



NSF ADBC Digitization TCN-TTD

Plants, Herbivores, and Parasitoids

A Model System for the study of Tri-Trophic Associations

Katja Seltmann, American Museum of Natural History

Rob Naczi, New York Botanical Garden

Christopher Marshall, Oregon State Arthropod Collection

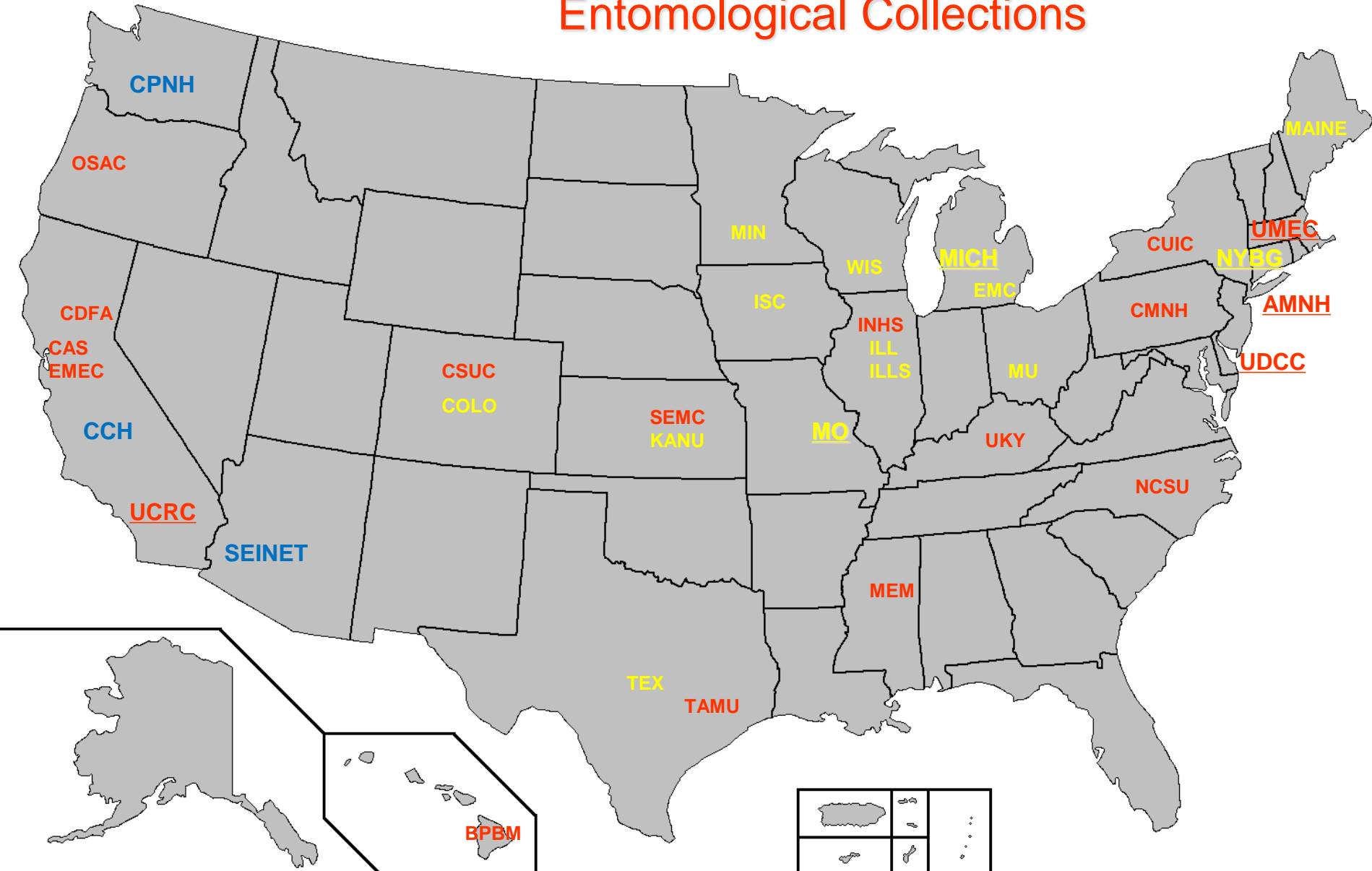


THE NEW YORK
BOTANICAL GARDEN



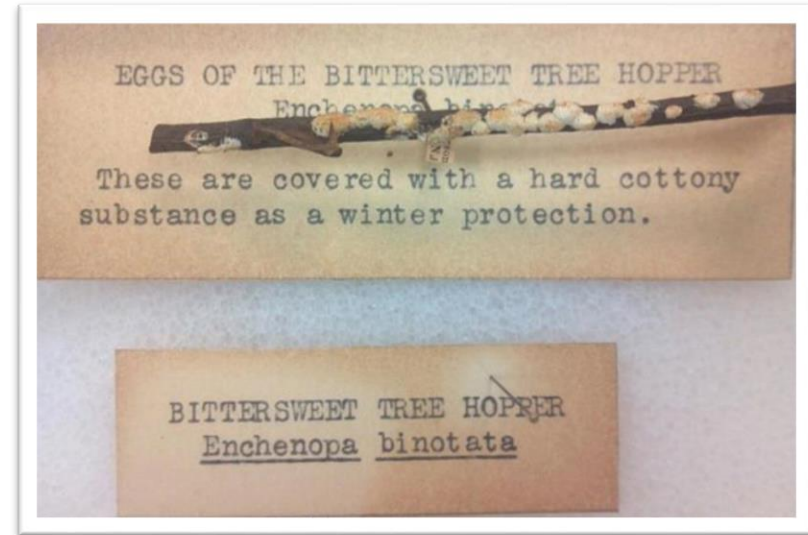
<http://tcn.amnh.org>

Botanical Institutions
Botanical Data Providers
Entomological Collections



Data Numbers (Insects):

- Specimens digitized: **1,211,000**
- Specimens imaged: **2719**
- Percent specimens georeferenced: **54%**
- Number insect families: **110**
- Percent specimens determined to species: **91%**
- Percent specimens with biotic data: **15-20%**
- Specimen data records shared with iDigBio: **785,320**
- Average cost per specimen: **\$1.33**
- Time per specimen: **10.7/hr average (range: 4-32)**



Cicadellidae



Aphelinidae



Belostomatidae



Pentatomidae



Tingidae



Aphididae



Encyrtidae



Miridae

Data Numbers (Plants):

- Specimen skeletal records: **424,747**
- Specimen complete records: **63,513**
- Specimens imaged: **1,050,306**
- Additional complete aggregated records: **1,190,929**
- Percent specimens georeferenced: **16%**
- Number plant families: **20**
- Percent specimens determined to species: **97%**
- Specimen data records shared with iDigBio:
 - images: **281,127**
- Cost per specimen: **\$.47**



Asteraceae



Cyperaceae



Fabaceae



Lamiaceae



Poaceae



Polygonaceae



Fagaceae

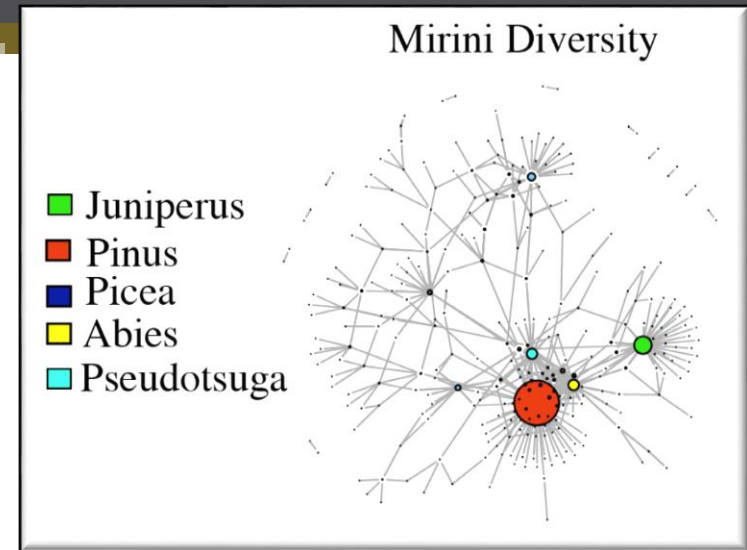


Oleaceae

Approaches to Outreach:

1. **Biological Specimen Informatics Short Course**
2. **Data Mining Workshop**
3. Data Carpentry Workshops
4. Diversity in our Workforce
5. Community Outreach

- entomological: 2 full time volunteers for 3 summers. 1 NSF Research Experience for Undergraduates
- botanical: 8 high school students, 3 teachers/professors, all of whom populated 7000+ records from images.



Biological Specimen Informatics Short Course



NYBG Summer High School Volunteers

Novel Contributions:

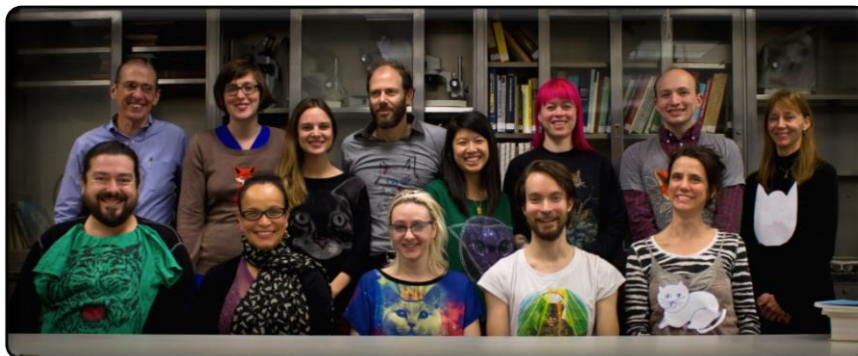
1. Online training and guidance
2. **Pre-curation and data quality**
3. Discover Life partnership
4. **Arthropod Easy Capture software**
 - Sustainable network for research
 - Create a legacy of fieldwork
 - Available at multiple institutions & Sourceforge
 - Captures structured association data (Tri-trophic data)
5. Image Appliance testing and development
6. Imaging standards (“lightbox”)
7. Training workshops with a focus on sustainability through research



Light box and specimen cart at MICH



Arthropod Easy Capture



American Museum of Natural History Digitizing Team



Training at COLO

Roadblocks for Digitization & Specimen Research:

1. Registration for all museums and institutions (grbio.org)
2. Movement of large image sets
3. **Lack of online nomenclatural resources**
4. Encourage use by specialists doing research
 - Integration of Federal Collections (Smithsonian) is critical to do research on many, many groups.
5. **Inadequate infrastructure at participating institutions**
 - botanical: not enough server space to put large images online for ingestion or crowd sourcing applications
 - entomological: not enough space in the collection to do the work; for pest control collections have to re-freeze before returning
6. Honest evaluation of the resources necessary for data capture



Lessons Learned:

The most serious obstacle to digitization: lack of “the right” institutional infrastructure. Best to proactively solve this problem during project design.

Quality of data is a critical concern. Best to ensure high quality from beginning, enlisting participation by specialists.

Easy to be fast at inefficient things. Honestly reevaluate your workflow often and with others.

Expect to contribute much of your own time for essential, behind-the-scenes tasks, such as coordination of network and administration.

From the start, it is best to befriend helpful and competent personnel in offices of Grants & Contracts/Sponsored Programs.

Celebrating milestones is one of the most effective ways to reward digitizers and maintain strong morale.

Thanks to:

National Science Foundation
co-PIs and collaborators

Image credits: Tom Murray, Rob Naczi & Plant Bug PBI



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Project PI's and managers

<http://tcn.amnh.org>