

1. Exceeded target (**2,650,764** digitized records) **80**% georeferenced, 53% identified to species
2. **65** non-ADBC funded collections, **1,040,293** digitized records
3. **267,858** images **55,858** high-res images, **212,000** specimen/label low-res images
4. **1** PEN grant funded 2017, **2** PEN proposals in review, 9/10 of original TCNs sustaining effort .
5. SCAN primary aggregator of North American arthropod data, InvertEBase primary aggregator of non-Arthropod data. Allows SCAN to provide framework for all Entomology data providers in North America.

NSF
This project made possible by National Science Foundation Award EF 1207371

iDigBio
Integrated Digitized Biocollections

SCAN
Symbiota Collections of Arthropods Network

Opportunities to Use Digitized Data for Arthropod Research:

- **Focus on North America – United States > Mexico > Canada**

- **14 million total arthropod records, > 50,000 records per week**

  Only 242 million more to go!!!
  At least 10 million "Climate Change" reference records sitting in drawers

- **Five Target Groups: 4,920 species can be modeled today!**

  (30 records per species)

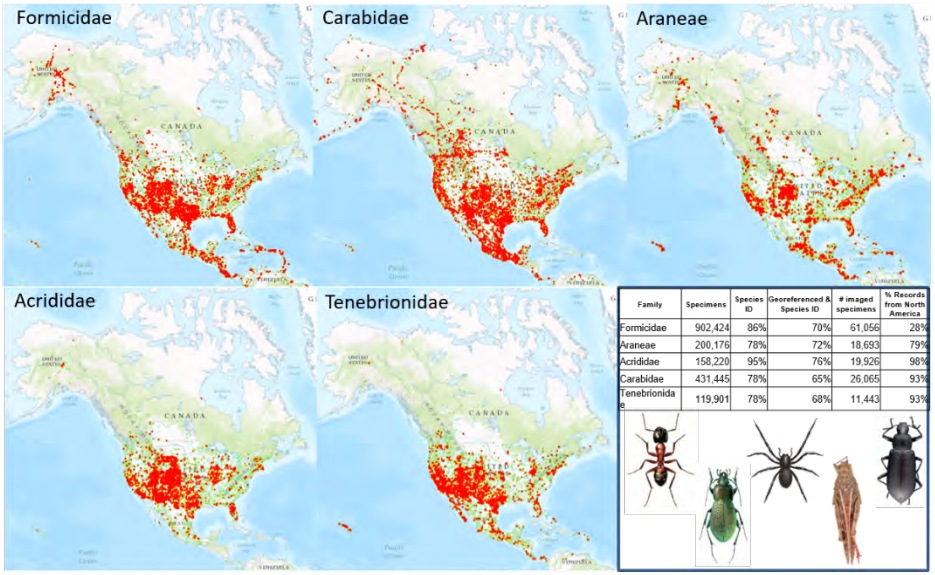
Formicidae (Ants)- 1,476 taxa

Araneae (Spiders) – 937 taxa

Acrididae (Grasshoppers) – 355 taxa

Carabidae (Ground beetles)- 1,476 taxa

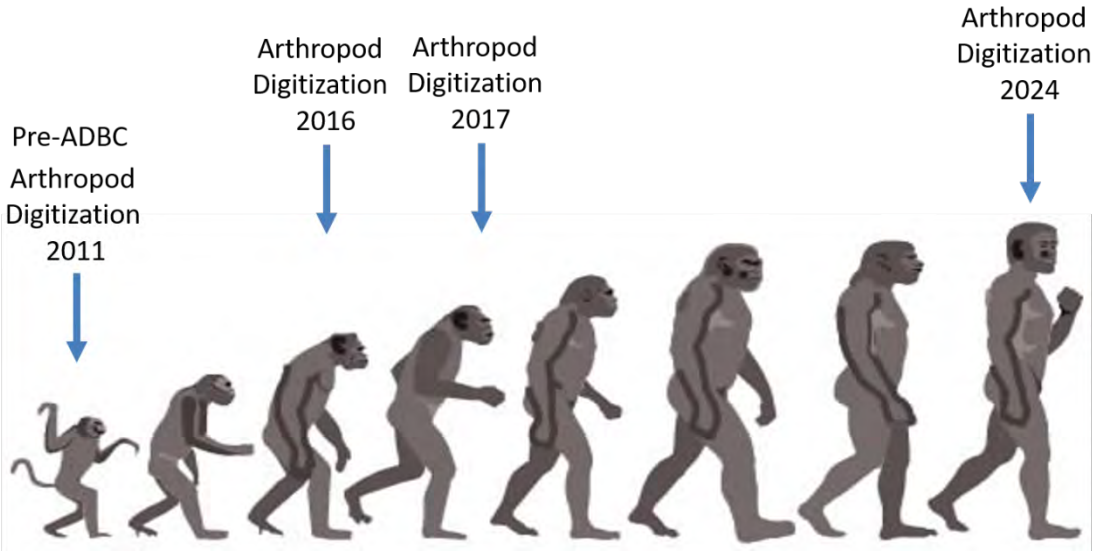
Tenebrionidae (Darkling beetles) 486 taxa



Family	Specimens	Species ID	Georeferenced & Species ID	# imaged specimens	% Records from North America
Formicidae	902,424	86%	70%	61,056	28%
Araneae	200,176	78%	72%	18,693	79%
Acrididae	158,220	95%	76%	19,926	98%
Carabidae	431,445	78%	65%	26,065	93%
Tenebrionidae	119,901	78%	68%	11,443	93%

SCAN 2017-2018 Priorities

1. Increase efficiency
    A. Universal “Rapid digitization of incoming material”
    B. solutions for robotic digitization, beyond the “Beyond the Box”
2. Data Quality: Integrate GBIF & IDigBio data flags, taxonomy tables, genetic linking, > images
3. Promote more digitization
    A. 103 US Entomology museums not serving data (66%)
    B. Support new TCNs: Arthropod Vertebrate Parasites TCN (Zaspel)
4. Connect Paleontology-Neontology taxa & the general Entomological Community beyond the United States



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Purdue Entomological Research Collection (PERC)
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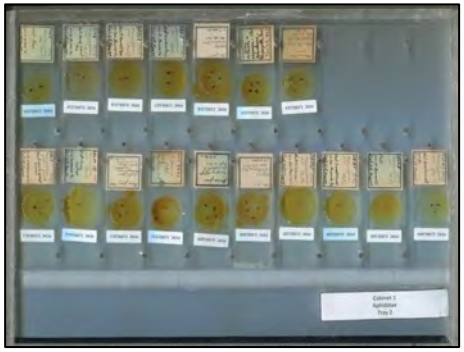
Objective

- Develop and implement an efficient workflow for cost-effective, high-throughput digitization of insect collections

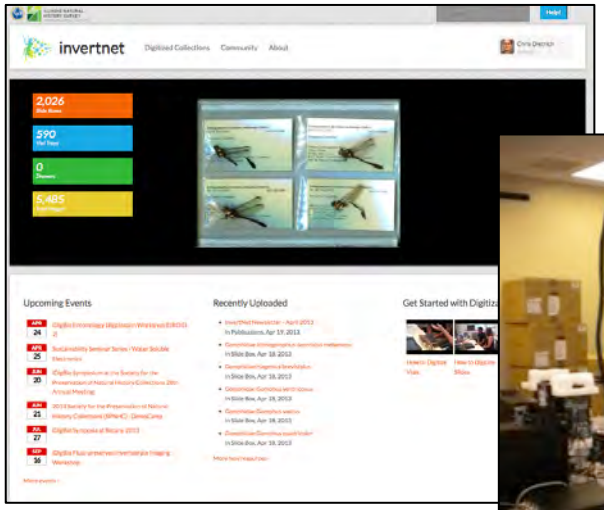


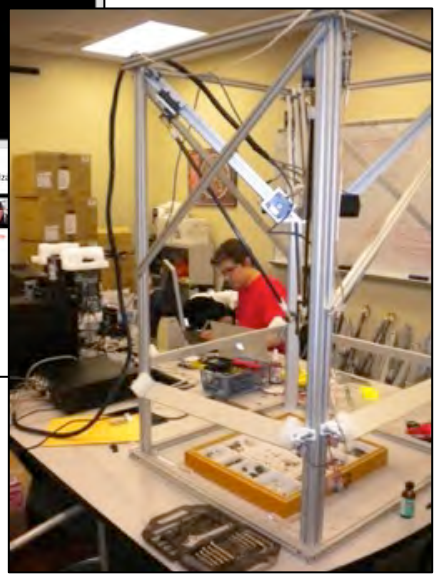
Specific Goals

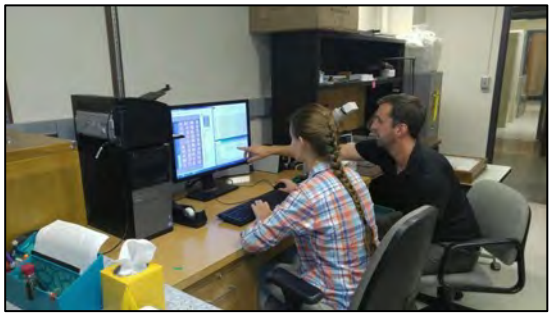
- Digitize all holdings of 22 midwestern arthropod collections (~50 million specimens)
  - Specimen images and metadata (label info)
  - Drawers, vials, slides
  - Advanced imaging (including 3D)
  - Best quality at reasonable cost (~$0.10/specimen)
- Provide access to images and other data via online virtual museum
  - browsable/searchable/zoomable web interface
  - link to other data providers (GBIF, iDigBio etc.)
- Provide platform for research and development of additional tools and resources
  - Data mining and analysis
  - Community building, collaboration, and support
  - Education, outreach, and reference

Accomplishments

- Created InvertNet cyberinfrastructure platform (invertnet.org)
- Implemented efficient workflows for slides and vials using 2D scanning technology
- Built 14 robotic drawer digitization systems & delivered to collaborators
- Built 180 TB storage system to house InvertNet image library
- Ingested >68,000 images and metadata from collaborating institutions representing >7.2 million specimens
- Developed image annotation tool to facilitate specimen-level data capture
- Linked InvertNet data repository to iDigBio portal and BugGuide.net
- Participated in numerous workshops, symposia, and planning meetings
- Trained numerous grad and undergrad students

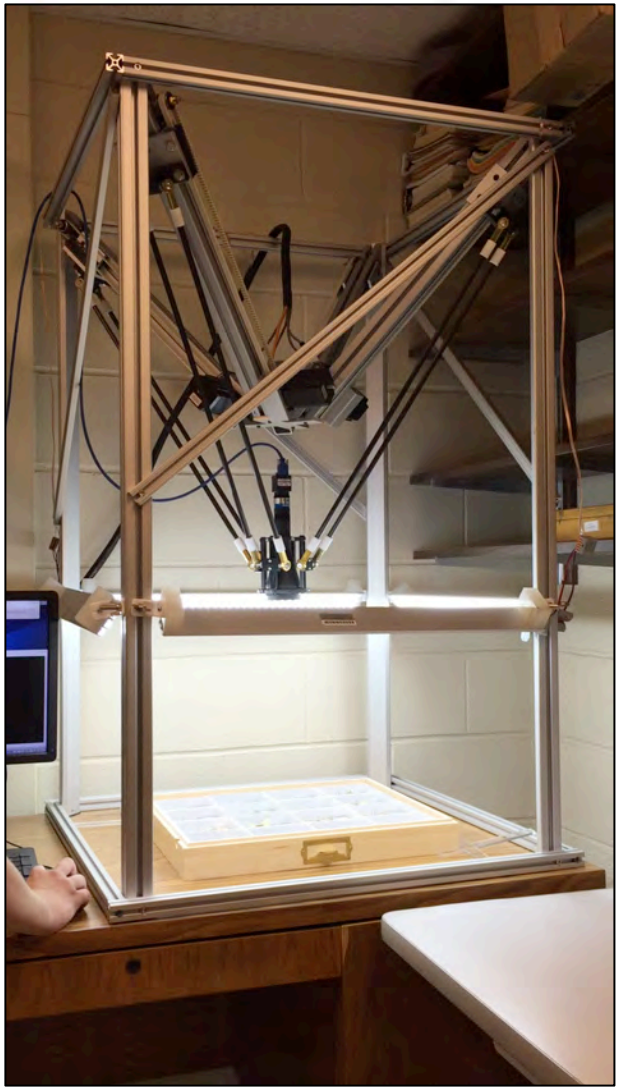






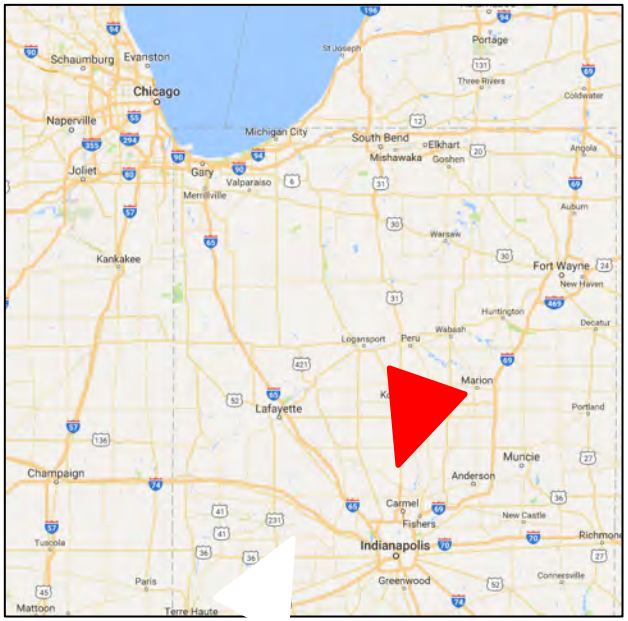
Ongoing Activities

- Capturing whole-drawer images at collaborating institutions
- Imaging workflows being tested for other TCNs

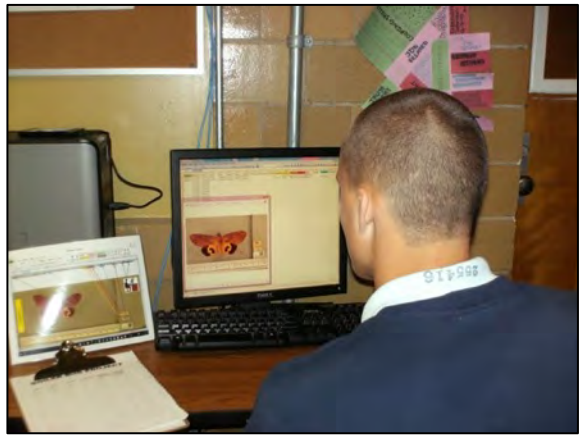


InvertNet Drawer Imaging System “BugEye”

Crowdsourcing with Logansport Indiana Youth Correctional Facility: Boiler Bug

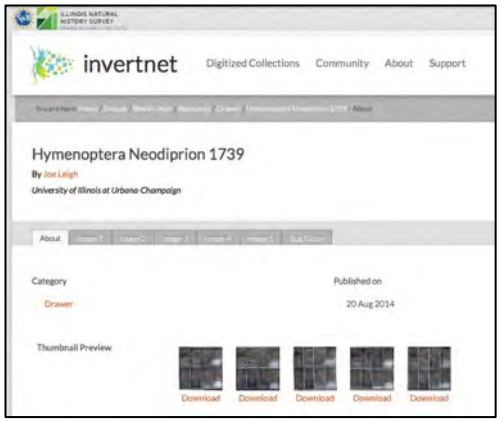


- 3 vacant state hospital buildings
- Security level: low-high
- Average daily population: 125
- Students committed by Indiana courts
- All males, 12-19 years old
- Data transcription (aquatic insects)
- 2,500 + slides databased
- 14 students participated FS2017



Cyberinfrastructure Upgrade

- previous platform used HUBzero/Joomla and was becoming obsolete
  - web application was producing excessive errors which caused the supporting web server to stop responding
  - storage for image data was depleted
  - hard drive failures were occurring on existing storage devices
  - lack of file management tools produced problems in managing large amounts of image data
- upgrades
  - migrate all content to more sustainable and simplified open-source content management system
  - maintain look/feel of current portal but provide additional dashboard with a simplified file manager and metadata editor to facilitate label transcription
  - new responsive layout
  - user tools for file management
  - workflows for editing image resources, and metadata
  - dashboard elements to support system accounts
  - integration of javascript libraries to support image viewers
  - programs for indexing files on storage server



InvertNet Summary

- Progress in digitization efforts
  - 68,388 images captured (20,794 slide boxes, 15,713 vial trays, 6,518 drawers [5 images per drawer]) from 13 collaborating institutions
  - ~ 7.2 million specimens (each high-res image includes up to 1,000 specimens)
- What we have learned
  - high-throughput digitization of insect collections is possible but there are no easy solutions
  - Adapt, adjust, adopt

LBCC Progress in Digitization

	Bryophyte Portal (95%)	Lichen Portal (68%)
Specimen Records	2,599,248	2,126,172
Georeferenced	35.5%	52.3%
Imaged	50.5%	36.0%
Specimens Identified to Species	2,572,707	2,111,379
Families	469	378
Genera	1,552	1,185
Species Number	24,983	20,984

Data Management & Open Access

- Management of databases responsibility of the 108 collection managers.
  - Original LBCC – 54 institutions
  - PENs with LBCC – 10 institutions
  - non-LBCC on portals – 44 institutions (1130 K+ records)
- Primary open access through the bryophyte and lichen portals (use statistics slide 3).
- Over 90% of the LBCC data are in iDigBio.

Management and Oversight

CURRENT: LBCC - PI, COPI, ROBERT ANGLIN, ED GILBERT
LONG-TERM: AMERICAN BRYOLOGICAL & LICHENOLOGICAL SOCIETY

GOOGLE ANALYTICS (Oct. 2015 to Oct. 2016)	Bryophyte Portal	Lichen Portal
No. Sessions	25,020	74,296
No. Users (not unique)	10,098	32,005
No. Page Views	74,646	237,347
Pages/Session	2.9	3.2
Avg. Duration (min.)	3:43	5:26
% New Sessions	39%	42%

What have we learned?

- Check your assumptions about how your project is progressing continuously throughout your funding period. – verbally and on-line!