

NSF ADBC Digitization TCN-TTD

Plants, Herbivores, and Parasitoids

A Model System for the study of Tri-Trophic Associations



Christine A. Johnson: American Museum of Natural History

**Katja Seltmann: American Museum of Natural History
(now at University California, Santa Barbara)**

Mari Roberts: New York Botanical Garden



THE NEW YORK
BOTANICAL GARDEN



<http://tcn.amnh.org>

Tri-trophic Digitization

Thematic Collections Network



Photo: S. Bauer



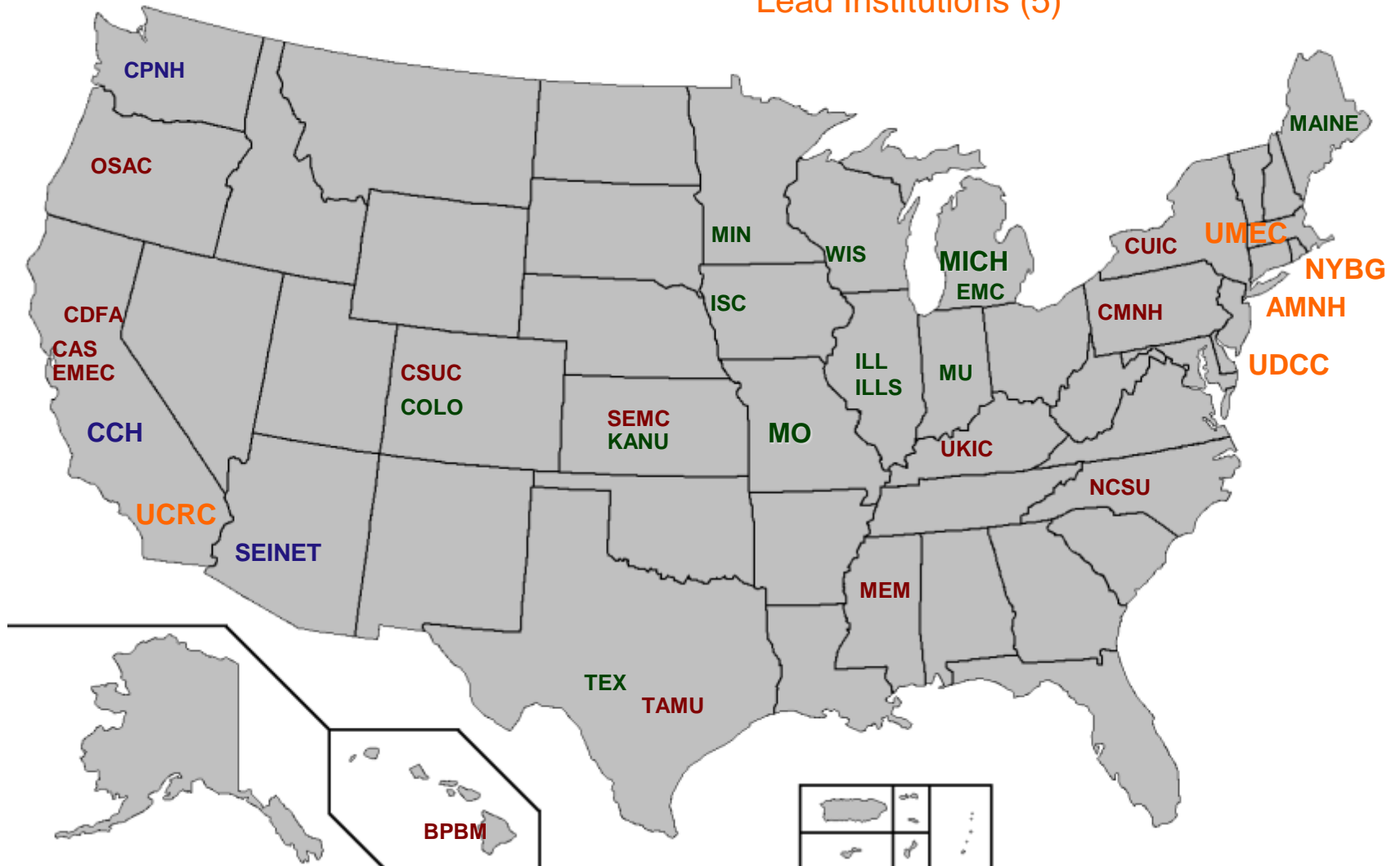
Illustration: W. J. Hooker



Photo: C. A. Johnson

TTD Network

Herbaria (14) Botanical Data Contributors (3)
Insect Collections (18)
Lead Institutions (5)



Network Management



Regular web-based steering committee meetings

Excellent project managers (Katja Seltmann, Kim

Watson & Mari Roberts)



Research Use of Data

Node size: Number of collecting events

Plants = green

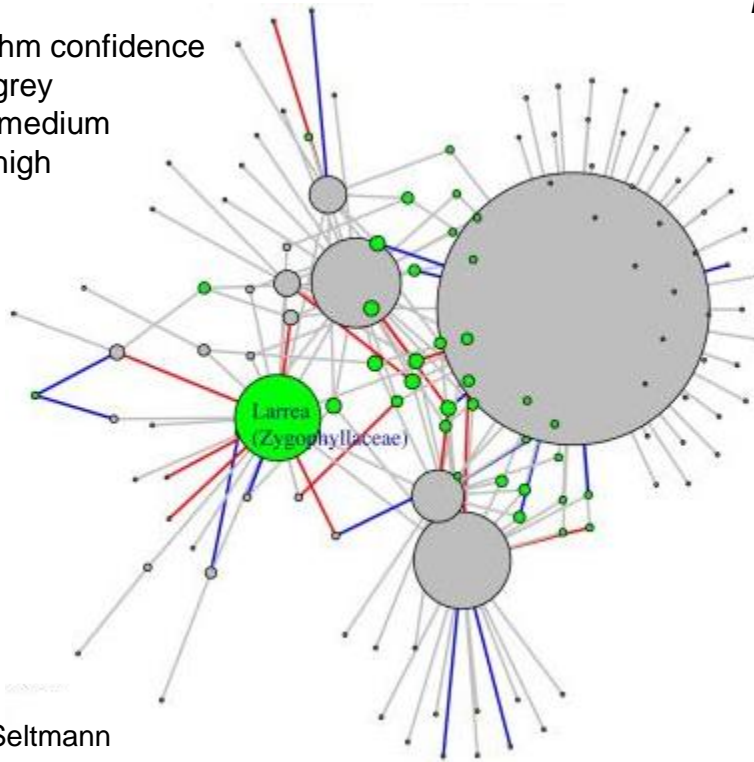
Insects = grey

Edges: Algorithm confidence

Low = grey

Blue = medium

Red = high



Katja Seltmann

Data Exploration/Quality

Relationship between insect family
Miridae & host plants

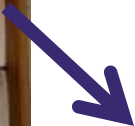
Research Use of Data

Treehoppers

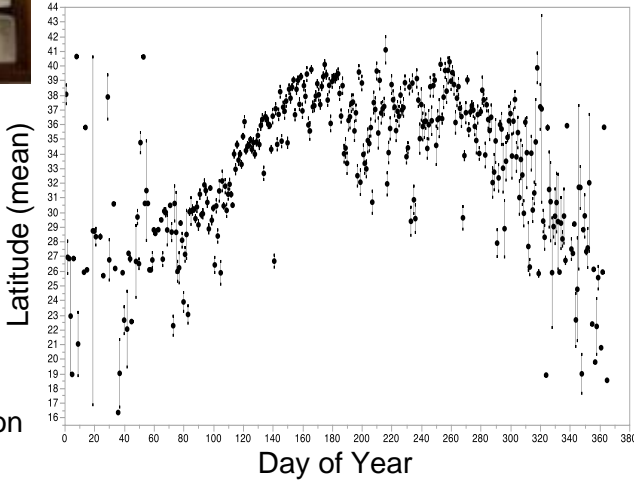


Ecological Statements

Changes in insect emergence/plant phenology over time related to abiotic conditions



Day of Year Specimen Collected by Mean Latitude



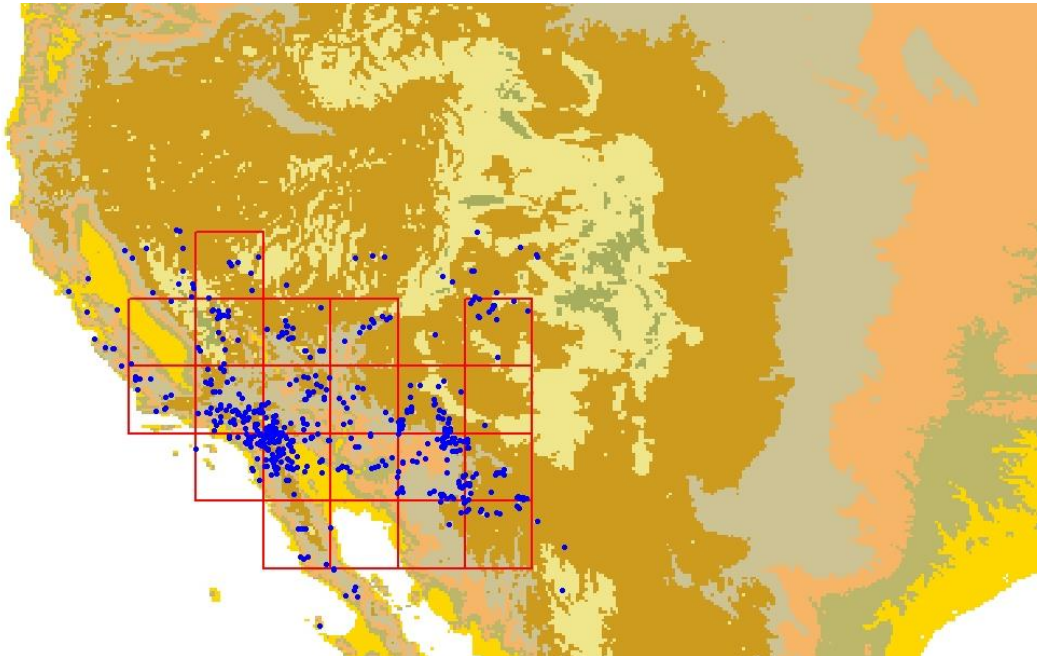
Christine Johnson

Research Use of Data

Species Distributions

Areas of endemism for North American
plant bugs & their host plants

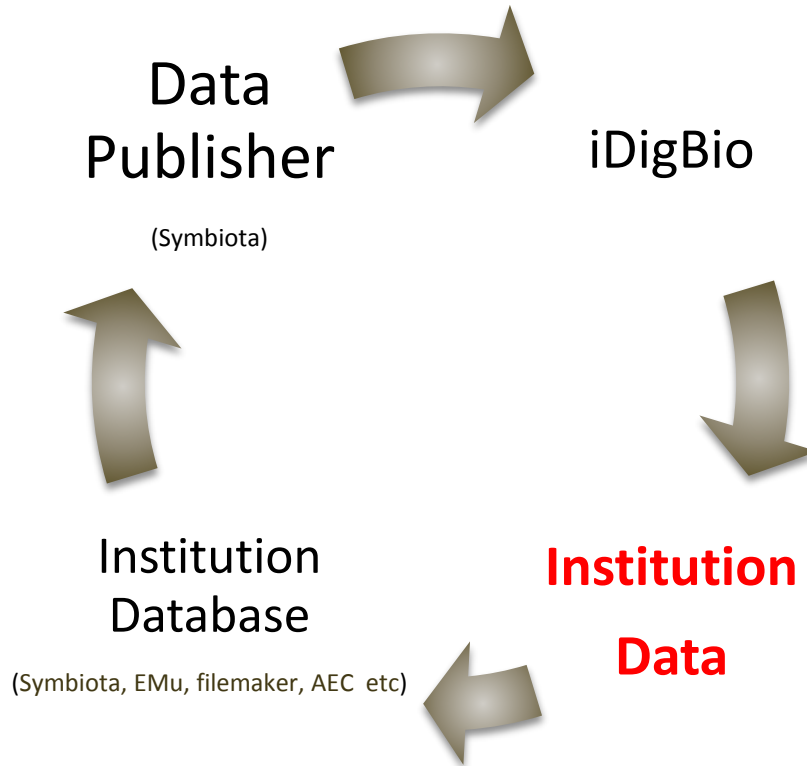
NDM results for 1,566 species of plant bugs
representing 61,784 specimens records



Christiane Weirauch, Randall Schuh,
Michael Schwartz, Katja Seltmann

Data Management

data publication workflow (Symbiota)



Data Management

institution publication workflow

Institution
Database

(Symbiota, EMu, filemaker, AEC etc)

iDigBio

**Institution
Data**

This screenshot shows a web form titled "Sites (1) - Search". It contains various input fields for site details, organized into sections: "Locality Details" (Ocean, Continent, Country, Province/State/Territory, District/County/Shire, City/Town, Nearest Named Place, Special Geographic Unit), "Elevation (Above Sea Level)" (From, To, in metres and feet), "Locality Details" (Township, Range, Section), "Precise Location", and "Site Size". At the bottom, there are tabs for "Locality", "Lat/Long", "Lat/Long (Pref)", "Mapping", "Notes", "Multimedia", "Security", and "Aid". The search bar at the bottom right contains the text "mroberts Herbarium 20085".

This screenshot shows a specimen data entry form titled "Tri-Trophic Thematic Collection Network - New York Botanical Garden (NY Herbarium)". It includes sections for "Collector Info" (Catalog Number, Other Numbers, Collector, Date, Shipped, Associated Collectors, Voucher Date), "Label Identification" (Scientific Name, Author, ID Number, Family, Authorname, Identified By, Date Identified), "Locality" (Country, State/Province, County, Municipality, Locality, Locality Security, UTM, UTM Zone, Datum, UTM Easting, UTM Northing, UTM Elevation, UTM Elevation Error), "Misc" (Habitat, Substrate, Associated Taxa, Description, Notes/Other Name(s)), "Life Stage" (Sex, Individual Count, Sampling Protocol, Preparations), and "Phenology" (Establishment Means, Cultured). On the right, there is a "Label Processing" section with an image of a plant specimen and checkboxes for "OCR image", "OCR at source", and "OCR at archive".

This screenshot shows a data management interface with a green header and a complex layout of fields and buttons. It includes sections for "New Records" (with fields for Name, Date, Sex, etc.), "Data Management" (with fields for Name, Date, Sex, etc.), and "New Records" (with fields for Name, Date, Sex, etc.). There are also buttons for "Save", "Cancel", and "Delete".

Data Management

institution merging workflow

Institution Data



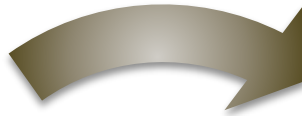
Institution Data



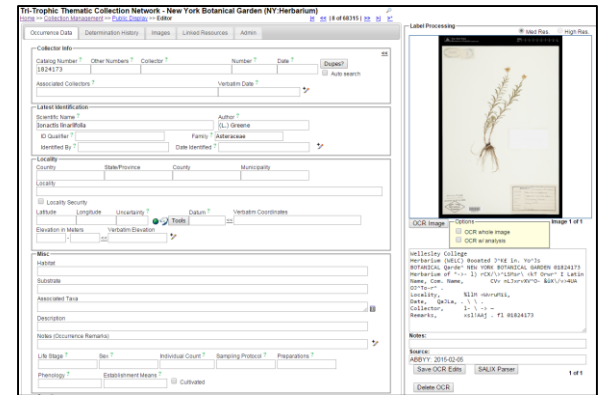
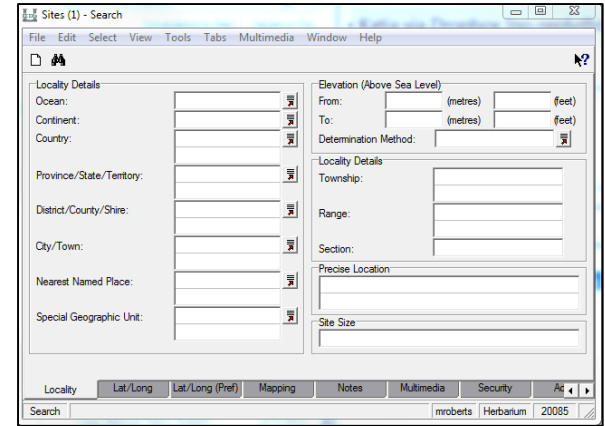
Institution Data



Institution Database
(Symbiota, EMu, filemaker, AEC etc)



iDigBio




Open Access to Data







IDigBio, DiscoverLife, Global Biotic Interactions (R, EOL)

← → ↻ ☆

What do interact with according to ?


[Phytocoris tiliae](#)
interact with... plenty of things!

Missing some results? Please [share your datasets!](#) Have suggestions? [Let us know.](#)

 Phytocoris tiliae	interactsWith	 Red Alder (Alnus rubra)	Tri-Trophic Thematic Collection Network, 2014 (and updates). Version: 2015-03-18. http://tcn.amnh.org/ . National Science Foundation grant(s) EF#1115081, EF#1115103, EF#1115080, EF#1115144, EF#1115191, EF#1115104, EF#1115115 show Provider: Tri-Trophic Thematic Collection Network, 2014 (and updates). Version: 2015-03-18. http://tcn.amnh.org/ . National Science Foundation grant(s) EF#1115081, EF#1115103, EF#1115080, EF#1115144, EF#1115191, EF#1115104, EF#1115115. Accessed at http://amnh.begoniasociety.org/dwc/AEC-TTD-TCN_DwC-A20150318.zip on 25 Oct 2015.
 Phytocoris tiliae	interactsWith	 Filbert (Corylus maxima)	Tri-Trophic Thematic Collection Network, 2014 (and updates). Version: 2015-03-18. http://tcn.amnh.org/ . National Science Foundation grant(s) EF#1115081, EF#1115103, EF#1115080, EF#1115144, EF#1115191, EF#1115104, EF#1115115 show Provider: Tri-Trophic Thematic Collection Network, 2014 (and updates). Version: 2015-03-18. http://tcn.amnh.org/ . National Science Foundation grant(s) EF#1115081, EF#1115103, EF#1115080, EF#1115144, EF#1115191, EF#1115104, EF#1115115. Accessed at http://amnh.begoniasociety.org/dwc/AEC-TTD-TCN_DwC-A20150318.zip on 25 Oct 2015.
 Phytocoris tiliae	interactsWith	 Large-leaved Lime (Tilia)	Tri-Trophic Thematic Collection Network, 2014 (and updates). Version: 2015-03-18. http://tcn.amnh.org/ . National Science Foundation grant(s) EF#1115081, EF#1115103, EF#1115080, EF#1115144, EF#1115191, EF#1115104, EF#1115115 show Provider: Tri-Trophic Thematic Collection Network, 2014 (and updates). Version: 2015-03-18. http://tcn.amnh.org/ . National Science Foundation grant(s) EF#1115081, EF#1115103, EF#1115080, EF#1115144, EF#1115191, EF#1115104, EF#1115115. Accessed at http://amnh.begoniasociety.org/dwc/AEC-TTD-TCN_DwC-A20150318.zip on 25 Oct 2015.

Education and Outreach

Volunteers (43+)

Paid Interns (23)

Workshops

Biological Specimen Informatics Short Course

Data Mining (1x) Workshops

Data Carpentry with iDigBio (4x)

Georeferencing Workshops (2015, 2015)

Digitization Workshops, Everett Children's Adventure Garden (2014, 2015)

“Goldman Sachs Volunteer Digitization Event”

Hackathon/Bioblitz

Educational Outreach

Volunteer and Internship Fairs (Fordham and St. Johns University)

“Hollingsworth Summer Camp for Kids” (2013, 2014)

Summer Youth Employment Program (1x)

Higher Education

Master's Theses (2x) Museum Studies (Seton Hall, Columbia University)

Research Experience for Undergraduates (1x, AMNH)

EOL Rubenstein Fellowship Award

Independent Research Projects (6x)



Data Mobilization

	<i>No. Insect Records</i>	<i>No. Plant Records</i>
Objects shared (iDigBio) (records, images, skeletal)	1,211,000	1,386,380
<i>Estimated # of total shared objects in December 2015</i>	1,485,939	2,160,036
Percent georeferenced	63%	23%
Specimens determined to species	91%	97%
Cost per specimen	\$1.33	\$.30
Specimens with associated taxa	15-20%	>1%

Grand Total - 3,645,975

Summary of the Past 4 years:

Novel Contributions:

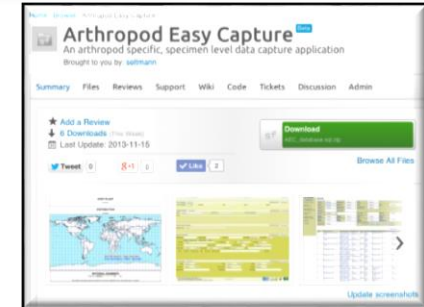
- Light box, botanical imaging standards
- Web-service data cleaning
- Research component to digitization efforts
- Crowd-sourcing module

Challenges:

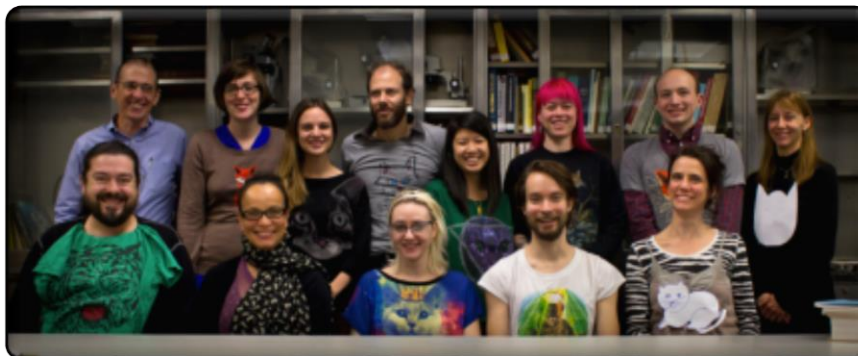
- Speed vs Efficiency trade-off
- Missing federal collections to use for data research
- Expand sharing of non Darwin Core data
- Improve data quality through research



Light box and specimen cart at MICH



Arthropod Easy Capture



American Museum of Natural History Digitizing Team



Training at COLO

Thanks to:

National Science Foundation
co-PIs and collaborators

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



THE NEW YORK
BOTANICAL GARDEN 

<http://tcn.amnh.org>



Project PI's and managers